



**DR. S.S. IYENGAR**

**FOUR DECADES  
OF CONTRIBUTION TOWARDS  
RESEARCH AND EDUCATIONAL  
ENHANCEMENT BETWEEN  
USA & INDIA**

**BY THEJAS GS**

FLORIDA INTERNATIONAL UNIVERSITY MIAMI, FL USA



**Dr. S.S. Iyengar:**  
**Four decades of Contribution towards  
Research and Educational Enhancement  
Between USA & India**

**Thejas GS**  
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## DEDICATION

*“This book is dedicated to heroes, the great leaders who strive for perfection despite human failings and who shoot for the moon, knowing full well that if they fail in their endeavor they will still land among the stars.”*

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<http://people.cis.fiu.edu/iyengar/>

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## PREFACE

*I am honored to chronicle Professor Iyengar's seminal contribution in computer science and technology transformation for over four decades in research, leadership and service to build the diamond bridge between India and USA. Further, this book describes the journey of Dr. S.S. Iyengar from India to USA with a great mission and vision to enhance the research and educational relationship between India and USA. This book also describes his notable research and service collaboration with different Indian Universities and impact of his efforts undertaken involving the search of the next Ramanujan - a great Indian Mathematician.*

*More importantly, this book describes 45 years of fundamental contribution to Science, Technology, Education of Prof. S. S. Iyengar in USA and India for pioneering and foundational work in collaborative research and educational development. The book is organized as follows:*

- *Chapter 1: **The Birth of Talent** gives a brief description about the background and early life of Dr. S.S. Iyengar, throwing light on his family upbringing, his educational interests, his evolution from a dreamer to an achiever, by converting his educational goals into reality, and testing his limits by crossing the 7 seas and going to USA for enhancing his skills which was bound to leave a big impact on the society in the upcoming future.*
- *Chapter 2: **The Chronicle** sheds some light on the current positioning of Dr. Iyengar as a founder and pioneer of various patents and initiatives, and gives the reader some cognizance about the work that he is currently pursuing, along with the list of his affiliations and the journals in which his research work has been established and published. It gives a holistic view of the projects and research work that has been undertaken at the present scenario by Dr. Iyengar, and various fields in which the impact will be seen in the near future.*
- *Chapter 3: **The Conqueror** discusses about the awards and recognition that Dr. S.S. Iyengar has received on both national and international level. It also discusses about the impact of his research on the business and commercial level and highlights the importance of his leadership qualities that encompassed his research work, propagating his work to various domains and finding applications in various startup businesses and research areas.*
- *Chapter 4: **The Machine** gives an account of the unending and untiring efforts that has been undertaken by Dr. Iyengar in putting his knowledge and skills to the forefront and making startling contributions to the Indian educational and research structure by holding various workshops, professional and scholarly activities like distinguished national lectures and invited lectures, along with keynote addresses. He lent his expertise to the upcoming and emerging educational revolution in the Indian society by chairing many conferences and lectures.*
- *Chapter 5: **In search of Ramanujan** elaborates on the opportunities that have been provided by Dr. S.S. Iyengar and his collaborators to the talented but economically backward students in order to uplift them from their present situation and giving them the power to explore their capability and contribute towards the upscaling of the society around them. This was made possible by spotting young talent in the deep crevices of Karnataka and polishing and nurturing that talent through fellowships along with life-long mentoring and guidance so that they brighten up the world around them with their shining talents.*
- *Chapter 6: **Initiation of Research enhancement in India** gives a detailed description of the collaborations and engagements that were established by Dr. Iyengar in the fields of Science and research through a multi-pronged approach, by connecting firms, educational institutions and people across the*

*American and Indian domain, to foster healthy relationships and strengthening the educational and research fabric of India.*

- *Chapter 7: **Iyengar Medical and Educational Foundation (IMEF)** deals with the various contributions to medical science and research that has been provided by the IMEF to the Indian society, as a whole. It discusses the initiatives that are undertaken by the foundation that focus on research work catering to improving the quality of life for the people and building a base to fund similar research work in the future.*
- *Chapter 8: **Press & Media Attention** gathers the excerpts from various newspapers and journals that discuss about the contribution of Dr. Iyengar to the society and the areas that are touched by his work.*

# **Innovation Fueling using Brooks-Iyengar Algorithm**

**Outstanding Research Award**

**“Test of Time”**

**for Research Contribution  
of Brooks-Iyengar Algorithm**

Presented to: Dr. S. S. Iyengar

@ IEEE Cybermatics Congress, Atlanta, GA, USA

July 14 – 15, 2019



Some inventions are here today gone tomorrow, while others stand the test of time. Those inventions that stand the test of time are often taken for granted in our society as they become integrated into the fabric of our modern life.

“It’s amazing to see the impact on people’s lives and the extent to which people benefit from our work every day,” says Distinguished University Professor Dr. S. S. “Ram” Iyengar. “Yet most people have no idea of the importance of our contribution on their everyday lives.” Dr. S.S. Iyengar is coinventor of the Brooks-Iyengar Algorithm for noise tolerant distributed control systems, which provides an optimal solution for sensor system fault dis-ambiguity. In layman’s terms, the algorithm allows a group of sensors to exchange values to aggregate a correct set point from good sensors and discard the incorrect or “bad” data from erroneous sensors, improving both the precision, accuracy and efficiency of a sensor network in the presence of faulty sensors. What this means for everyday use is that our systems operate without error when we need them most.

Dr. Iyengar was honored by the Institute of Electrical and Electronics Engineers’ (IEEE) Cybermatics Congress in Atlanta, Georgia, on July 15, 2019, where he will received the Outstanding Research Award known as the “Test of Time Award” for his work in creating the Brooks-Iyengar Algorithm. The award was presented by Dr. Steven Yau, Professor of Computer Science and Engineering at Arizona State University and former IEEE Computer Society President, and Dr. Bhavani Thuraisingham, Director of Cybersecurity program at UT Dallas. The ceremony was held at the Sheraton Atlanta Hotel. Dr. Iyengar was also a keynote speaker for the event.

Iyengar created the Brooks-Iyengar Algorithm in 1996 along with his student, Richard Brooks who is now a Professor of Electrical and Computer Engineering at Clemson University. Since its creation, the algorithm has been incorporated into a variety of systems across the world.

The algorithm was incorporated in new versions of real-time extensions to the Linux Operating System, in particular in RT Linux and MINIX. In 2015 researchers proposed and incorporated a robust fault-tolerant railway door opening and monitoring system for use in transportation, providing accurate automatic opening and closing with minimum traction through the fusion of sensor inputs. At the heart of this creation was the Brooks-Iyengar algorithm. Most recently, the system has been applied in social networks such as identifying and tracking influential nodes and eliminating false information to obtain more accurate predictive results. His system was incorporated in several projection models for the presidential election in 2016, which accurately predicted the upset for Hillary Clinton, despite more conventional models which gave her an 80% chance of winning.

Today, the Brooks Iyengar algorithm can be found at the heart of smart power grids and intelligent transportation networks across the world. It has had “significant impact” on defense and telecommunications work by Raytheon BBN Technologies, Telcordia, and Boeing.

“I’m deeply humbled by the praise we have received for our algorithm and astonished at the number of uses for which this technology has been applied,” Iyengar stated. It is truly an honor to receive this ***Test of Time Award***,” he continued, “as the algorithm has been used in more than 28 doctoral dissertations around the world, including such prestigious institutions as MIT, Carnegie Mellon University and the University of Southern California. We knew we were on to something when it

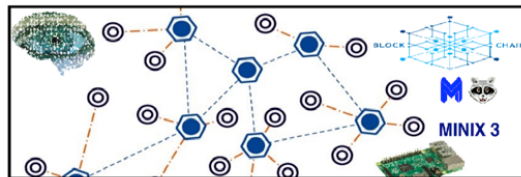
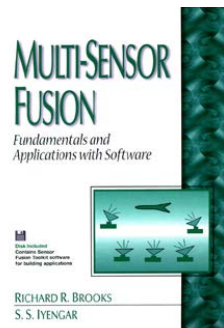
was created, but I couldn't image 23 years ago the impact it would have on technology and ultimately people's lives throughout the world."

Dr. Iyengar went on to say that it was a great honor to be selected for the award from such a large number of scientists and industry professionals. "I want to especially thank, Dr. Yau for presenting the award, Dr. Brooks for his continuing collaboration over the years and I would like to thank the entire Cybermatics Congress for this recognition."



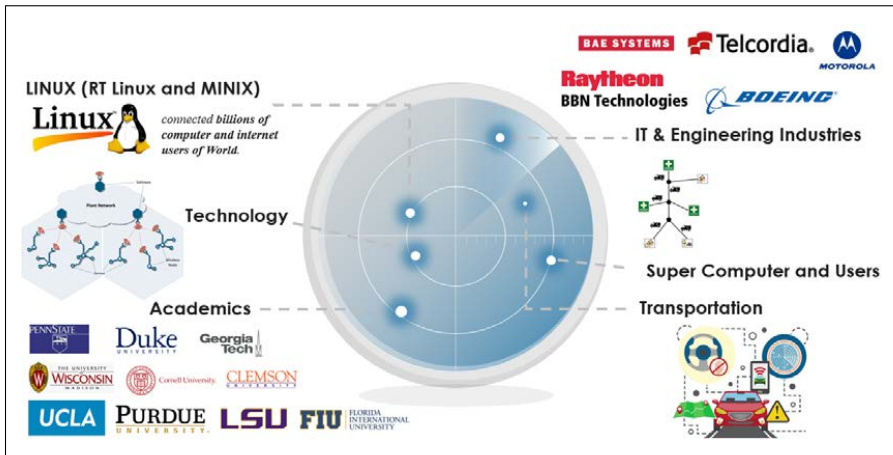
# Brooks-Iyengar Algorithm

- Discovered in 1996 by S S Iyengar and his former student Richard Brooks (Currently a Professor in Clemson University).
- BI algorithm is a distributed algorithm that improves both the precision and accuracy of the **interval measurements** taken by a distributed sensor network, even in the presence of faulty sensors.
- It combines **Byzantine agreement** with **sensor fusion**.



Impression of the use of BI algorithm in a Distributed Sensor Network (DSN)

# Impact of Brooks-Iyengar Algorithm



# Impact of BI Algorithm on

- More than **28 dissertations** from highly ranked universities (e.g. **MIT**, **Carnegie Mellon University**, **RICE University**, **University of Southern California**, and **University of Pennsylvania**) have extensively been inspired by the Brooks-Iyengar Algorithm or applied it in their dissertation.
- BI algorithm has impacted thesis in Germany, the United States, and China. His foundational work has also resulted in innumerable **funding opportunities provided by the National Science Foundation (NSF)** to continue to advance research in this significant area.

**Logos:** MIT, RICE, USC, Penn, CARNEGIE MELLON UNIVERSITY, NSF

# Impact of BI Algorithm on 2016 USA politics

- Electoral competitions
  - Voter Sophistication
  - Analysis of social norms in hierarchical systems
  - Public Finance campaign analysis
  - Predictable Money market
  - Government Formation and Parliamentary Systems
- BI was incorporated in several projection models for the presidential election in 2016, which accurately predicted the upset for Hillary Clinton, despite more conventional models which gave her an 80% chance of winning.



Politics of the United States of America



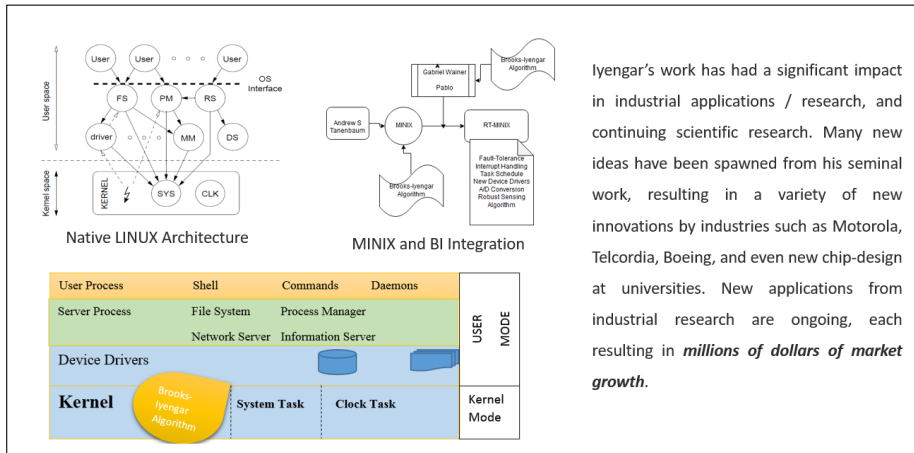
Politics of the United States of America



Selected Two Party Predictions, Results, and Root Mean Square Errors for 2016

State	Trump Actual	Trump Predicted	Clinton Actual	Clinton Predicted	RMSE
West Virginia	0.721	0.62	0.279	0.38	10.1
Texas	0.547	0.51	0.453	0.46	0.7
Arizona	0.519	0.508	0.481	0.492	1.1
Hawaii	0.312	0.354	0.688	0.646	2.2
Massachusetts	0.353	0.352	0.647	0.648	0.1
Minnesota	0.492	0.449	0.508	0.551	4.3
Wyoming	0.757	0.664	0.243	0.336	9.3
Colorado	0.474	0.468	0.527	0.532	0.5
Florida	0.506	0.485	0.494	0.515	2.1
Iowa	0.551	0.507	0.449	0.493	4.4
Michigan	0.501	0.461	0.499	0.539	3
Nebraska	0.487	0.492	0.513	0.508	0.5
New Hampshire	0.498	0.468	0.502	0.532	3
North Carolina	0.519	0.489	0.481	0.511	3
Ohio	0.543	0.497	0.457	0.503	4.6
Pennsylvania	0.504	0.466	0.496	0.531	3.8
Virginia	0.471	0.455	0.529	0.545	1.6
Wisconsin	0.504	0.469	0.496	0.531	3.5

# Market Attractiveness & Share



Iyengar's work has had a significant impact in industrial applications / research, and continuing scientific research. Many new ideas have been spawned from his seminal work, resulting in a variety of new innovations by industries such as Motorola, Telcordia, Boeing, and even new chip-design at universities. New applications from industrial research are ongoing, each resulting in *millions of dollars of market growth*.

## Selected Publications Highlighting the Impact & Use of BI

- V. Kumar, "Impact of Brooks-Iyengar Distributed Sensing Algorithm on Real Time Systems," in IEEE Transactions on Parallel and Distributed Systems, vol. 25, no. 5, pp. 1370-1370, May 2014.
- Buke Ao, "Robust Fault Tolerant Rail Door State Monitoring Systems: Applying the Brooks-Iyengar Sensing Algorithm to Transportation Applications," in International Journal of Next-Generation Computing, Vol. 6, No. 3, November 2015.

# Chapter 1

## The Birth of a Talent

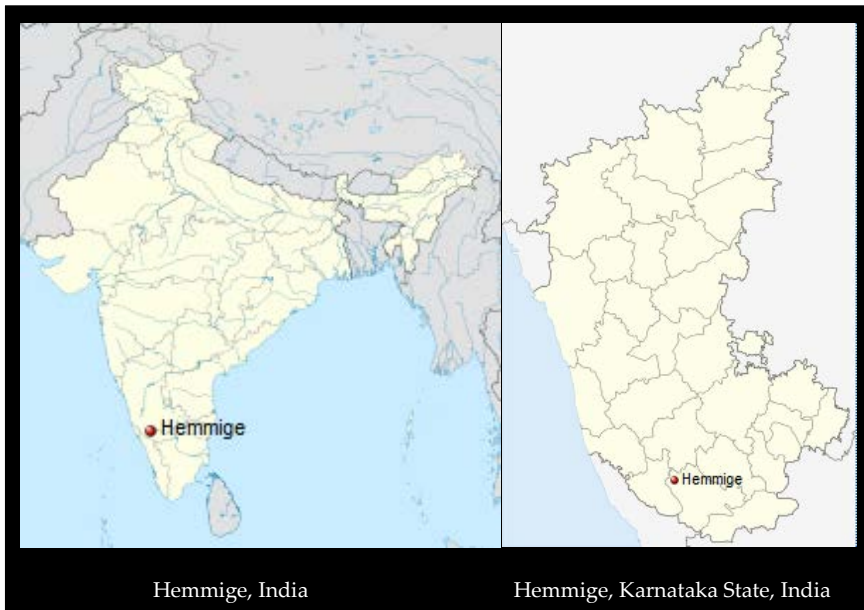
## CHAPTER 1: THE BIRTH OF TALENT

“Hide not your talents, they for use were made,  
What's a sundial in the shade?”  
— Benjamin Franklin



Sitharam June 1969 (22 years old)

## 1.1. CHILDHOOD

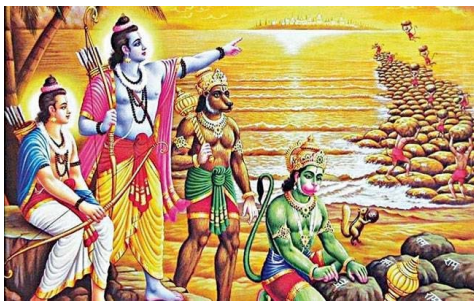


*Sundaraja Sitharama Iyengar was born in Hemmige on August 26, 1947 → 11 days after India took its first breath as a free country. The British India got dissolved by gaining independence from the United Kingdom, giving birth to a new, independent India. After partition of India took place, Viscount Mountbatten of Burma continued to be the Governor-general of the Union of India and at this time, Jawaharlal Nehru became the First Prime Minister of India.*

*The village Hemmige is thirteen kilometers from T. Narasipur. The village looked very similar to other villages in India at the beginning of independence. On those days Hemmige had no electricity, running water or automobiles. The children enjoyed swimming in the crystal clear waters of the river Cauvery. Agriculture was the primary occupation for the village people and there was very little opportunity for good education.*



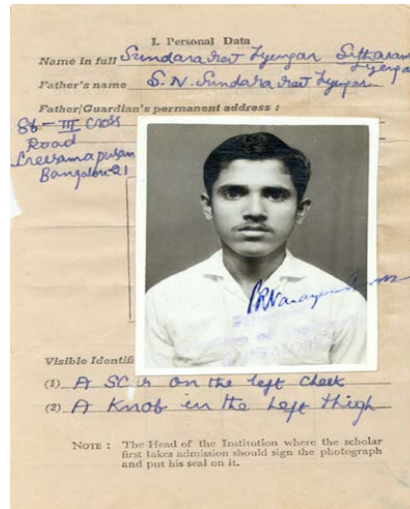
Sitharama was the fourth child of S.N. Sundararaj Iyengar and S. Mahalakshmi. He was born in a small mud house. Some untrained servants and Chokkamma, the great great grandmother, assisted the delivery of the baby. There was no hospital or clinic and no mid-wife to assist women in childbirth. During the third or fourth day of the birth of the baby, the mother noticed ants crawling over the newborn causing bruises to the skin and flesh. Ants had to be removed by hand picking as no other treatment was available. The baby had sustained so much injuries that the parents thought that he would die but he bounced back to life. The boy was named Sitharama in the Varadaraja Swamy Temple. The name Sitharama is the name of the hero of the great Indian epic 'Ramayana' written by Sage Valmiki.



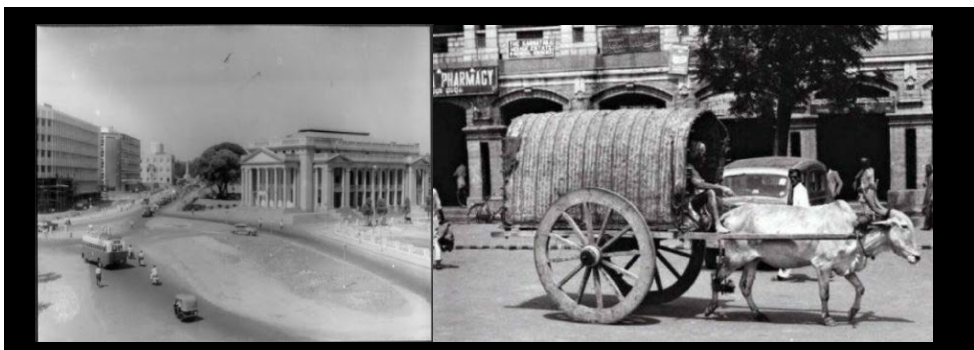
Sitharama father S.N. Sundararaja Iyengar and Mother S. Mahalakshmi. In 1992 at Lakshminarasimha temple in Marehalli, Mandya district.

At the time of the birth of Sitharama his father, a B.Sc. (Hons.) in Chemistry, was working as a divisional assistant in the Mysore State Electricity Board at a nearby place named Shimsha. The job had no use for his knowledge in Chemistry! He moved to Bengaluru in 1949 and joined the Accountant General's office as the divisional accountant. He retired on the 19th of October, 1972 as the superintendent of Accounts. Lack of personal recognition of his abilities and an urge to improve the quality of life by careful planning made the family to struggle to make a decent living. Sundaraj Iyengar was closely related to very successful literatures like P.T. Narasimhachar and Gorur Ramaswamy Iyengar. Professors of Chemistry like Venkatanarasimhachar and M. Seshadri, professor of Indology, University of Mysore somehow, he lacked the drive and courage to take risk and strive for higher ends. Strangely, his son Sitharama worked hard from his boyhood to achieve excellence by taking risks. Like the river Cauvery changing its course from east towards west near Hemmige, Sitharama moved towards Western education with determination. Ultimately, the boy who dreamed of a purposeful life, while, playing on the shores of the river cauvery, blossomed into a successful scientist in the planes of the great Mississippi river in the United States of America.

Sitharama was two years old when his father moved with his brood to Bengaluru. When Sitharama's parents moved to Bengaluru (Bengaluru in annada) it was not the 11th great city in Science and Technology as listed by the "Techno Review" of United States. According to the Newsweek magazine, Bengaluru is one of the 10 cities considered to be having the State of the Art Technology. At present Bengaluru is described as the 'Millenium city', 'the Silicon Valley of India', 'Technology capital of India', 'Home for Information Technology' and 'capital for Biotechnology'. It is also the capital of the Karnataka State. Bengaluru was also the first Indian city when got streetlights electrified. The great research centre, 'The Indian Institute of Science' was started here in 1909. Seven million people currently live in this city.



In the 1950's Bengaluru was just a big town in the old State of Mysore. In 1953, the Karnataka State was not formed. It was a clean town with beautifully laid out parks and gardens, wide tree lined avenues. The town is believed to have been founded by a king named Kempegowda in the early 16th century. It became an important fortress town under Hyder-Ali and Tipu Sultan two centuries later. The famous Lalbagh Botanical Gardens remains as a relic of their period of rule. It was a town of Tanks, towers erected by Kempegowda, rocks, gardens and avenues with flowering trees. There were baskets full of Marigold flowers and the historic city market was greeting the people with garlands of Jasmine flowers and mango fruits. Sitharama's primary education started at the Nagappa block Government Primary School,



Bengaluru in 1953. He skipped the first grade and entered the second grade directly. His early childhood was spent in self-study as the family was unable to provide a nursery and Montessori Method of teaching children.

He was diligent in studies and loved to complete the home assignments without seeking help from the elders and in most of the cases well ahead of time. Always first in his class of 30 students, he willingly helped other kids in solving their home assignment problems. There were many instances of teaching other kids in the primary class just to get some food to eat. He was painfully aware of the financial constraints of his Parents who were struggling to make both ends meet. When other children merrily played munching snacks, they could buy from the pocket money their parents had given, Sitharama would sit sulkily practicing multiplication tables. By the time he completed the primary schooling and joined the middle school, he had already developed voracious appetite for reading.

While, he was in the middle school he recognized his prowess in solving problems in Arithmetic. His mathematics teacher once asked the class to solve mathematical fractions in a surprise test. This chapter was not taught in the class but the teacher wanted to test the logical skills of his students. Sitharama prepared the solution and nicely helped the entire class to understand the solution.

He recalls with pride “I always used to be ahead of others in my class and perhaps, sometimes, my teacher also”. He was never satisfied with his performance in the examinations, even though he stood first in the class. “I always thought that I could do more” he used to muse. This apparently insignificant episode, yet important, reinforced his confidence in mastering mathematics and science. He loved books and wanted to read more. The penury of the family discouraged buying even the textbooks. In those days’ students had to memorize the English poems from the textbook and recite in the class. Sitharama Iyengar recalls how he was punished by the English teacher for not memorizing a poem called “Brooks”. The punishment was to memorize two poems! He thought it was unfair for a teacher to punish him for no fault of his.

At his middle school, to quench his thirst for knowledge he visited Public Libraries and seminars. Utilization of the notes of seminar contents he meticulously prepared helped him to sharpen his intellect and think positively towards study materials. Rigorous in his approach, intensely focused and remarkably diligent, Sitharama quickly set new standards in his school education.

His days in the middle school were spent with joy and sorrow. Academic success filled him with joy and hope. Economically and socially there were instances of painful disappointments.

An incident that happened while, he was in the middle school, apparently trivial, lingers on in his memory as an unpleasant episode even after four



Family Picture 1972

He joined the Seshadripuram high school which was known for its discipline and excellence in teaching. The transition from middle school to high school was smooth as far as the studies were concerned. He liked mathematics and science. The head-master Mr. Subramanya Iyer was a scholar in law, and an excellent teacher and an efficient administrator. He was formerly Prof. English at St. Joseph's college. Yet another teacher whom he fondly remembers while, at school was Mr. Div. Narasimhamurthy. He was an excellent teacher of mathematics. Mr. Murthy's son, Dr. Jayasimha of Ohio State University, happened to work with Sitharama Iyengar on some research projects in computer science in the 1990's. Mr. S.R. Srinivasa Iyengar, Mr. K.V. Subbarao, Mr. H.V. Krishnamurthy, Mr. S.R. Chakravarthy were the other outstanding teachers whom he fondly remembers. He remembers those great teachers, with gratitude, as the ones who groomed him to gain reasonable understanding of science and mathematics.

Life in the school was not without a few bitter memories also. One of his teachers made some uncharitable comments about the dress he was wearing and his bare feet. He recalls the incident: This pained me because it would be rude to remark upon someone's appearance. The comment of the teacher; "If you want to be a scholar you must dress well" did not go down very well with him. However, this episode strengthened his determination to become famous and prove his abilities despite the poor conditions prevailing around him.

One of the fond memories Iyengar cherishes is the lecture he listened while he was in the final year of his high school studies. Prof. Subramanian Chandrasekhar was on a lecture tour and had come to Bengaluru. Iyengar had read about the life and achievement of Chandrasekhar. He talked about the mystery of the white dwarfs and the death of massive stars. Iyengar listened to the details, entranced at the beauty and grandeur of science.

Iyengar couldn't sleep that night "I should also, one day achieve something unique in my career" was his dream. He began to think seriously that he should go either to England or to USA for his higher studies. He was always thinking that someday he would be prosperous and help his parents to come out of the poverty stricken life and be happy. He started looking far into the future.

It was proved that it wasn't just a day dream when the results of his SSLC examination were announced. He had passed in high first class, may be 12th or 16th in the State ranking. He had secured highest marks in Physics, Chemistry and Mathematics for the School. The Seshadripuram high school honored him with a prize.



**"ANYONE WHO HAS NEVER MADE A MISTAKE HAS NEVER TRIED ANYTHING NEW."  
– ALBERT EINSTEIN**

## 1.2 TURNING POINT



Dr. H. Narasimhiah before Prof. Iyengar presents a seminar at the Bengaluru

In the early sixties of the last century the choice of bright young students after passing their tenth standard was to join the famous National College at Basavangudi, in Bengaluru. Great thinkers and educators like Prof. K. Sampathgiri Rao and Prof. Gopaldaswamy Iyengar had laid a firm foundation for the college which blossomed into a centre for excellence in educating the youth. When Sitharama joined the college in 1962 for his pre-university studies, Dr. H. Narasimhiah was the Principal. He had earned his doctorate degree in Nuclear Physics in 1960 from the Ohio State University, USA. Sitharama had heard about this visionary who had the distinction of being known by his initials like G.K.C. and G.B.S. in England. Sitharama was inspired by the personality of H.N. The mind of HN was brimming with new ideas of great consequence and he freely mingled with the students and motivated them to achieve excellence in different fields. "It was my choice to join the National College" says Iyengar, and his parents had nothing to do in selecting the college.

Sitharama made the best use of all the opportunities provided by the college. He recalls the excellent teaching of his dedicated teachers, for whom, teaching was a passion. The teachers were outstanding and helped him to acquire a thorough understanding of subjects like calculus, trigonometry, physics and chemistry. The college had a good library and he read some of the best English classics in addition to the prescribed text. Learning the languages, especially English, was a dominant factor during his study of two years in the college.

Sir M. Visvesvaraya, the great engineer, who was honored as the jewel of India (Bharat Ratna) was another visionary who inspired Sitharama when he was in the college. He wanted to see Sir M. Visvesvaraya in person and, listen to his magical words. This didn't happen as Sir M. Visvesvaraya died in 1962, the year in which he joined the college. Sir M. Visvesvaraya was an epitome of honesty, sincerity, and dedicated work, concern for the poor and self-motivation. He practiced all that he preached. For young Sitharama Sir M. Visvesvaraya became another role model besides Prof. H. Narasimhaiah who just got his PhD from Ohio State University and he was the principal in 1962.

Prof. H. Narasimhaiah taught Physics. Besides teaching physics, he was also sharing his experiences and in America, while, he was studying for his doctorate. The American system of education, unlike the British model adopted by the Bengaluru University, was more inspiring for Sitharama. A passionate desire to study in USA filled his mind.

It was during his stay at the National College, the college was affiliated to the Mysore University. The experience he gained over five years was very rewarding. Slowly his future career was getting shaped. he had the opportunity of listening to a lecture delivered by Prof. C.V. Raman, the Nobel laureate. Raman's vision about the development of scientific research in India impressed him the most. Unfortunately, quality of research was not a major focus in Indian research at that time. He often wondered whether he should continue his higher studies in India or to follow the footsteps of scientists like Khorana and Chandrasekhar! He passed his pre-university examination in first class with distinction.

During his college days, Sitharama was speaking good English. He participated in the intersection debates and also took keen interest in sports, living in penury and the distance he had to walk dissuaded him from active participation in co-curricular and extra-curricular activities. He often remembered the affectionate words of his secondary school teacher who would say while announcing the class marks, "Sitharama, something I see in you, but can't explain, you have great potential but you must pursue". He used to go to her for suggestions. Instead of giving suggestions she was giving him books to study, "I see a spirit of competition embedded in you, cultivate!" was the advice she used to give.

What should Sitharama do next was a big question in the minds of everyone at home. His father was well educated. Traditionally Iyengars are adventurous and love to lead a quality life. They always work hard to be at the top. However, parents of Sitharama were basically good people but lacked the spirit of adventure. They too were like the majority of Indian parents who are worried about their odd age and always be thinking how to support themselves at later years. They were affectionate but timid. They wanted him to take some degree and secure a job in the Government. They just couldn't think beyond that. It's really amazing how Sitharama could venture to join an Engineering College. He decided to be a mechanical engineer and dreamed of building machines; that too computational machines! He convinced his parents that jobs were much easier to get with an engineering degree. He would get scholarships and educational loan and will never be a financial burden to the family. With much reservation, the consent was given by the family. Finally, Iyengar joined the University Visvesvaraya College of Engineering, Bengaluru in 1963, for a bachelor's degree.

Tuesday, March 4, 2003

The Times of India, Bangalore



Indian Institute of Science Director Prof. Goverdhan Mehta presents the 'Distinguished Alumnus Award' for 2001 to Prof. S. Sitharama Iyengar, Department of Computer Science, Louisiana State University, USA, in Bangalore on Monday.

## Award for professor

**TIMES NEWS NETWORK**  
**Bangalore:** The Council of the Indian Institute of Science and the Indian Institute of Science Alumni Association on Monday gave the 'Distinguished Alumnus Award', 2001, to Prof. S. Sitharama Iyengar of the Department of Computer Science, Louisiana State University, USA, and currently Satish Dhawan professor of IISc.

The award was presented on the birth anniversary of the Institute's founder Jamsetji N.Tata.

Prof. Iyengar has made contributions in computa-

tional science. His discoveries on high performance algorithms and various applications have been acclaimed.

His paper, 'Virtual Quad-trees' solved an important problem of image representation; his work on 'Balancing Algorithm' has also become a benchmark for evaluating other algorithms in time and space complexity.

Earlier in the day, Prof. Goverdhan Mehta led staff and students in paying tributes to the founder. The Tata Memorial Sports Club and students forum 'Prastutha' also conducted a science quiz for students.



Sitharama and friends Oct 1967



Satish Dhawan, director of the Institute of Science



Indian institute of science (IISc), bagalore



Mississippi State University (MSU)

## MASTERS DEGREE 1968 -1970

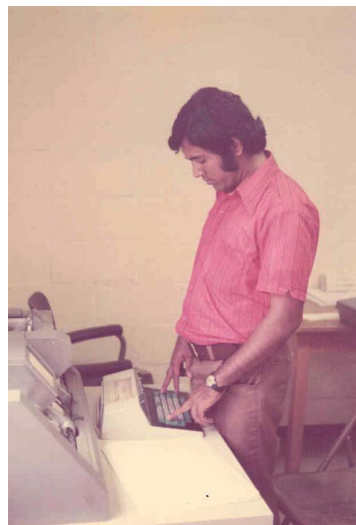
Iyengar joined the Indian Institute of Science in July of 1968, for a masters degree in Engineering. The Indian Institute of Science (IISc) is a premier post-graduate institution of research and higher learning located in Bengaluru, India. Sitharama mentor Prof. Satish Dhawan played an important role for the development of his career. Prof. Dawan recognized Sitharama's talent and channelized Sitharama's dream of doing a Ph.D. in United States of America.

## PH.D. DEGREE 1970 -1973

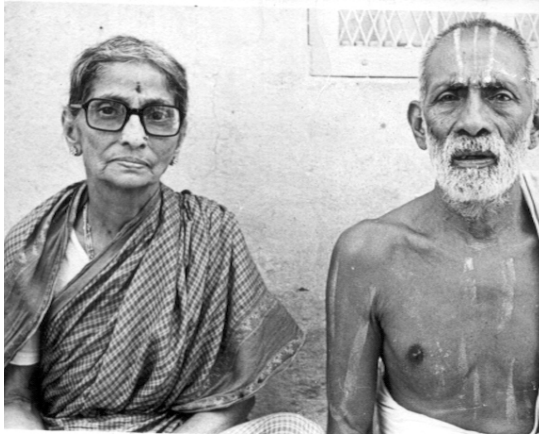
With lots of hard work and passing the hurdles Sitharama Iyengar was able to secure admission in six universities like Brown University, Worcester Polytechnic Institute, Illinois Institute of Technology, Utah State University, University of Illinois and Mississippi State University. Ultimately, he selected the Mississippi State University, which offered him a scholarship. Many other universities offered him assistantships in the second year and he was not able to afford to go without financial assistance.



Prof. Iyengar as a student (with Prof. Brown (middle)) at MSU



Programming computers using the old-fashioned punch-cards (1971 - USA)



Prof. Iyengar's in-laws – Ranganayakamma and Alasingachar (1977)

## MARRIAGE 1974

One of the most momentous incidents in his life was his marriage with Chi. Sow. Manorama, daughter of Smt. and Sri Koratikere Doddamane Alasingachar. It was a traditional Hindu marriage which was solemnized on Friday the 30th August, 1974.



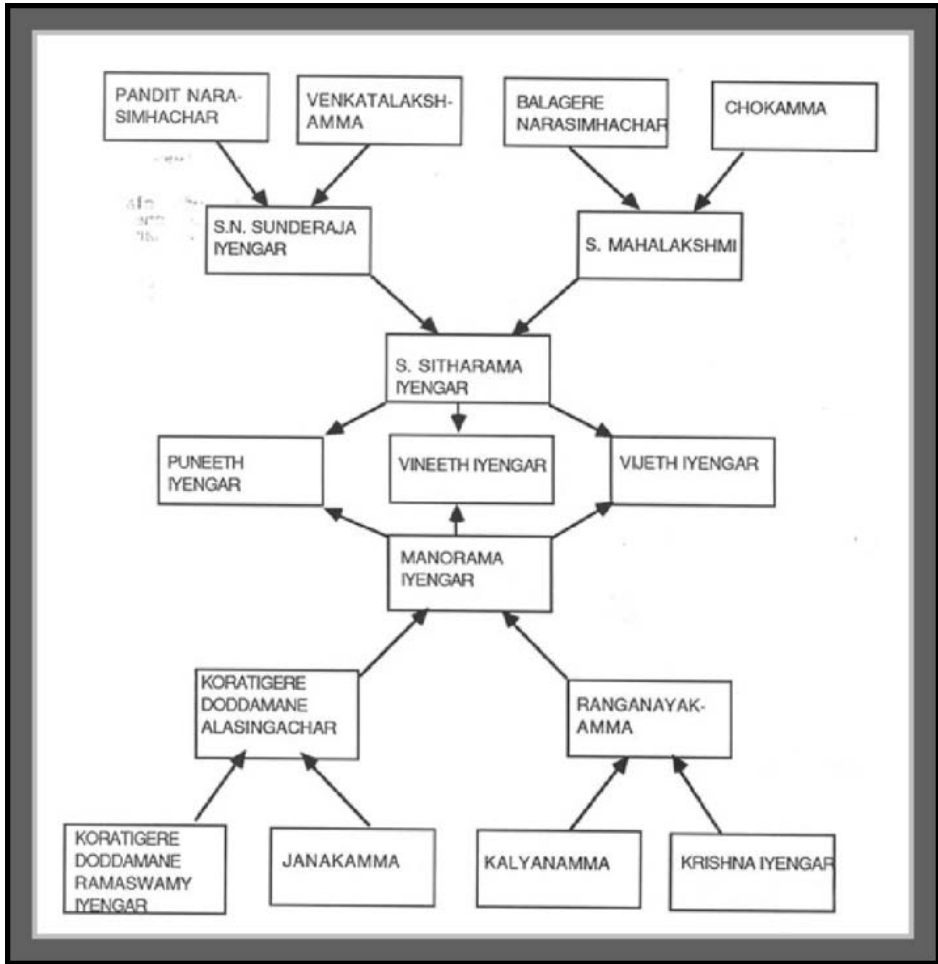
Manorama Iyengar, Dr. S.S. Iyengar and Son Mr. Puneeth Iyengar



Great grandfather Krishna Iyengar (1921)



Mr. Thirumalachar principle architect to bring the connection between Prof. Iyengar and his wife Manorama



Professor Iyengar's family tree

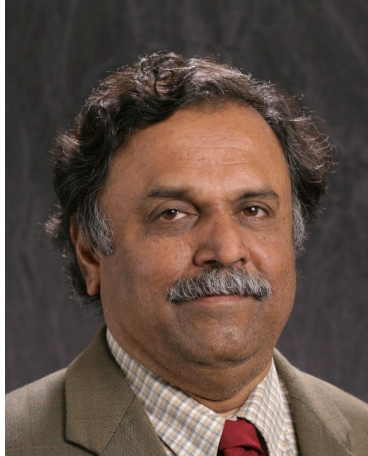
## Chapter 2

### The Chronicle

“If four things are followed - having a great aim, acquiring knowledge, hard work, and perseverance - then anything can be achieved. ”

— A. P. J. Abdul Kalam





Dr. S.S. Iyengar

Distinguished University Professor, Distinguished Ryder Professor and Director of the School of Computing and Information Sciences at Florida International University, Miami, Florida, USA



*S.S. Iyengar is a Distinguished University Professor, Distinguished Ryder Professor and Director of the School of Computing and Information Sciences at Florida International University, Miami. He has been involved with research and education in high-Performance Algorithms, Data Structures, Sensor Fusion, Data Mining, Artificial Intelligence, Machine Learning and Intelligent Systems. Since receiving his Ph.D. degree in 1974 from MSU, USA, he has directed over 55 Ph.D. students, 100 Master's students, and many undergraduate students who are now faculty at Major Universities worldwide Scientists and Engineers at National Labs/Industries around the world. He has published close to 600 research papers, authored/co-authored and edited more than 26 books. His books are published by MIT Press, John Wiley and Sons, CRC Press, Prentice Hall, Springer Verlag, IEEE Computer Society Press, etc. One of his books titled "Introduction to Parallel Algorithms" has been translated into Chinese. During the last thirty years Dr. Iyengar has brought in over 65 million dollars as grants for research and education. He has been providing the students and faculty with a vision for active learning and collaboration at Jackson State University, Louisiana State University, Florida International University, and across the world. Dr. Iyengar's career is a distinguished one, marked by his incredible record of success in ground breaking research, inspirational teaching and excellence in community service.*



*Through his national and international contributions, he has consistently provided opportunities for minority students and underrepresented groups to participate in his research endeavors, and to develop local, state, and national programs to promote minority and underrepresented groups in computer science and STEM education programs. He has developed enormously successful models and programs that have been replicated in universities around the world. Through NSF, he developed a comprehensive network of computer education, and coordinated computer science workshops and short courses which introduced computer science to over 5,000 minority students and assisted minority faculty in advancing educational concepts and research. In his most current initiatives in providing computer science advising and student tutors, he has been able to significantly increase retention rates at his University in STEM areas.*

*Dr. Iyengar has also provided outreach to industry and to a variety of groups in the local high school community. Industry affiliations have resulted in internships for his students with multiple Fortune 500 companies. Informally, as well as formally through his NSF sponsored Research Experience for Teachers, he has worked with local science teachers in high school and middle schools to open up many of his labs for weekend work and interaction with the students to participate with undergraduate students in areas such as computer hardware, cyber security and robotics. He has invited and sponsored the Girls Who Code organization to provide summer seminars for local high school women — which got a tremendous success in preparing and recruiting high school women for STEM careers.*

## Books published



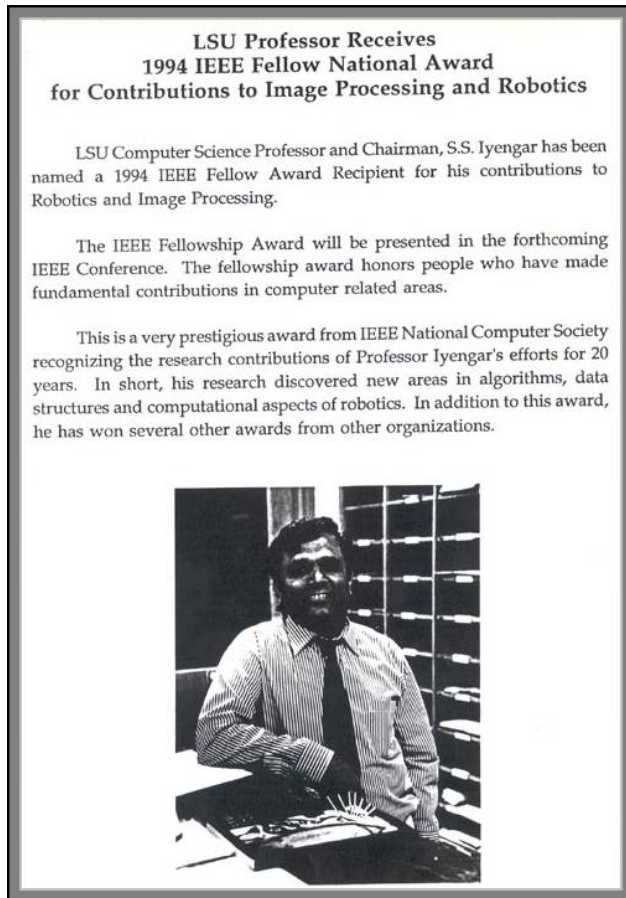
His research has been funded by National Science Foundation (NSF), Defense Advanced Research Projects Agency (DARPA), Multi-University Research Initiative (MURI Program), Office of Naval Research (ONR), Department of Energy / Oak Ridge National Laboratory (DOE/ORNL), Naval Research Laboratory (NRL), National Aeronautics and Space Administration (NASA), US Army Research Office (URO), and various state agencies and companies. He has served on US National Science Foundation and National Institute of Health Panels to review proposals in various aspects of Computational Science and has been involved as an external evaluator (ABET-accreditation) for several Computer Science and Engineering Departments across the country and the world. Dr. Iyengar has also served as a research proposal evaluator for the National Academy.

## Funding Agencies



### 2.1.1 INVENTIONS

1. Co-inventor of the Brooks–Iyengar algorithm for noise tolerant distributed control which bridges the gap between sensor fusion and Byzantine fault tolerance, providing an optimal solution to the fault-event disambiguation problem in sensor-networks (1996)
2. Co-inventor of a novel, paradigm shifting method for grid coverage of surveillance and target location in distributed sensor networks (2002)
3. Provided seminal work for automated analyses and interpretation of satellite imagery of the ocean and other unknown terrain (1994)



4. Co-invented the Cognitive Information Processing Shell, a complex event processing architecture and engine which recognizes and responds to complex patterns in mission critical, real-time applications (2010)
5. Solved an open problem in graph recognition, laying foundation for fast parallel computing for large scale data sets (1988)



## Professional Member and Recognition

The impact of his research contributions can be seen in places like Raytheon, Telecordia, Motorola, the United States Navy, DARPA agencies, etc.

Dr. Iyengar is a Member of the European Academy of Sciences, a Life Fellow of the Institute of Electrical and Electronics Engineers (IEEE), a Fellow of the Association of Computing Machinery (ACM), a Fellow of the American Association for the Advancement of Science (AAAS), a Fellow of the Society for Design and Process Science (SDPS),

and a Fellow of the American Institute for Medical and Biological Engineering (AIMBE).



He has received various national and international awards including the Times Network NRI (Non-Resident Indian) of the Year Award for 2017, most distinguished Ramamoorthy Award at the Society for Design and Process Science (SDPS 2017), the National Academy of Inventors Fellow Award in 2013, and the NRI Mahatma Gandhi Pradvasi Medal at the House of Lords in London in 2013 among others. He was awarded Satish Dhawan Chaired Professorship at IISc, then Roy Paul Daniel Professorship at LSU. He has received the Distinguished Alumnus Award of the Indian Institute of Science. In 1998, he was awarded the IEEE Computer Society's Technical Achievement Award and is an IEEE Golden Core Member. Professor Iyengar is an IEEE Distinguished Visitor, SIAM Distinguished Lecturer, and ACM

National Lecturer.

In 2006, his paper entitled, *A Fast-Parallel Thinning Algorithm for the Binary Image Skeletonization*, was the most frequently read article in the month of January in the *International Journal of High-Performance Computing*

*Applications. His innovative work called the Brooks-Iyengar algorithm along with Professor Richard Brooks from Clemson University is applied in industries to solve real-world applications. Dr. Iyengar's work had a big impact; in 1988, when he and his colleagues discovered "NC algorithms for Recognizing Chordal Graphs and K-trees" [IEEE Trans. on Computers 1988]. This breakthrough result led to the extension of designing fast parallel algorithms by researchers like J. Naor (Stanford), M. Naor (Berkeley), and A. A. Schaffer (AT&T Bell Labs).*

*Dr. Iyengar has been awarded the Satish Dhawan Visiting Chaired Professorship at the Indian Institute of Science, the Homi Bhabha Visiting Chaired Professor (IGCAR), and a professorship at the University of Paris-Sorbonne.*



The National Academy of Inventors Fellow Award in 2013



Mahatma Gandhi Pravasi Medal Oct. 5 by the Non-Resident Indians (NRI) Welfare Society of India

## 2.1.2 PROFESSIONAL EMPLOYMENT AFFILIATIONS



Aug 2018 **Distinguished University Professor**, Florida International University, Miami, USA  
 – Present

Aug 2011 **Ryder Professor & Director**, School of Computing and Information Sciences (SCIS), Florida International University, Miami, USA  
 – Present



Jul 1992 - **Roy Paul Daniel's Professor & Chairman**, Department of Computer Science, Louisiana State University, Louisiana, USA  
 Aug 2011

**Professor of Computer Science, Director - Robotics Research Lab**, Louisiana State University, Baton Rouge  
 Aug 1987-  
 Aug 2011

Jul 1991 – **Professor and Interim Chairman**, Department of Computer Science, Louisiana State University, Baton Rouge, Louisiana.

Aug 1983 - **Associate Professor**, Dept. of Computer Science, Louisiana State University.  
 Jul 1987

Jan 1980 - **Assistant Professor**, Dept. of Computer Science, Louisiana State University.  
 Aug 1983



Dec 2007 **Visiting Homi Bhabha Distinguished Professor** at Indira Gandhi Center of Atomic Research, Kalpakkam, India.  
 – Jul 2008



Aug 2006 **Visiting Chaired Professorship**, Department of Computer and Communication Engineering, Asia University, Taichung, Taiwan.  
 – Jul 2007



2004 - **Co-Director**, Louisiana Biomedical Research Network (LBRN) Bioinformatics Core, Department of Computer Science, Louisiana State University.  
 2011



Jul 2003 – **Visiting Satish Dhawan Chaired Professor**, Indian Institute of Science, Bengaluru, India.  
 Aug 2006

May - Aug **Visiting Professor**, School of Computer Science and Automation, Indian Institute of Science, Bengaluru, India.  
 1984



May 2002 **Visiting Professor, University of Kuwait.**



Feb - Mar 1993 **Visiting Professor, Department of Computer Science, Université Paris VII, France, Host: Professor A. Saoudi.**



Jun - Aug 1990 **NASA Summer Faculty Fellow, Division of Automated Systems at Jet Propulsion Laboratory, California Institute of Technology.**



Jul 1988 **Visiting Faculty, Robotics and Artificial Intelligence Group, CESAR Division, Oak Ridge National Laboratory, Oak Ridge, TN.**

Jun - Jul 1987 **Visiting Faculty, Robotics and Artificial Intelligence Group, CESAR Division, Oak Ridge National Laboratory, Oak Ridge, TN.**

Jun - Aug 1985 **Oak Ridge Associated Universities program visiting faculty, Robotics and Artificial Intelligence Group, CESAR Division, Oak Ridge National Laboratory.**

Jun - Jul 1986 **Visiting Faculty, Robotics and Artificial Intelligence Group, CESAR Division, Oak Ridge National Laboratory, Oak Ridge, TN.**



Aug 1977 - Dec 1980 **Associate Professor, Dept. of Computer Science, Jackson State University.**

Jun 1974 - Aug 1977 **Assistant Professor of Computer Science, Jackson State University.**



May - Jun 1977 **Visiting Faculty, Department of Informatics, University of Bonn, Germany.**



1991 - 2004 **Technical Consultant: Jet Propulsion Laboratory-Caltech (1991), Naval Research Lab (1996), Duke University (2002-2003), South Carolina Commission on Higher Education (2003), Ministry of Education - UAE (2002-2004).**



### 2.1.3 REASEARCH PUBLICATION, BOOKS AND PATENTS

Dr. Iyengar has published close to 700 scholarly articles in

- Authored/coauthored/edited books (26),
- leading technical journals (237),
- conference proceedings (310),
- Technical Reports (9) (jointly with Cornell, UT-Austin, Purdue, Georgia Tech, Case Western University, Oak Ridge National Lab, Georgia State University, Indian Institute of Science, and others).
- Patents (9).



Books Authored  
and Co-authored

## Chapter 3

# The Conqueror

CHAPTER 3: THE CONQUEROR

“If you want to achieve excellence, you can get there today. As of this second, quit doing less-than-excellent work.”

—Thomas J. Watson



An advertisement for the NRI of the Year award. It features a photo of a man receiving an award. Text includes: "TIMES NOW ACTION BEGINS HERE", "Watch Indian Americans get Global Indian recognition.", "NRI OF THE YEAR", "SITHARAMA IYENGAR", "ICICI Bank", and logos for sponsors like EY, The South Asian Group, and The Hindu Group.



### 3.1. HONORS AND AWARDS FOR CONTRIBUTION TO RESEARCH AND SCHOLARSHIP

- **Distinguished University Professor**; FIU.
- **Professor Ramamoorthy Mentoring Award** for contribution to Software Engineering at the conference on Society of Process and Design Science Nov. 2017 Birmingham, Alabama.
- **TIMES NETWORK and ICCI NRI Award** to DR. S.S. Iyengar for Global contribution to technology and Leadership June 2017.
- **Honorary Doctorate**; Ph.D. (h.c.), Nanjing University of Posts and Telecommunications (2017)
- **Fellow of American Institute of Medical and Biological Engg.** (Fellow of AIMBE), for outstanding contributions to the development of distributed computational algorithms, 2017
- **Florida Inventors Hall of Fame**, (Nominated) 2016
- **Fellow of the American Association of Biomedical Engineering** (Nominated) 2016
- **NRI Mahatma Gandhi Pravasi Samman Award and Medal**, House of Lords, London, UK 2013
- **IBM Distinguished Faculty Award**, 2013
- **Fellow of National Academy of Inventors Award**, 2013.
- **Fellow, National Academy of Inventors (NAI)** in recognition of support and commitment to advancing technological development and innovation, Prof. Iyengar was selected as a Fellow of the National Academy of Inventors, 2013.
- **Lifetime Achievement Award** for Outstanding Contribution to Engineering, Science and Leadership in Education Awarded at Agile Engineering Conference at Indian Institute of Technology, Banaras Hindu University, ICAM, December 16-19, 2012.
- **Innovation-2-Industry Award** (2012) Dr. Iyengar and Nulogix were awarded third prize in the 2012 Innovation 2 Industry (i2i) Florida competition. The innovative and patented technology invented by the team enables a person to see changes in intra ocular pressure by observing their eye using a small hand held device. ["Funding the Dream", Harbor Style Magazine - June]
- **The Association of Scientist and Developers and Faculty Award**, 2012, awarded to selected, distinguished faculty by the Eminent Engineer Award Institution of Engineers, Calcutta (India), 2012.
- **Distinguished Alumnus Award** from University Visvesvaraya College of Engineering, Bengaluru, India, and January 2-3, 2011.
- **Distinguished Research Award** from Xaimen University, China for Dr. Iyengar's research in Sensor Networks, Computer Vision and Image Processing for 2010.
- **ATLAS-2010**, The Academy of Transdisciplinary Learning and Advanced Studies, George Town, Texas, elected Dr. Iyengar to the Grade of its **Prestigious Village Fellow**.

- *Recognized by the Societe Mathematique de Tunisie (SMT) for "Notable Services and Outstanding Contributions in the Area of Mathematical Theories in Sensor Networks and Computational Algorithms in Robotics for 2010".*
- *Honorary Doctorate in D.Sc (Eng). from Techno Global University, Calcutta, India, 2010.*
- *Distinguished Rain Makers for Leadership and Research Award at LSU (2009)*
- *Satish Dhawan Chaired Professorship Award, Indian Institute of Science, Bengaluru, and Homibhaba Professor, 2007-08.*
- *Best Paper Award at the 10th International Conference on Information Technology (IEEE - ICIT 2007) Rourkee, India, Co-authored with Ranjit Abraham and Jay B. Simha, "Medical Data-mining with a New Algorithm for Feature Selection and Naive Bayesian Classifier".*
- *World's Best Technology Showcase Award 2007 - A project titled "Fast Web Page Allocation on a Server Using Self-Organizing Properties of Neural Networks LA Tech - LSU" authored by Dr. Phoha (LA Tech), Dr. S.S. Iyengar (LSU) and Dr. Kannan (LSU) has been selected in this highly competitive summit - May 15-18, Arlington, Texas.*
- *Visiting Chaired Professorship, Dept of Computer and Communication Engineering, Asia University, Taichung, Taiwan. (Aug 2006 - July 31st, 2007).*
- *Best Paper Award at the International Conference on Information Systems, ISNG, November 19-21 2004, Las Vegas Co-authored with Lydia Ray, Rajgopal Kannan, Arjan Durrezi, and Ramaraju Kalindi, "Secure Weighted Data Aggregation in Wireless Sensor Networks"*
- *Best Paper Award at the 18th International Conference on Advanced Information Networking and Application (AINA 2004) March 2004 at Tokyo. Co-authored with Parachuri, Durrezi, and Kannan "Authenticated Autonomous System Trace back".*
- *Distinguished Alumnus Award of the Indian Institute of Science, Bengaluru, India, 2003. Presentation of a Medal and a lecture on March 3, 2003 at the Senate Hall, IISc, Bengaluru, India.*
- *Satish Dhawan Chaired Professorship Award, Indian Institute of Science, Bengaluru, and 2002-04.*
- *Elected Member of the European Academy of Sciences (EAS) in the category of Computer Science, 2002. Elected*
- *Fellow, Association of Computing Machinery (ACM) for Outstanding and Professional Achievements in the Field of Information Technology, 2002.*
- *Roy Paul Daniel's Endowed Professor of Computer Science in Research/Teaching, 2002.*
- *Appointed Member of the Advisory Board of the Springer Verlag Dictionary of Internet Dictionary, 2002.*

- **Technology Innovation Award Louisiana Tech University Research Foundation Inventor Award**, September 2001. This was a patent titled "Fast Web Page Allocation on a Server using self-organizing properties of Neural Networks". United States Patent, Application filed, September 1, 2001, OIP File: 0110, submitted jointly with Dr. R. Kannan and Dr. V. Phoha. Featured in World's Best Technology Showcase.
- **Rainmaker Award, LSU 2009-2010.**
- **Elected Fellow, American Association of Advancement of Science (AAAS) for Outstanding Contribution to Algorithms in Robotics, 2000.**
- **Distinguished Research Master Award, University Medalist 1999.**
- **H.M. Hub Cotton Award for Faculty Excellence, 1999.**
- **LSU Association for Computing Machinery Student Chapter Award, 1999.**
- **IEEE Computer Society Technical Achievement (Research) National Award for Outstanding Contribution to Algorithms in Robotics, 1998.**
- **Member of the New York Academy of Sciences, 1996.**
- **LSU Alumni Association Distinguished Faculty Award of Excellence in Research/Training, 1996.**
- **LSU College of Basic Sciences Tiger Athletic Foundation Award, 1996.**
- **Elected Fellow, Institute of Electrical and Electronics Engineering (IEEE), for Outstanding Contribution to Algorithms in Robotics 1995.**
- **Jawaharlal Nehru Chaired Professorship Award, September, 1995, University of Hyderabad.**
- **Appointed member of the advisory panel NIH (National Institute of Health)-NLM (National Library of Medicine), 1993-97.**
- **Awarded Williams Evans Fellowship, University of Otago, New Zealand, 1991.**



**SITHARAMA S. IYENGAR, PH.D.**

**AIMBE College of Fellows Class of 2017**

*For outstanding contributions to development of distributed computational algorithms with applications in biomedical sciences and engineering and education of computer scientists.*



## Brooks-Iyengar Distributed Sensing Algorithm

The Brooks-Iyengar algorithm or Brooks-Iyengar hybrid algorithm is a distributed algorithm that improves both the precision and accuracy of the measurements taken by a distributed sensor network, even in the presence of faulty sensors. The sensor network does this by exchanging the measured value and accuracy value at every node with every other node. It computes the accuracy range and a measured value for the whole network from all of the values collected. Even if some of the data from some of the sensors is faulty, the sensor network will not malfunction. Iyengar is the Co-inventor of the Brooks-Iyengar algorithm for noise tolerant distributed control, which bridges the gap between sensor fusion and Byzantine fault tolerance thus providing an optimal solution to the fault-event disambiguation problem in sensor-networks (R. B. Iyengar 1996) (R. R. Iyengar 1995) (R. B. Iyengar 1998).

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APPLICATION OF THIS ALGORITHM IN MODERN DAY LINUX OPERATING SYSTEM FOR COMBINING DATA IN FAULT-TOLERANCE. (MINIX)

APPLICATION IN DARPA'S PROGRAM DEMONSTRATION WITH BBN, CAMBRIDGE MASSACHUSETTS, MURI, RESEARCHERS FROM PSU/ARL, DUKE, U. WISCONSIN, UCLA, CORNELL AND LSU

BROOK-IYENGAR SENSOR FUSION ALGORITHM HAS BEEN EXTREMELY INFLUENTIAL

## Impact of Leadership in Research

Dr. Iyengar has exhibited leadership in research that has proven itself useful in defense and industrial applications and motivated many academic and industrial researchers at FIU as well as in South Florida, leading to the establishment of Airforce Research Lab in partnership with FIU

Establishment of Research Collaboration between FIU and IHMC. Ignition of research collaborations between FIU and Brazil in the area of Future Internet Architecture (FIA). This research and development is for more conservatively and high-impact research collaborations on two countries.

Establishment of Discovery Lab and Visualization Lab at FIU for

1. Academic research to commercialization
2. National Robotics week event for local community
3. Robotics Summer Camp for high/middle school students
4. Telepresence project for disabled veteran and police has been worldwide spot lighted

*Yahoo news, MSNBC TechNews, CNet News, Deccan Herald (India), Nate News South Korea), etc.*

## Optimization of Sensor Network Infrastructure

The impact of Iyengar's seminal work on optimization of sensor network infrastructure has been wide ranging. Since he laid the foundations for sensor deployment through his early papers, several major companies have commercialized this research and filed for patents (K. Chakrabarty 2002) (S.S. Dhillon, Sensor Placement for Effective Grid Coverage and Surveillance 2002) (S.S. Dhillon, Sensor Placement for Grid Coverage under Imprecise Detections 2002) (C. a.

## Research in Global Scale

His research work was shown on the Discovery channel, History channel, local ABC news affiliates (WBRZ News), Fox TV channel (Fox 44 WGMB), Youtube and major news outlets (LSUReville, The Advocate) around the world, over 60 million homes distributed worldwide (Russia, Korea, Europe, China, India etc.) One of Dr. Iyengar's students Brian Obe's love of digital artistry emerged in 1990 with a visit to LSU robotics research laboratory where he was introduced to many techniques and that ended him getting an animation award at the 78th Academy Awards.

## Research into Commercial Area

One of Dr. Iyengar's project along with Dr. Phoha (LA Tech) and Dr. Kannan (LSU) entitled "Fast Web Page Allocation on a Server Using Self-Organizing Properties of Neural Networks" was selected in World's Best Technology Showcase in the year 2007. This is a highly competitive summit and other competitors were Los Alamos Labs, Johns Hopkins University, EPA , NASA and many other. His research has spanned over three decades producing a number of new inventions and has led him to have his impact on thousands of researchers. Professor Iyengar has named patents and has guided graduate level research of almost 150 students.

## Research in Global Scale

His research work was shown on the Discovery channel, History channel, local ABC news affiliates (WBRZ News), Fox TV channel (Fox 44 WGMB), Youtube and major news outlets (LSUReville, The Advocate) around the world, over 60 million homes distributed worldwide (Russia, Korea, Europe, China, India etc.) One of Dr. Iyengar's students Brian Obe's love of digital artistry emerged in 1990 with a visit to LSU robotics research laboratory where he was introduced to many techniques and that ended him getting an animation award at the 78th Academy Awards.

## Influential Text Books

Dr. Iyengar's influential text books have been used extensively and translated into many languages worldwide in Multi-Sensor Fusions, Sensor Network Programming, Wavelet Analysis, and Distributed Sensor Networks. The research findings uniquely connect computing techniques to imaging techniques to biological systems protocols and modeling.

## Impact on Startup Companies

In 2010, Iyengar as a president of NoeticNexus Company has been instrumental in setting up the technology goals and vision of the start-up [www.noeticnexus.com](http://www.noeticnexus.com) and built up innovative applications using Java, PHP and the latest web technologies. They also built iPhone Apps. In 2010, he co-founded GroupThink, a startup company for social network applications. He has been helping the company on getting the tight clientele and keeping up a competitive edge with the competitors. Under his guidance the following projects have been delivered. In collaboration with Morph2O and Indian Agricultural Research Institute, Dr. Iyengar led the engineering team at NuLogix Labs, a startup company that he founded in 2010 to commercialize this technology and lead its deployment in the agricultural domain in India and the United States. Dr. Iyengar invented the Cognitive Information Management Shell, a complex event processing architecture and engine that innovatively combines automated agent synthesis with machine learning-based agile analytics and distributed databases. This shell introduced a new paradigm for combining machine learning with expert knowledge and human input. Prof. Iyengar serves on several boards / councils of corporations, universities, foundation, and governments.

## Contribution in Sensor Networks

Traditional routing algorithms for sensor networks are data-centric in nature. Given the unattended and untethered nature of sensor networks, data-centric routing must be collaborative as well as energy-conserving for individual sensors. In related research, we develop a novel sensor-centric paradigm for network routing using game-theory in which sensors collaborate to achieve common network-wide goals such as route reliability and path length while minimizing individual costs. The sensor-centric model can be used to define the quality of routing paths in the network (also called path weakness) describes inapproximability results on obtaining paths with bounded weakness along with some heuristics for obtaining strong paths. The development of efficient distributed algorithms for approximately optimal strong routing is an open issue that can be explored further (R. Kannan 2003) (R. K. Iyengar 2004).



Distinguished Service Award  
Rov Paul Daniel



Dr. S.S. Iyengar received Distinguished Alumnus Award from University Visvesvaraya College of Engineering on UVCE Mega Reunion at Bengaluru, India.





Dr. Iyengar was awarded the most distinguished Ramamoorthy Award at the Society for Design and Process Science (SDPS 2017) Conference.

*“For important contributions to fundamental research in software engineering, computation on sensor networks and architecture”*





Lifetime Achievement Award” for his contributions in research and education in the area of Distributed Sensor Systems at the 25th IEEE International Conference on High Performance Computing, Data and Analytics on December 19th in Radisson Hotel, Bengaluru, India.



Honorary degree of Doctor of Science in Engineering, Kolkata, India on March 18, 2010



Best Paper Award for the paper “ Hybrid Model for Forecasting Power Demand and Generation in Smart Grid at 8<sup>th</sup> International Conference on Communication Network July 2014 Bengaluru, India



UVCE recognition for outstanding contributions to academics Jun 2014, Bengaluru, India

# THE INSTITUTION OF ENGINEERS (INDIA)

**Karnataka State Centre, Bangalore**

## FORTY-FOURTH ENGINEERS' DAY

(To Commemorate 151<sup>st</sup> Birth Anniversary of Engineer Statesman Bharat Ratna Dr. Sir M. Visvesvaraya)

### CITATION

This Citation is presented to Dr. S. Sitharama Iyengar for his meritorious service in the fields of distributed sensor networks, computational robotics, and oceanographic applications, and is perhaps best known for introducing novel data structures and algorithmic techniques for large scale computations in sensor technologies and image processing applications on the occasion of Forty-fourth Engineers' Day Celebration on 15<sup>th</sup> September 2011.

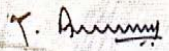
Dr. S.S. Iyengar obtained his B.E. from UVCE Bangalore University in 1968. He obtained his M.E. degree in 1970 from Indian Institute of Science, Bangalore. His Doctor of Philosophy is in Computer Science Engineering from University of Mississippi USA in 1974. He has published more than 400 research papers and has authored or co-authored eight textbooks and edited 10 others.

Dr. Iyengar has helped in organizing as well as delivering key note speeches in International / National Symposia / Workshops/ Conferences in the fields of Information Processing, Data mining, Security in Sensor networks, Distributed and Parallel computing, Context Programming and establishing research units in University/ Institutes/ Organizations in the region. He is a member of IEEE, AAAS, ACM. He is a Fellow of Institution of Engineers (India).

Dr. Iyengar's visionary proposal on sensor systems for monitoring pollution in urban areas- SENSYM submitted to National Design Research Forum, of IET, KSC, Bangalore is being pursued vigorously using Iyengar's expertise and thereby obtaining results on pollution monitoring using single station sensors data from KSPCB as a first step and obtain funding from KSPCB for detailed proposal SENSYM for Bangalore city.

Dr. Iyengar received a) Distinguished Alumnus Award at University Visvesvaraya College of Engineering- Bangalore, India, January 2-3, 2011 b) Distinguished Research Award from Xiamen University, China for his research in Sensor Networks, Computer Vision and Image Processing ,c)Distinguished Service Award Roy Paul Daniel's Professor Award(2008-2010), d)Dr. Iyengar is recognized by the Societe Mathematique de Tunisie(SMT) for "Notable Services and Outstanding Contributions in the Area of Mathematical Theories in Sensor Networks and Computational Algorithms in Robotics for 2010", e) Dr. Iyengar received an Honorary Doctorate in D.Sc(Eng) from Techno Global University Calcutta, India, f) Best Alumnus award from IISc, Bangalore.

The Chairman, Honorary Secretary and Committee Members of Karnataka State Centre of the Institution of Engineers (India) are extremely pleased to convey their fraternal felicitations to Dr. S.S. Iyengar for his spectacular achievement and wish him many more years of sound health and prosperity inspiring the younger generation to emulate him and strive for reaching such singular success in their professional career.

  
G. Sreekanth, FIE  
Honorary Secretary



  
Dr. K. Gopalakrishnan, FIE  
Chairman

VI SATURDAY, JANUARY 14, 1995

SPECTRUM

Miscellany

knowledge of our ancient sculptors. The natural cave has been known to exist from time immemorial. Kempe Gowda, Bangalore's founder, is credited with putting up the temple structure. The Shivalinga which faces south is yet another offbeat feature of the temple whose shikhara is distinctly Chalukyan. It is believed that Gauthama Rishi worshipped the linga as Gangadhreshwara. The cave itself is supposed to stretch for some distance though the priests claim it leads to Kashi!

The temple's surroundings are idyllic. On the north west it overlooks the Kempambudhi tank and the Vrishabhavati valley. The Hariharagudda park skirts the south west, providing a splendid backdrop. The Nandi hills loom on the northern horizon while to the south lies the AJaneya temple.

SUMITRA MANMOHAN

Award for Bangalorean

BANGALORE:

■ It is a robot with a human eye which can make intelligent decisions using pattern recognition techniques. It can, for example, segmentise a human face into various "objects" — eyes, nose, mouth and so on. It uses a special camera called CCD to process a picture into digital representations — and computer specialists call this image processing.

One such specialist is S.S. Iyengar, Professor of Computer Science at Louisiana State University. A native of Bangalore and an IISc alumnus, Prof. Iyengar has been conferred with the 1994 Institution of Electrical and

Electronic Engineers Fellow Award in the US. This fellowship honours people who have made fundamental contributions in computer related areas.

The award is for his research spanning over 20 years in the field of image processing and robotics. His research, funded by agencies like NASA, the National Science Foundation, Office of Naval Research and the Jet Propulsion Laboratory, explored new areas in algorithms, data structures and computational aspects of robotics. "Over the last six years, I have got grants close to \$2 million," says Iyengar, whose students work at some of America's most prestigious research institutions.

Iyengar's findings have been put into practical application by the US Navy. Called Disturbed Target Detection Problem, the automated robot picks up signals and

interprets infrared images of moving objects in space. It then integrates the sensors, merges them and comes up with an intelligent decision regarding the particular object. At NASA, his studies have found application in the storage of astrophysical data through image



S.S. Iyengar: carry on, professor

compression.

Iyengar has to his credit six textbooks and over 150 research papers. He was in Bangalore recently to attend a workshop on parallel processing.

Maya Thomas

## Chapter 4

# The Machine

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Dream is not what you see in sleep, Dream is something  
which doesn't let you sleep.

— A. P. J. Abdul Kalam

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## Professional Services and Distinctions

- Charter Member, IEEE National Computer Society's Golden Core, 2000.
- IEEE National Computer Society Meritorious Service Award, 2000.
- Certificate of Distinction to Professor S.S. Iyengar by the Institution of Engineers (India), 1999.
- Certificate of Appreciation from IEEE National Computer Society, (Fall 1999) for having served on IEEE Fellows Committee.

## Distinguished National Lecturer

- Society for Industrial and Applied Mathematics (SIAM) Distinguished Visiting Lecturer, 2000-02.
- Institute of Electrical and Electronics Engineering (IEEE) Distinguished Lecturer (under distinguished visitors program), 1995-1998.
- ACM National Distinguished Lecturer, (1986 - 1995): Association for Computing Machinery selects a distinguished group of computer scientists across the country as national lecturers. This is a distinguished program for professors to visit student chapters of ACM for seminar presentations. Dr. Iyengar has been the part of this lecture program and gave lectures at over 50 ACM Student Chapters across the country and the world.

## Professional and Scholarly Activities

- Program Chair at International Conference on "Agility, Design & Manufacturing Summit, December 11-13, 2005, Bengaluru, India.
- Program Co-Chair at Third International Conference on Innovative Applications of Information Technology for the Developing World (AACC-2005), Kathmandu, December 10-12, 2005, Nepal
- Co Program Chairman of the Advanced Computational and Communications, December, 2004, Ahmadabad, India.
- Technical Program Co. Chairs, 6th International Conference on High Performance Computing in Asia Pacific Region - 2002, December, Bengaluru India.

- Program Chairman of Advanced Computing and Communication (ADCOM) Conference, Bhubaneswar, December 2001, India
- Member of the IEEE Fellows Reviews Committee for reviewing IEEE Fellow nominations, 1998-2001.
- ACM-IEEE Computer Science Accreditation Board for program review in Computer Science in US and all over the world, July 2001-2011.
- Technical Advisor of Manipal International Institute of Information Technology, Bengaluru, India, Fall 2000.
- Member of the 8th International Conference on Advanced Computing and Communications, December 2000, Cochin, India.
- Founding member of the Karnataka Information Technology Task Force on higher education, 1999- 2000, India.
- Technical Advisor to Metalogic Inc. Hyderabad, India, 1999-2011.
- Member of the IEEE National Computer Society Awards Committee, 1998-2003.
- Distinguished Experts on a two-day National Workshop on "Distributed Problem Solving using Multi Robot Cooperation in Agile Manufacturing," July 1997 sponsored by the Institution of Engineers, Bengaluru, India.
- Member of the Program Committee: 4th International Conference on High Performance Computing, December, 1997 Bengaluru, India.
- Member of the Third International Conference on High Performance Computing, Trivandrum, India, December, 1996.
- Member of the Program Committee: SPIE's Proceedings on Multimedia Storage and Archiving Systems, November, 1996.
- Member of the Second International Conference on High Performance Computing, Delhi, India, December, 1995.
- Program Committee member at the First International Workshop on Parallel Processing, Bengaluru, India, during December, 1994.
- Program Chairman on Indo-US Workshop on Parallel and Distributed Signal and Image Integration Problems, December, 1993.

## Invited Lectures

- Invited Workshop/Speaker at International Conference of Contemporary Computing to be held on Aug 7-9, 2008 in Noida, Delhi. Topic: " A New Class of Computation for Distributed Sensor Networks ".
- Invited speaker at the International Conference on Contemporary Computing at Noida, India from Aug. 7-9, 2008.
- International Conference on High Performance Computing, "Self-Organizing, Fault-Tolerant Feature Extraction in a Distributed Wireless Sensor Network", Goa, India from December 18-21, 2005.
- Third International Conference on Intelligent Sensing and Information Processing, "Futuristic Distributed Sensor Networks" Bengaluru, December 14-17, 2005, India.
- Indian Institute of Science on "Computational Framework for Content Based Image Retrieval", Bangalore, India, January 7, 2005.
- INFOSYS Technologies, on "Distributed Sensor Networks: An Emerging Application", Bengaluru, December 28, 2004.
- Supercomputing Education & Research Center, Indian Institute of Science on "Distributed Sensor Networks: Exploring beyond the Boundaries", Bengaluru, July12, 2004.
- Honeywell on "Distributed Sensor Networks", Bengaluru, July14, 2004.
- Department of Aerospace Engineering, Indian Institute of Science on "New Applications of Distributed Sensor Networks", Bengaluru, July14, 2004.
- Center for Development of Advanced Computing (CDAC) on "Remote Visualization of Networks", Bengaluru, July16, 2004.
- Institution of Engineers (Karnataka), "Distributed Sensor Networks - An Emerging Technology", Bengaluru, July 17, 2004.
- General Electric John Welch Research Laboratory on "New Applications of Distributed Sensor Networks", Bengaluru, July 20, 2004.
- Ashok Leyland, Hosur, "Robots in Intelligent Manufacturing," 15th July 1997, Bengaluru University, India.
- Computer Point Company "Scientific Visualization using High Performance Computers," July 29, 1997, Bengaluru University, India.
- The First International Conference on High Performance Computing, Bengaluru, India, Dec 27-29, 1994.

- NSF Indo-US Workshop on Cooperative Research in Computer Sciences, August 4 - 6, 1992, Bengaluru, India.
- NSF Workshop in Computer Science, Bengaluru, India, August 3 - 7, 1992.
- NSF funded International Conference on Informatics (Paper co-authored with N. S. V. Rao and D. Kraft) Bengaluru, India. August 10, 1991.
- Center for Advanced Computing CDAC, Bengaluru, India, Jan. 11, 1991, on, "Parallel Computational Models for AI Systems".
- S. J. College of Engineering, Mysore, India, June 6, 1990, on, "Towards the Design of Intelligent Systems".
- National Aeronautical Laboratory, Bengaluru, India, May 25, 1990, on, "Towards the Design of Intelligent Systems".
- Indo-US Workshop on High Speed Digital Processing, New Delhi, India, Nov. 28, 1989, on, "Routing Strategies in Distributed Sensor Networks".
- Titan International Co., Bengaluru, India, Dec 13, 1989, on "Distributed Intelligent manufacturing for Real Time Applications".
- Indian Institute of Science, Department of Communication Engineering, Bengaluru, India, Dec. 12, 1989, on, "Reliability and Communication Issues in Sensor Networks".
- Indian Institute of Technology, Kharagpur, India, Aug. 1984.
- Indian Statistical Institute, Calcutta, India, Aug. 1984.
- Indian Institute of Science, Bengaluru, India, June 1977, June 1980.
- Indian Institute of Technology, Kanpur & Chennai, India, May 1974.

## Keynote/Distinguished/Plenary Lectures

- Invited Keynote Speaker at NASSCOM, Bengaluru, India November 2017
- Invited Keynote Speaker at Fortieth Annual Science Festival, Bengaluru, India July 2017
- Dr. S.S. Iyengar as a guest of honor to deliver talk on "AI and Deep Learning: A New Revolution in Software Development" at the IEEE International Conference on Computational Systems and Information Technology for Sustainable Solution at RV College of Engineering, Bengaluru, Karnataka, India on 21st and 23rd December 2017.

- Dr. S.S. Iyengar as a general chair of the conference delivered talk on “Artificial Learning and Deep Learning in Software” at the Second IEEE International Conference on Emerging Computing and Information Technologies (ICECIT) at Siddaganga Institute of Technology, Tumakuru, Karnataka, India on 15th and 16th December 2017.
- Dr.S.S.Iyengar Keynote addressed at the International Conference on next generation computing and information system at Model Institute of engineering and technology, Jammu, India on 11th and 12th December 2017.
- Keynote Speaker at Conference Shaastrarth 2016 - Innovations in Sciences, Engineering and Technology February 2016
- Invited Keynote Speaker at Chettinad College of Engineering and Technology on July 29-31, 2010 in Puliur C.F, Karur district, Tamil Nadu, India, Topic: “Information Dynamics In Sensor Networks for Extreme Environments”.
- Keynote Talk at Second International Conference on Multimedia and Content Based Image Retrieval (ICMCBIR-2010) - & on July 14, 2010 in H N Hall, Basavanagudi, Bengaluru, India, Topic: “Modeling and Visualization of Oil Spills”.
- Keynote Talk at Bengaluru Science Forum - & on July 21-23, 2010 in National College, Bengaluru, India, Topic: “Modeling and Visualization of Oil Spills”.
- Tutorial Sessions at Indo-US Workshop for Engineering Education - & on June 28 - July 02, 2010 in Chittoor, India, Topic: " Distributed Sensor Networks and Programming".
- Invited Keynote Speaker at ATLAS TRANSDISCIPLINARY- TRANSNATIONAL-TRANSCULTURAL bi-annual meeting, Southwestern University, - & on May 23-28, 2010 in Georgetown, TX, Topic: " Translational Medical Systems In India".
- Invited Keynote Speaker at National Modeling and Simulation Conference on December 16-18, 2009 in Pune, India. Topic: “Distributed Sensor Networks”.
- Invited Workshop/Speaker at International Conference of Contemporary Computing to be held on Aug 7-9, 2008 in Noida, Delhi, and Topic: “A New Class of Computation for Distributed Sensor Networks ”.
- Keynote Speaker at the International Conference on Content Based Image Retrieval (ICCBIR - 2008) at PESIT, Bengaluru, India during July 16-18, 2008.
- Invited talk at Bengaluru Science Forum, Bengaluru, India in July 19, 2008.
- Keynote Talk at the Second IEEE International Workshop on Next Generation Wireless Networks 2006 (IEEE WoNGeN '06), "Contamination Detection and Mapping Sensor Networks", Bengaluru, India, December 18-21, 2006.
- Plenary Speaker at 92nd Indian Science Congress, January 6, 2005, Ahmedabad, India

· Keynote Speaker at the IASTED International Conference on Advances in Computer Science and Technology (ACST-2006), "A New Class of Computation for Distributed Sensor Networks" January 23-25, 2006 Puerto Vallarta, Mexico. · Plenary Speaker at 2nd International Conference on Distributed Computing & Internet Technology (ICDCIT 2005), "The Distributed Sensor Networks - An

Emerging Technology" December 22-24, 2005 Kalinga Institute of Industrial Technology, Bhubaneswar, India.

· "Distributed Sensor Networks" at the International Conference on Intelligent Sensing and Information Processing, Chennai, India, Jan 5th, 2004.

· International Conference on Computing and Communications, Coimbatore, India, Dec 18-19, 2003.

· International conference on Information Technology Integration for Manufacturing, Dec. 28-30, Bengaluru, India, 1998.

· "International Conference of Information Technology", Bhubaneshwar, India, Dec. 20 1999.

· Workshop on "Distributed Problem Solving using Multi Robot Cooperation in Agile Manufacturing," 25-26th July 1997, Bengaluru, India.

· Internet networking for the Twenty-first Century, The Institution of Engineers, India, July 16, 1996.

· Institution of Engineers, Bengaluru, (India), Jan 6, 1996, Topic: "Theory of Computer Vision".

## External Ph.D. reviewer, Member of the Ph.D. committee and Technical Advisor for Universities in India

- Indian Institute of Technology, Bombay, India
- Manipal International Institute of Information Technology, Bengaluru, India
- UniSoft Infotech, A software company in Bengaluru, India
- Indian Institute of Technology, Kharagpur, India
- Indian Institute of Technology, Chennai, India
- Indian Institute of Science, Bengaluru, India
- St. Xavier's College, Tirunelveli, Tamil Nadu, India.
- University of Hyderabad, India
- Bharathidasan University, Tamil Nadu India
- National Institute of Technology (formerly REC), Calicut, Kerala, India.
- Indian Statistical Institute, Calcutta, India

## 'Invest more in computers'

EXPRESS NEWS SERVICE

PUNE - Highlighting the need for channelising more resources and expertise towards the computer sector, Vijay Bhatkar, executive director of the Centre for Development of Advanced Computing (C-DAC), here on Tuesday maintained that "the need for computing will always exceed the available computing power at any given time."

Addressing a group of experts at a workshop on "Future trends in transputers" organised as part of the first conference of the Indian Transputer User Group (ITUG) here, Bhatkar made it clear that India, in the near future will have to acquire "terallop" computing power.

This, he said, was imperative if the country was to tackle successfully several areas like weather forecasting and space research. Peter Thompson of Innos, Bristol, U.K., speaking on the occasion said India constituted a large market for parallel processing products. Param, the supercomputer developed by the C-DAC is based on parallel processing architecture. The transputer is the basic processor or the building block for the Param.

Thompson discussed the details of the next generation transputer which, he said, would be many times more powerful than the present ones.

Over 200 scientists and engineers are participating in the conference including L.M. Patnaik of the Indian Institute of Science, Bangalore, Jairam Hebbar of the Indian Remote Sensing Agency, Anshul Kumar of IIT, Delhi, R.M. Vasagam of the Vikram Sarabhai Space centre, Trivandrum and Satekhia Bannerjee of the Indian Statistical Institute, Calcutta.

An exhibition of parallel processing products from the C-DAC was inaugurated by Virendra Bhavsar of the University of Brunswick, Canada.

## Workshop on image processing

EXPRESS NEWS SERVICE

PUNE - The Centre for Development of Advanced Computing (C-DAC) will organise an Indo-US workshop on 'Parallel and Distributed Signal and Image Integration Problems' from December 16 to 18 here.

To be attended by 15 scientists from the US and 25 from India, the workshop will discuss growing applications of image processing and signal processing in the fields of biomedical engineering, acoustics, broadcast television, sonar, radar, seismology, speech processing and communications.

The workshop will also discuss Seismic Signal Processing which is of importance in the exploration of petroleum resources. A panel discussion proposed on the final day will review the world scenario and plan the strategy for research in the coming years.

Presentation of the state-of-the-art in the fields of image and signal processing, fault tolerant systems, neural network, multimedia and artificial intelligence will be another feature of the workshop.

## Workshop on data mining

Staff Reporter

BANGALORE: A one-day national workshop on 'Data warehousing & data mining for manufacturing in the next millennium' will be held at the Centre for Development of Advanced Computing (C-DAC) in Brunton Road here on Friday. Three international experts led by S.S. Iyengar, chairman and distinguished professor, Dept of Computer Science & Robotics, Louisiana State University will conduct the workshop. The other two are Raj Sharma and S. Dua, both professors in Dept of Computer Science, Tulane University.

December 24th, 1999 Doordarshan  
Provides a Glimpse of the Workshop

## C-DAC workshop on Dec. 16

By our staff reporter

About 15 scientists from various universities and laboratories in America, are expected to attend an Indo-US workshop on "Parallel and distributed signal and image integration problems" to be organised by the Centre for Development of Advanced Computing (C-DAC) in Pune, on December 16.

Dr. A.K.S. Gopalan, Prof. L.M. Patnaik, Prof. S.C. Sahasrabudhe, Dr. Narayan Dutt, Dr. R.N. Mahapatra, Dr. (Mrs) Jharna Majumdar and a host of Indian scientists will also participate in the workshop.

C-DAC has been working in the area of image and signal processing for a long time and has come out with many useful products. For example, VESPA-M a signal processing library developed for ZORAN, image PRO - a library and tools for image analysis, MIGRATE for the migration of large seismic data and NEST - a natural network simulator tool.

PUNE PLUS  
Dec 13, 1993  
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Column 6-7

## Top scientists for C-DAC workshops

By A Staff Reporter  
PUNE, December 12

TOP experts from India and abroad will be participating in a three-day conference of the Indian Transputer User Group (ITUG) and an Indo-US workshop on 'parallel and distributed signal and image integration problems' to be hosted by the Centre for Development of Advanced Computing (C-DAC).

The conference on Indian transputer users will be held from the 12 to 14 while the workshop on image integration problems will be held from Dec. 16 to 18.

The transputer is a microprocessor based on a Bus-based architecture. Set Computer (RISC) like architecture and with an on-chip communication channels and on-chip RAM. The transputer is a building block for constructing efficient and cost-effective parallel systems. It is a very popular processing element among leading researchers and application engineers in India.

In order to bring all these users on a common platform, ITUG was formed in September 1992 with Prof. L.M. Patnaik of the Indian Institute of Science, Bangalore, as chairman. To provide a forum for the members of this group to exchange their ideas, advertise their new products and discuss their problems, C-DAC is sponsoring this first conference here, in preparation of the centre's visit.

Major academic, research and development organisations as well as industries would be participating. A highlight would be talks on the use of transputer in the area of space application by Dr. R. M. Vasagam, deputy director, Vikram Sarabhai Space Centre, Trivandrum, on office automation by Mr. Sahal Dutt of SCS Thompson, Singapore, computer aided

design by Prof. Anshul Kumar, Institute of Technology, New Delhi and state-of-the-art in image computing by Dr. Vijay Bhatkar, executive director, C-DAC, Pune.

Mr. Peter Thompson of Innos, UK, will deliver the keynote address.

The conference also features an exhibition, which will be open from December 13 to 15, 1993 from 9 a.m. to 6 p.m. Tata Infos Limited, Indian Telephone Industries and Apollo Computers Limited will be exhibiting their new products in addition to those of the Centre for Development of Advanced Computing, Pune. The exhibition will be inaugurated by Prof. Virendra Bhavsar, University of New Brunswick, Canada.

The lectures will be delivered by Dr. Jairam Hebbar of the National Remote Sensing Agency, Hyderabad, Prof. S. K. Saha of the Indian Institute of Science, Bangalore and Mr. Rajesh Kumar of C-DAC, Pune.

Among 15 scientists from various universities and laboratories in the United States, including the Purdue University, University of Louisiana, Texas A&M University, Oak Ridge National Laboratory, University of California, University of Florida, Oregon State State University and California Institute of Technology have been invited to participate in the workshop on state-of-the-art in the fields of image and signal processing, fault tolerant systems, neural networks, etc. Prof. S. Jyengar, Prof. Bhavsar, Prof. Patnaik, Prof. Sahani and Prof. Bhavsar will be participating from the US side.

Prof. L.M. Patnaik, Prof. S.C. Sahasrabudhe, Dr. A.K.S. Gopalan, Dr. Narayan Dutt, Dr. R.N. Mahapatra, Dr. (Mrs) Jharna Majumdar and many other experts will be participating from the Indian side.

# Data galore, but scant information

EXPRESS NEWS SERVICE

## Weak algorithms dog Indian space scientists

PUNE - Indian scientists, especially those working in the signal and image processing areas, have now realised that they are ill-equipped to handle the 'overwhelming' amounts of data emanating from the Indian Remote Sensing (IRS) satellites and a host of other sources.

The scientific fraternity has been able to assimilate only a woeful 0.001 percent of the data coming from satellites. The startling revelation came during an Indo-US Workshop on 'Parallel and Distributed Signal and Image Integration Problems' hosted by the Office of Naval Research of the United States and the Centre for Development of Advanced Computing (C-DAC) here.

A.K.S. Gopalan of the Advanced Data Processing Research Institute (ADRIN), Hyderabad, in his inaugural address main-

tained that they were "rich on data" but extremely "poor on information." He lamented that the necessary systems and algorithms for processing the mounds of data were very weak and that caused the anomaly.

In a free and frank exposition, the scientist warned that in the near future the problem would only aggravate as the "volumes of data are going to be enormous."

The data base, he said, was dynamic in nature and was updated almost every 11 days due to the orbiting of the satellites. India is slated to launch another remote sensing satellite, the IRS-1C, some time in 1994. This would certainly lead to a data overload unless amends are made to enhance the capabilities to process them.

Gopalan said it is important to develop models to enable the scientists to provide information inputs to decision makers. For instance, the model on agriculture drew liberally from the satellite images and consequently provided vital information on the crop yield for a particular period of time. Armed with this information, the government could work on the import or export quota for various crops.

Enormous computing and processing power is, therefore, absolutely necessary, he said, and explained the problems the scientists had on their hands. The volume of raw data from the IRS-1C would be around 300 MB. In the realms of aerial cameras, raw data would be around a phenomenal 1.2 G Byte, a "terrible"

load. Digitising photographic images was another area that Indian scientists ought to concentrate on, Gopalan said.

Maintaining that the C-DAC had done enormous work in application areas on the PARAM, the supercomputer, Gopalan wanted to know whether "industry standards" had been set for parallel processing systems.

S.S. Iyengar, Head of the Robotics Laboratory, in the Louisiana State University, in the US, congratulated the C-DAC for its work over the years and said that the PARAM had generated a lot of interest recently, especially

in comparison with the CRAY supercomputers of the USA. The PARAM has a definite cost advantage.

Vijay Bhatkar, Executive Director of the C-DAC, in his welcome address dwelt on the genesis of the PARAM and the innumerable problems that they had to surmount in the process, especially in the acquisition of vital components like transputers and memories. Considerable emphasis, he said, had been laid on the development of software for various purposes, including signal and image processing in tandem with the Space Application Centre and also the National Centre for Radio Astronomy.

INDIAN EXPRESS, Pune  
Dec., 16th, 1993  
Page No 3, Column 1

### C-DAC workshop begins today

◆ The Centre for Development of Advanced Computing (C-DAC) will host an Indo-US workshop on "Parallel and distributed signal and image integration problems" here from Thursday.

The three-day workshop will be inaugurated by S.S. Iyengar of Louisiana State University. A.K.S. Gopalan, director, ADRIN, Hyderabad will deliver a lecture on image processing and its application in the context of India's future programme in space sciences.

### Internet's origin traced to US defence

INS ECONOMIC BUREAU BANGALORE, July 17: Speaking on the origin of the "network of networks" — the information and communication system known as Internet — Prof S S Iyengar of the University of Louisiana said the system was born out of a network originally created for the United States defense establishment.

In a talk on Internet organised by the Institute of Engineers and the Indian Science Congress Association on Tuesday, he said that defense organisations had

wanted to store various kinds of relevant data. Later, on they decided to make use of information resources of the universities and libraries, and they were included in the network. The funding was provided by Federal agencies. At a later stage it was decided to open it up for the public.

Though Internet was still an expensive option in India, it had been calculated that in an university campus, Internet access cost an individual only \$ 1 per month, he said.

Indian Express Bengaluru-July, 1996



Data Mining Workshop – NRSA, Hyderabad

# ICNGCIS 2017

International Conference on Next Generation Computing & Information System

## General Chairs



Prof. Saraj Sahai  
University of Florida, USA



Prof. Bharat Bhargava  
Purdue University, USA



Prof. Vijay Kumar  
University of Missouri-Kansas City  
USA

## Program Chairs



Prof. Lata Awasthi  
Director, NIT, Jalandhar



Prof. Ankur Gupta  
IIT, Jaipur



Prof. Deepak Garg  
Bentley University, Noida

## Keynote Addresses



Prof. Siharama Iyengar  
Florida International University  
USA



Prof. Sharma Chakraborty  
University of Texas at Arlington  
USA



Prof. Sanjay Madria  
Missouri University of Science  
and Technology, USA



Prof. Torsten Braun  
University of Bern, Switzerland

**Dr. S.S. Iyengar**  
Visiting Professor of Computer Science and Director,  
School of Computing and Information Science at  
Florida International University (FIU), Miami.  
#NPCSPEAKER | #NPC2017

INDIAN TECHNOLOGY CONGRESS - 2017  
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Indian Technology Congress

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President of IITCC

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**Dr. S. S. Iyengar**  
member of the European Academy of  
Science, winner of the Lifetime  
Achievement Award from ISAM-ITP  
(2015), a Fellow of the Institute of  
Electrical and Electronics Engineers  
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**Dr. Rajendra Hegde**  
Regional Director, IICAR-NBSBLLUP,  
Bangalore  
Principal Scientist at IICAR-NBSBLLUP,  
IC, Bangalore

## Chapter 5

# In Search of Ramanujan

2 BANGALORE CITY

THE HINDU • MONDAY, DECEMBER 19, 2005

**Future of Government**  
Former Deputy Chief Minister Siddaramaiah has predicted that the coalition Government will collapse after the zilla and taluk panchayat elections. Page 5

**Around the world**  
B.V. Narayana who went round the world on bicycle in 1979-80 covering 66,000 miles in 59 countries is again on a motorcycle journey with his team. Page 6

## A scientist on a mission to spot young talent in India

**MEET**  S.S. Iyengar

"Behind every significant scientific discovery there is someone who discovered the scientist in the first place." K. Setyanaray meets S.S. Iyengar, who is keen on helping young researchers realise their potential.

"THERE MAY be hundreds of mathematical geniuses like Srinivasa Ramanujan waiting to be discovered... let me find at least some of them and help them realise their potential," says this scientist from Bangalore, whose work is recognised worldwide.

S.S. Iyengar is Chairman and Roy Paul Daniels Professor of Computer Science at Louisiana State University and also the Satish Dhawan Professor at the Indian Institute of Science here.

Back in his hometown — he graduated from the University Visweswara College of Engineering here and at IISc before going to the U.S. — Dr. Iyengar recalls how he keeps meeting very bright young people at the various scientific conferences he is invited to in India. He was able to help quite a few find suitable opportunities with universities and research organisations in the U.S. "I will keep doing this and also help with research going on here... it is something to pay back to my country," he says.

Talent is often not recognised in time here and that is why many bright young people go to other countries, he has found. He recalls meeting at a conference in Pune, a gold medalist from an NRI, then working with a leading national research organisation in Mumbai. "He had been there for two years, doing practically nothing more than shuffling papers. Here was at a corner of the conference hall writing down complex mathematical problems... I was amazed at his talent and now he is doing well in the U.S.," Dr. Iyengar says.

Behind every significant scientific discovery there is someone who discovered the scientist in the first place, he has found. He can draw from his own experience, having guided over 36 Ph.D. candidates, many now on the faculty of leading universities across the world. Dr. Iyengar has himself been visiting professor at the University of Paris.

Known for his precise and easily understood writing on complex scientific subjects, his published books and journal articles are used by scholars in most universities. But he is most happy about being involved with the publication of the International Journal of Distributed Networks, now in its second year and considered a valuable reference source by researchers.

"Sensors which can try or as large as a palm-top, if networked and made interoperable, can do wonders... anything from detecting natural calamities in time to helping with biomedical work. You can have a tiny device inside the body, cleaning out blocks in a blood vessel of the heart and no serious surgery may be necessary... this is all going to be a possibility within some years," he forecasts.

The Indian Institute of Science is setting up a centre dedicated to research in this field and he is confident funding will not be a problem. "Many sensor devices have commercial applications and are research related to them is funded on a large-scale by American companies. They will not hesitate to sponsor research in India either," he says. "The science of computing sensing and networking have to come together and synergise each other for a bright future... all I want to do now is to excite researchers in India to achieve this. We may even be the leaders," he says.



THE NEW INDIAN EXPRESS

NATION WORLD STATES CITIES BUSINESS SPORT ENTERTAINMENT GALLERIES VIDEOS

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## NRI scientist on a mission to find the next Ramanujan

A city-based computer scientist who spent over four decades in the US and racked up an outstanding body of work is starting a first-of-its-kind.

Published: 06th January 2017 05:30 AM | Last Updated: 06th January 2017 05:30 AM

By Tushar Kaushik  
Express News Service

**BENGALURU:** A city-based computer scientist who spent over four decades in the US and racked up an outstanding body of work is starting a first-of-its-kind talent search programme in the state. For this initiative, he has had inputs and backing from another titan in the field of science — Prof C N R Rao, who will inaugurate the programme's award function in Indian Institute of Science on Friday.

The programme, called NIAS-Maiya Prodigy, involves 10 meritorious students from various parts of the state — some from rural areas — who will receive a scholarship of ₹50,000. The students can be from any field. The USP of the programme is that the 10 students will have a mentor assigned to them who will guide them in their studies and careers and monitor them over five years. This programme is a joint initiative by the food brand Maiya, National College and the Iyengar Medical Foundation.



Prof Sundaraja Sitharama Iyengar

"Nobody else in the world is doing this, not even in the US," says Prof Sundaraja Sitharama Iyengar, who conceived the project and had it executed over the past 18 months.

Prof Iyengar is currently the Ryder Professor and Director of Computer Science at Florida International University, Miami, USA. During his career, he has received many prestigious awards including the NRI Mahatma Gandhi Pradvasi Medal at the House of Lords in London on October 2013.

When asked about his biggest accomplishment, he says, "It was mentoring younger minds. Even now, what I want is to discover the next Ramanujan or C N R Rao." It was this thought, along with the urge to give back to his country that made him come up with the programme.

The seeds of the idea were sown two years ago when he spoke to Prof Rao about his idea, and the latter liked it. Iyengar then set about an exhaustive selection process. After multiple selection rounds, 10 students were chosen for the scholarship, and their names will be announced at 3.30 pm on Friday at NIAS Auditorium, IISc.

Describing the students, Iyengar says, "I came across some bright students with lofty ambitions, and they are all technically good. One of them wants to win a Nobel Prize. Another wants to find a cure for blindness. We have so much potential, but there are problems like inability to articulate well and lack of confidence. Their mentors will work with them and teach them how to ask questions."

## 5.1. DR. S.S. IYENGAR'S VISION AND MISSION ABOUT TALENT SEARCH

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*"Helping aspirants move from 'intent to action'  
and rise from 'good to great'"*

*-Dr. S.S. Iyengar*

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*"I have been in the US for last 46 Years and have been a distinguished Computer scientist and also a distinguished visiting professor at Indian Institute of Science, Bengaluru for the past several years. After having served for so many years in the United States and being well aware of the available opportunities and benefits for students here, I thought of giving similar opportunities to the students back in India.*

*On several of my visits to India in the last four years, I have happened to meet thousands of students who are bright, intelligent and good but have not been fortunate enough to be exposed to the many digital facilities that exist including the basic features offered by the Internet and this saddens and disheartens me. This digital divide means that they do not have the similar opportunities that their fellow students abroad have to showcase their talents or even follow their dreams.*

*Everyone strives for an opportunity that would provide them with the ideal platform to showcase their talents and add colors to their dreams. It is in this context of diminishing the digital divide that I in collaboration with some of the brightest minds from National Institute of Advanced Studies (NIAS), National College -Bengaluru, Iyengar Foundation and the United States have decided to launch a flagship program titled – The MaiYa Prodigy Program – a talent Search Program for High School seniors. "*

*-Dr. S.S.Iyengar*

“Mentoring is vital to a student’s success. We are committed to cultivating a culture of mentoring in education to give deserving students a clear path to success. Students with strong mentoring relationships are more productive, more involved in the community, and more satisfied with their school experience. Mentoring support ensures that students will be well trained, successfully complete their degrees, and obtain promising job opportunities. Mentoring provides youth with promise and taps into unrealized abilities through support and guidance about education and career goals.

Our program matches youth age 17-19 with prosocial supportive adults as mentors; recruited from diverse fields including organizations, targeted businesses, civil organizations, professional student organization, and Science, Technology, Engineering and Math (STEM) related majors, as well as the Arts.

Our broader commitment is to train the next generation of global leaders, entrepreneurs, researchers, scientist and artists. We believe mentoring is a key component in developing these talents and are committed to bring distinguished mentors, both old and young who can inspire our top talent student team to achieve success.”

-Dr. S.S. Iyengar

## ABOUT THE PROGRAM

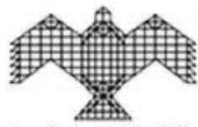
**MaiYa PRODIGY** - Mentoring to Attain International Youth Achievement in Mathematics, Applied Science, Technology, Engineering and Research (**MASTER**) for great **MINDs**. The NIAS MaiYa Prodigy Fellowship program is an important collaboration of *Iyengar foundation*, *National Institute of Advanced Studies (NIAS)*, Bengaluru, Karnataka, India, and *National College*, Basavangudi, Bengaluru, Karnataka, India. The program targets to identify talent at grades X and XII and embark on an active mentoring initiative to accelerate youth achievement in promoting the development of India’s Gifted Youth. This program is continuing its tradition of seeking and developing the best talents in India. Although a young organization by nearly all standards, program is founded on a deep tradition, though vibrant, active youth and mentors. It began the journey in 2015, and celebrated with the very first group of students on January 6<sup>th</sup> 2017 with the Prodigy Fellowship Awardees for 2017. These talented awardees were selected through an extremely competitive process requiring them to demonstrate not just academic prowess, but an ability to demonstrate passion, creativity and imagination, the driving forces for societal advancement. The programs continuing spirit to select students was Srinivasa Iyengar Ramanujan.

Srinivasa Iyengar Ramanujan was a brilliant, self-taught Indian mathematician who, having almost no formal training in pure mathematics made substantial contributions to mathematical analysis, number theory, infinite series, and continued fractions. Ramanujan initially

developed his own mathematical research in isolation, however it was quickly recognized by other Indian mathematicians. As his fame spread throughout the wider mathematical community centered in Europe, his skills increased and became obvious to noted mathematicians of his time, such as G.H. Hardy a Cambridge mathematics professor who realized had produced new mathematical theorems in addition to rediscovering previously known ones.

Hence, NIAS Maiya Prodigy Fellowship program mission is in search of the next Srinivasa Iyengar Ramanujan. This mission began in the presence of Dr. C.N.R. Rao, Dr. A.S. Kiran Kumar, Dr. Baldev Raj, Former Chairman, NIAS; Dr.S.S.Iyengar, and Dr. A.H. Rama Rao, Chairman, National College.





NIAS-MaiYa  
PRODIGY FELLOWSHIP



Mentoring to Accelerate Individual Youth Achievement in Promoting Development of India's Gifted Young

# TALENT SEARCH WORKSHOP



**LEARNING BY PLAYING IT FORWARD**

AN INITIATIVE OF NIAS-PRODIGY, THE NATIONAL COLLEGE BASAVANAGUDI & THE IYENGAR FOUNDATION

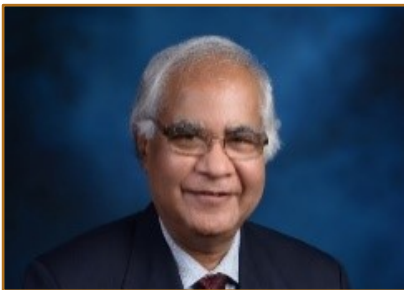
**A TRIBUTE TO DR. BALDEV RAJ**



**Dr. C.N.R. Rao**

National Research Professor,  
Linus Pauling Research Professor &  
Honorary President,  
Jawaharlal Nehru Centre for  
Advanced Scientific Research, India

**Dr. A.S. Kiran Kumar**  
Chairman of the Indian  
Space Research  
Organization (ISRO), India



**Dr. Baldev Raj**

Former Chairman, NIAS,  
India

**Dr. A.H. Rama Rao**

Chairman, National College  
and President, The National  
Education Society of  
Karnataka, India



**Dr. S.S. Iyengar**

Distinguished University Professor,  
Ryder Professor, and Director, SCIS,  
FIU



The program is one of the most far-reaching programs in the world and has no rivals. The program titled, "Mentoring to Attain International Youth Achievement (MAIYA)" focusses on development of outstanding skills in mathematics, applied science, technology, engineering and research, as well as the arts in the development of great minds.

The program strives to advance the national and global community by lifting up the best and most gifted so as to make them aware of the need for greater service to the country, across the world and for all of humanity.

Program website:  
<http://identifyingtalents.org/index.php>

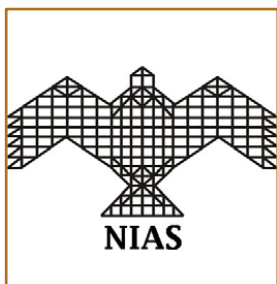


*"We are very excited about our new, international venture for talent search, where we will be igniting young minds! Do you have what it takes to change the world?"*

*-MaiYa PRODIGY*

## 5.2 PROGRAM UNIQUENESS

- Students are taught to be future mentors
- Mix of traditional and non-traditional
- Reverse mentoring
- Teachers mentoring teachers
- Mid and senior mentors acting as an Ad Hoc advisory board for one another



### **National Institute of Advanced Studies (NIAS), Karnataka, India**

NIAS is an institution whose current aims are to integrate the findings of scholarship in the natural and social sciences as well as technology, the humanities and arts through multi-disciplinary research on the complex issues that face Indian and global society, and to assist in the creation of new leadership with broad horizons in all sectors of society by disseminating the conclusions of such research through appropriate publications and courses as well as through dialogues with leaders and the public. Through dialogues with leaders and the public. (<http://nias.res.in/>)



### **The National College, Bengaluru, Karnataka, India**

The National College, Bengaluru is the name given to two sister institutions: The National College Basavanagudi, founded in 1945, and the National College, Jayanagar, founded in 1965. These institutions are managed by The National Education Society of Karnataka (NES). The Institution aims at promoting the ideals of Secularism, Humanism and Scientific spirit enshrined in the Constitution of India and imparting Value based higher education to one and all at a reasonable cost. (<http://ncbgudi.com/>)



### **The Iyengar Medical Foundation, Bengaluru, Karnataka, India**

The Iyengar Medical Foundation is a 501(c)(3) non-profit organization registered both in the USA and India with a staff of health professionals, social scientists and physicians with demonstrated experience in program management, health communications, evaluation and assessment, training and the development and oversight of medical research grants programs. We commit to excellence, innovation and caring in health care, education and research. We are community based and not for profit. (<http://ssiyengarfoundation.org/>)

*“Winning is great, sure, but if you are really going to do something in life, the secret is learning how to lose. Nobody goes undefeated all the time. If you can pick up after a crushing defeat, and go on to win again, you are going to be a champion someday.”*

*-Wilma Rudolph*

*“What do I consider a teacher should be? One who breathes life into knowledge so that it takes new form in progress and civilization.”*

*- Helen Keller, Speech to the National Education Association, 1938*



## **The MaiYaPRODIGY Mentoring Model uses a one-to-one, site-based mentoring model.**

- Mentors and mentees meet in a supervised environment at a set time and location.
- Each mentor is matched with one mentee, who will choose his/her mentor.
- Mentors must commit to mentoring for one year.
- Sessions take place in Bengaluru, India.
- A site supervisor will be present at all mentoring sessions to assist the mentors and mentees.
- The site supervisor represents partner organizations.
- The site supervisor is your main level of support, and is available as a resource to facilitate activities at these mentoring workshops.

## PROGRAM MENTORS

The program possess professionally highly reputed mentors from various backgrounds includes academics, science, technology, engineering, mathematics, arts, business, and industry.



**Late Dr. Baldev Raj**

Dr. Baldev Raj has assumed responsibilities as the Director of the National Institute of Advanced Studies, Bengaluru, one of India's leading multi-disciplinary institutions. A distinguished scientist and former Director of the Indira Gandhi Centre for Atomic Research in Kalapakkam, Dr. Baldev Raj has helped advance several challenging technologies, especially those related to the Fast Breeder Test Reactor (FBTR) and the Prototype Fast Breeder Reactor (PFBR). He has also nurtured and grown excellent

schools of global stature in nuclear materials and mechanics, non-destructive evaluation, Nano science and technology, and robotics & automation. He pursued his work in interdisciplinary domains of energy, cultural heritage, medical technologies, Nano science and technology and education. He has been responsible for providing solutions to many unsolved problems in Strategic and Security sectors in the country.

The author of more than 970 academic papers in peer reviewed journals along with 70 books and special journal volumes, Dr. Baldev Raj has been recognized by way of more than 100 awards, 380 honors, keynote, invited lectures and assignments in more than 30 countries. A recipient of the Padma Shri; the other awards include Life Time Achievement Award of the Indian Nuclear Society, the Homi Bhabha Gold Medal, Distinguished Materials Science Award, Materials Research Society of India, etc. He is a distinguished alumni of Indian Institute of Science, Bengaluru.

A member of the Circle of Advisors, Cambridge University, UK, and a member of the Search Group for the Queen Elizabeth prize in engineering, Dr. Baldev Raj is also a Fellow of all the Science and Engineering academies in India, German Academy of Sciences and the World Academy of Sciences. He is the Chairman of the Board of Governors of IIT Gandhinagar, a member of the Court of Jawaharlal Nehru University, Delhi, and President-Elect of the International Council of Academies of Engineering and Technology Sources. He is Honorary Member, International Medical Sciences Academy.

Dr. Baldev Raj is known to have mentored hundreds of children, students, scientists and technologists, inspiring them to pursue high levels of professionalism in the pursuit of science and technology without losing sight of the need for exemplary ethical practices.



**Dr. Anitha Kurup**

Anitha Kurup is a Professor, School of Social Sciences and Anchor of the Education Programme. She is also leading the National Gifted Education Program in India anchored at NIAS. Her research interests span the broad disciplines of education and gender studies. Her recent publications “Trained Scientific Women Power: How much are we Losing and Why?” and “Trends Report: Creation and Analysis of Database of PhDs in India (1998-2007)” have been widely appreciated. As part of the Gifted Education research, she has developed an Indian based identification protocol to identify the gifted children in the age group 3-18 years. She has been working with her team on the standardization of the identification protocol. Along the same lines she is developing a multi-level multi stage model for mentoring the gifted children in India. Her doctoral work on quality of primary education in rural India is one of the earliest often cited work on grounded research in class room processes and school–community relationship in rural India. Prof Anitha Kurup's expertise in the area of gender covers a wide spectrum, from examining conceptual and methodological strands of gender relations to political participation and decentralized governance. Prof. Anitha Kurup is a Member, Governing Board of ISEC, Bengaluru, and Member, Academic Council, Christ University. She has several publications to her name.



**Dr. A.H. Rama Rao**

Dr. A.H.Rama Rao is the President of the National Education Society of Karnataka. He was a student of the National College, Basavanagudi. He joined the Department of Physics in the year 1966. He was constantly associated with Dr. H.N., the President of The National Education Society of Karnataka, and continues to lead the institution's growth from strength to strength. He has a Doctorate in Physics from the Indian Institute of Science, Bengaluru. The State Government of Karnataka honoured Dr. A. H. R with the Rajyotsava Award in recognition of his service to the cause of education. Dr. A. H. Rama Rao has gone beyond the frontiers of education and has identified himself with problems of the poor in society. Hence, he has involved himself in many social services for uplifting the poor. He has taken up many outreach programmes in different villages, where his contributions to benefit women and primary education in rural areas are well known.

Dr. A. H. Rama Rao has donated several lakhs of rupees not only to the different programmes of the N.E.S of Karnataka, but also to several Cultural Organizations and Rural Development Programmes. His work in villages spans over a decade, where he has touched some of the needs of more than 30,000 students in different primary schools of Anekal Taluk. A special mention should be made for his contribution to the welfare of the 400 blind inmates of Sri. Ramana Maharishi Academy for the Blind.

Dr. A. H. Rama Rao has been associated with the Bengaluru Science Forum since 1967 in different capacities, where he served as Treasurer, as Secretary and as Vice-President. He has contributed generously towards the development of the Computer Science Laboratories at the National College Basavanagudi and the National College Jayanagar. He was also the Head of the Departments of Computer Science in both the colleges for several years. He has been instrumental in Computerization of our Libraries. Since its inception, he has been the Vice-President of the Bengaluru Lalithakala Parishath, an organization to promote Cultural Activities in the National College, Jayanagar campus.

Dr. A.H. Rama Rao has been the main inspiration behind the starting of P.G. courses in general and M.Sc, Computer Science in particular at the National Degree College Basavanagudi, Bengaluru.

With his untiring enthusiasm, Dr. A. H. Rama Rao has many fruitful years to serve the society in its various aspects.



**Dr. Sadananda Maiya**

Dr. Sadananda Maiya was an alumnus of the National College Basavanagudi. He has an Electrical Engineering Degree to his credit. He has submitted his thesis for the Ph.D. degree to the University of Columbia, USA, for having worked in the field of application of NANO Technology in food processing. He has also been conferred with an Honorary Doctorate from the University of Tumakuru.

Dr. Maiya is an entrepreneur and industrialist in the food industry, and a well-known restaurateur. He is credited to have made 'MTR' a world-renowned brand. As an entrepreneur he has developed a wide assortment of innovations in the food processing industry, including development and application of nanotechnology to food preservation, which has gained worldwide recognition. He has received many awards in recognition of his significant contributions to various sections of society.

In 2006, he received the Rajyothsava Award from the Government of Karnataka. In addition, he has received; the Aryabhata Award, the Kempegowda Award, the Honest Tax Payer award from the Karnataka Commercial Taxes Department, and a "Lifetime Achievement" Award from the All India Food Processors' Association.

He is a major donor to the National Education Society of Karnataka having donated crores of Rupees. The "Dr. P. Sadananda Maiya Pre-University Block" in the National College, Jayanagar, and "Dr. H. Narasimhaiah Multimedia Hall" in the National College, Basavanagudi, are testimonies of his munificent philanthropy. He has been a Governing Member and is at present the Honorary Secretary of the National Education Society of Karnataka.



**Dr. Puneeth Iyengar**

His medical caregiving and treatments to lung cancer patients have motivated his research work, in developing advanced treatments for patients.

He is an expert in stereotactic ablative radiation therapy (SABR), a form of radiation treatment for lung cancer that's becoming more of a first-line, curative treatment. This type of noninvasive treatment involves high-dose radiation beams entering the body through various angles and intersecting at the desired target, allowing for a concentrated dose to reach the tumor while limiting the dose to surrounding healthy tissue.

He is dedicated to advancing medical science, creating opportunities for youth and providing care for the community.

Leading our Board of Governors is Dr. Puneeth Iyengar. Dr. P. Iyengar, MD, PhD, is a member of the Iyengar Medical and Educational Foundation's Board of Governors and one of the Founding members of the Iyengar Medical and Education Foundation.

Puneeth is a renowned radiation oncologist, currently serving as a physician and research scientist and Assistant Professor of Radiation Oncology at the University of Texas' Southwest Medical Center.



**Dr. Dinesha KV**

Prof Dinesha has a Ph.D. from the Indian Institute of Technology, Bombay, and for the past 20 years, has been involved in teaching, research and consultancy in Information Technology. His expertise is in developing scientific and commercial software. Professor Dinesha's areas of interest include; Software Engineering, Quality Systems (ISO and SEI CMM Models), Cryptography, Object Technology and Data Structures.



**Col. Jerry Miller**

Mr. Miller is CEO of The Delano Group Consulting with a background in Telecommunications and Computer Networking, Renewable Energy, Human Rights, Disaster Response, Human Resources/Relations, Leadership, and Business Management.

He is a former US Air Force Foreign Area Officer with service in Honduras and at the US Embassy in Montevideo, Uruguay, as well as previous international experience working and living in Iceland, the Republic of the Philippines, Japan, Saudi Arabia, and Turkey.

He has training in disaster management and experience as a disaster management on-scene crisis response commander, as well as training as a Disaster Assistance Response Team member for international crises.

He holds a BS in Basic Sciences from the US Force Academy, a dual MA in Business Management and Human Resources/Relations and an MS in Telecommunications and Computer Networking.



**Dr. Niki Pissinou**

Dr. Pissinou is a Professor of Computer Science at Florida International University's School of Computing and Information Sciences, and the Director of the Institute for Telecommunications and Information Technology.

Dr. Pissinou has published over two hundred and fifty research papers in peer reviewed journals, conference proceedings and books chapters on networking, telecommunications, distributed systems, mobile computing, security and aspects of nontraditional data

management including co-editing over four texts in the area of mobile and wireless networking and systems and over fourteen IEEE and ACM conference volumes. Widely cited in books and research papers, her research has been funded by NSF, DHS, NASA, DOT, state governments and industry. She has graduated over nineteen Ph.D. students who now hold positions in academia, federal government and industry.

Dr. Pissinou has served as the general and technical program chair on a variety of ACM and IEEE conferences. She also served on hundreds of IEEE and ACM program committees, organizing committees, review panels, advisory boards, editorial boards etc. She has served as an editor of many journals including the IEEE Transactions on Data and Knowledge Engineering. She also has been the founder of many professional forums, including the ACM GIS.

Dr. Pissinou has given keynote talks at various events and served as consultant to industry. Her achievements have been recognized by her peers, who have given her several awards and honors, including best paper awards.



**Dr. Debra Lee Davis**

Debra Lee Davis is a senior executive with over 16 years of diverse experience in research, education and technology. She was a previous chief information officer and senior research and evaluation analyst for the children's trust, where she provided vision, leadership strategic planning and management of information systems. Prior to this position, she was an Educational Specialist for the Miami-Dade County Public Schools in adult education and regional operations. She received her PhD in cognitive developmental

psychology with a minor in statistics from the University of Texas at Austin, enter Master of Science in computer science at Florida international University. She also has an MA in developmental psychology with a minor in statistics from the University of Texas at Austin and

received her BA with academic and research honors in psychology and computer science from FIU. Throughout her career she has been a student-oriented mentor with an interactive, hands-on approach where she has worked with students to enhance their strengths and overcome their weaknesses helping them to excel in both their studies and careers. Dr. Davis also has strong project management skills in behavioral science and the IT fields. She is an articulate speaker and author with proven communication skills able to communicate technical information to non-technical individuals and audiences. She's authored a variety of peer-reviewed journal articles in both computer science and psychology. She been nominated to the Phi Kappa Phi national honor Society. She is currently a faculty member at Florida International University's School of Computing and Information Sciences.

## SPONSORS



**Maiyas** is a family business that runs on pure passion for good food. It is the vision of Dr. P. Sadananda Maiya, a pioneer in the Indian food industry. With his passion for food and 36 years of expertise, Dr. Maiya has rewritten the history of the food industry with many firsts credited to his name.

(<http://www.maiyas.in/>)



**Iyengar Foundation** IMEF is a non-profit organization with a staff of health professionals, social scientists and physicians with demonstration experience in program management, health communications, evaluation and assessment, training and development and oversight of medical research grants programs. (<http://ssiyengarfoundation.org/index.htm>)

**A** Accelerated  
**M** Mentoring  
**R** Reaching  
**I** Indian  
**T** Talents

**AMRIT Foundation-** is the inspiration provided by Dr. Baldev Raj to institute these scholarships in the name of his mother **Amrit**.

**PRODIGY (Promoting the Development of India's Gifted Young)** is an initiative to bring together researchers, educators, policymakers, parents, and other stakeholders to address the challenge of gifted education. It provides a platform to explore the activities undertaken by the member institutions and access resources for stakeholders. Also, additionally explore opportunities for collaborating on the project.

(<http://www.prodigy.net.in/>)

## AWARDEES

The first fellowship award ceremony was held on January 6<sup>th</sup> 2017 for 2016-2017 batch students at JRD Tata Auditorium, NIAS, Indian Institute of Science Campus, Bengaluru, Karnataka, India.



First Talent Search Award Ceremony January 6<sup>th</sup> 2017



*Padma Shri Dr. Anant Agarwal, Professor  
& Director of CSAIL, MIT, USA  
CEO edX - Technology of the Future*

The Second fellowship award ceremony was held on January 4<sup>th</sup> 2018 for 2017-2018 batch students at JRD Tata Auditorium, NIAS, Indian Institute of Science Campus, Bengaluru, Karnataka, India. The event was graced by many great visionaries and academicians like Padmashri Dr. Anant Agarwal (keynote speaker), Dr. Iyengar, Dr. Rama Rao, Late Dr. Baldev Raj, Dr. Anitha Kurup, Dr. Sadananda Maiya, Dr. K R Venugopal.



## Second Talent Search Award Ceremony January 4<sup>th</sup> 2018

# 15

awardees of 2017-2018 batch

<b>Name</b>	<b>Scholl/College</b>	<b>Class</b>	<b>Place in India</b>
Bhuvan S	Vijaya Composite PU College	II PUC	Bangalore
Chaitra A	Mount Carmel PU College	I PUC	Bangalore
Deepshikha Basu	Sophia High School	II PUC	Bangalore
Mahesh Bhaskar Hegde	MES Chaitanya PU College	I PUC	Uttara Karnataka
Prachi Shenoy B	Karkala Jnana Sudha PU College	II PUC	Udupi
Pramatha Gajanan Bhat	Alva's PU College	II PUC	Moodbidri
Rushab Prakash Kulkarni	SBR PU College of Science	I PUC	Kalaburgi
Raveena Hebbar	Vidya Jyothi College	I PUC	Kolar
Reshma Ram	Sri Vidya Mandir PU College	II PUC	Bangalore
Somshekar M	National College, Jayanagar	II PUC	Bangalore
Soukhya Rajaram Hegde	MES Chaitanya PU College	II PUC	Uttara Karnataka
Spoorthi D Nadig	Christ Junior College	I PUC	Bangalore
Varshit Gopalakrishna Bhat	MES PU College, Sirsi	I PUC	Uttara Karnataka
Neha H	Schoensatt St Mary's PU College for women	I PUC	Bangalore
Abhinand PS	GHSS, Sivapuram	I PUC	Kozhikode

The Third fellowship award ceremony was held on January 4<sup>th</sup> 2019 for 2018-2019 batch students at JRD Tata Auditorium, NIAS, Indian Institute of Science Campus, Bengaluru, Karnataka, India.



**Keynote Speaker: Dr. Zvi Galil, Dean at Georgia Tech, USA**



**Third Talent Search Award Ceremony January 4<sup>th</sup> 2019**

# 22 awardees of 2018-2019 batch

## NIAS MAIYA PRODIGY AMRIT FELLOWSHIP

Name	Scholl/College	District in India
Amrutha Ajit Patil	Tungal Science Comp PU College	Bagalkote
Ananya K G Hebbar	Excellent Science and Commerce PU College	Chikmangalore
Aneesh N A	Sri Aurobindo PU College	Shivamoga
Ashwini V Kashyap	Chetana PU College	Mysore
Ayman Saara	National College, Basavanagudi	Bangalore
Deepit S Patil	Base PU College	Bangalore
Gagan D	Masters PU College	Hassan
Goutham K	National College, Basavanagudi	Bangalore
Hitha M	Chetana PU College	Mysore
M K Kaveriappa	Masters PU College	Hassan
Manohara K	National College, Basavanagudi	Bangalore
Pallavi N B	Shree Vedanta College	Bangalore

## NIAS MAIYA PRODIGY IYENGAR FELLOWSHIP

Shamanth GM	Shubhodaya PU College	Tumkur
Shravya Shedikaje	Christ King PU College	Udupi
Shreyas S Bharadwaj	Pace UM PU College	Shivamoga
Spoorthi K S	Base PU College	Bangalore
Suraj Suresh K	Base PU College	Bangalore
Surya Saathi	National College, Basavanagudi	Bangalore
Tushar Mandhana	Christ Junior College	Bangalore
Varun Girimaji	Base PU College	Bangalore
Vinay Kumar A	National College Bagepalli	Chikbalapur
Vrinda S Girimaji	Base PU College	Bangalore

# NIAS MAIYA PRODIGY WORKSHOPS



## Mentoring and Interacting with students



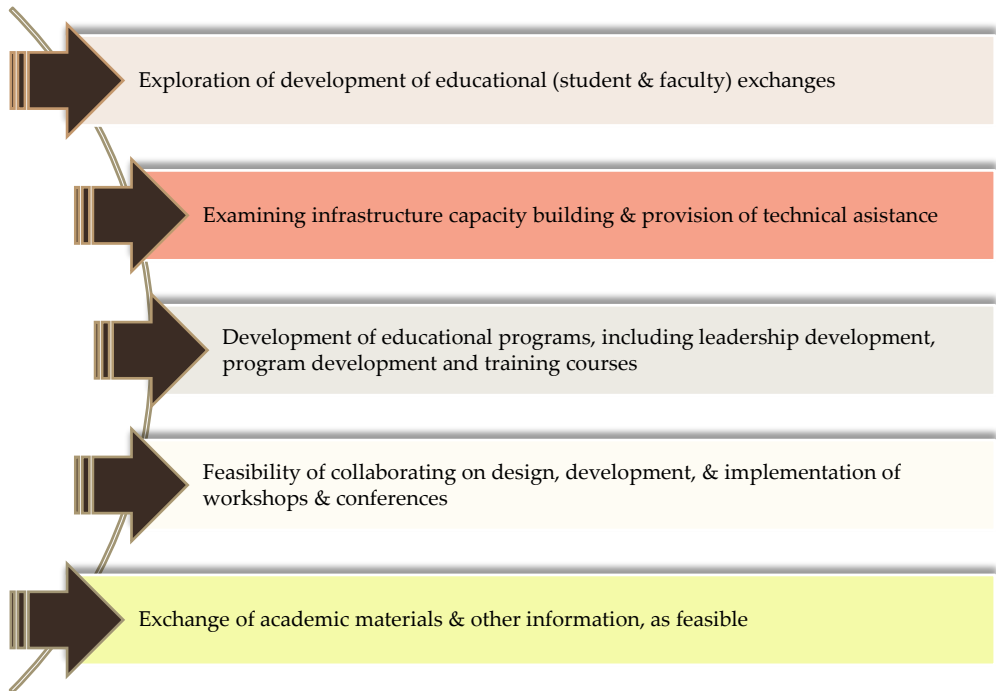
## Round table discussions with leaders



## **Chapter 6**

# **Initiation of Research Enhancement In India**

## DR. S.S. IYENGAR'S VISION AND MISSION ABOUT COLLABORATION



## COLLABORATIONS

An interesting dream of Dr. S.S. Iyengar was to enhance research and academic activities in India. It was an exceptional idea to build a Collaboration Bridge between colleges, universities, agencies, companies and firms in India and USA. Dr. S. S. Iyengar has been able to play a pivotal role in establishing such fruitful collaborations.

### Indian Agricultural Research Institute

In collaboration with Indian Agricultural Research Institute, Dr. Iyengar led the engineering team at NuLogix Labs, a start-up company that he founded in 2010 to commercialize this technology and lead its deployment in the agricultural domain in India and the United States.



The system Dr. Iyengar and his team developed provide soil and water management information for precise agriculture with an ability to deal with unpredictable environmental conditions. It receives data from ground sensors and satellite imagery to both proactively and reactively provides analytics and control for irrigation, fertilization, yield management, etc.

### INDIAN INSTITUTE OF MANAGEMENT

**FIU News**

Campus Life In the World Science & Health Sports Arts & Culture BeyondPossible2020

#### FIU to play key role in India's energy evolution

Posted by Millie Acebal · 09/16/2018 at 11:55 am

Share 10 Tweet

FIU delegation in India.

In developing countries, there is a growing need for electricity and generating it in creative ways. India is addressing this problem by giving power to the people and turning them into prosumers. A prosumer is someone who not only consumes electricity, but also produces it, usually through solar panels, and can then sell or trade it back to the power grid.

As part of **India's Smart Grids Innovation Challenge**, FIU, in partnership with the Indian Institute of Management Ahmedabad (IIMA) has been awarded a \$400,000 grant for two years to develop algorithms and software-driven infrastructure to help develop India's peer-to-peer energy transferring platform. The **School of Computing & Information Sciences (SCIS)**, housed in the **College of Engineering & Computing**, is spearheading the project with school director, S.S. Iyengar overseeing the school's role.

*"This collaboration with IIMA, thanks to Dr. Iyengar, recognizes FIU's forward-thinking approach to research, particularly in the areas of energy innovation and protecting the smart grid."*

*- Kenneth G. Furton, Provost and Executive Vice President, Florida International University*



*Dr. S S Iyengar from Florida International University, USA visits Sahyadri, 28-Dec-2017*

A session with the faculty and staff was arranged during his visit and while introducing Dr. Iyengar to the faculty, Mr. Manjunath Bhandary, Chairman, Bhandary Foundation commended the professionalism with which Dr. Iyengar deals with people and committed to drive professionalism. Further, he urged teachers to contribute to student's confidence, character building and also give inspirational talks which will bring out their talents. His key message for the teachers was to be proactive in research, proactive in teaching, practice leadership and contribute to the community. He concluded by saying that the ideas should result in a device and encouragement should be given to products that have social impact solutions.



## SAHYADRI COLLEGE OF ENGINEERING & MANAGEMENT



Dr. Iyengar fostered the collaboration with Sahyadri College of Engineering in 2018 wherein students in the V semester were provided with an Industry Connect Course from FIU's Discovery Lab, inspired by Dr. Iyengar's exemplary course material. This helped around 500 students to gain significant knowledge in some the booming Computer Science topics such as Machine Learning and advanced programming languages like Python which are undoubtedly the future of the Computer Science world.

The College is also seeking future support from Dr. Iyengar through Student Exchange Programs for Undergrad students, Technical support in the form of lab setup infrastructure, Video lectures for students from FIU Professors as well as collaborative research work.



*Sahyadri scholars interact with Dr. S.S. Iyengar at the Florida International University (FIU), USA*



# SAHYADRI CONCLAVE

SCIENCE • TECHNOLOGY • MANAGEMENT



In association with



January 6<sup>th</sup> - 10<sup>th</sup>, 2018 Sahyadri Campus, Mangaluru

## Nobel Laureates & Internationally Renowned Scientists



Ada E. Yonath  
Nobel Prize in Chemistry  
2009



Serge Haroche  
Nobel Prize in Physics  
2012



Joseph Sifakis  
Turing Award in  
Computer Science 2007



Robert C Richardson  
Scientific Researcher in Robotics  
Leeds University, UK



Satish K. Tripathi  
President  
University at Buffalo, USA



S S Iyengar  
Professor  
Florida University



Anish Arora  
Professor  
Ohio University, USA



Satya Prakash  
Professor  
Mcgill University, Canada



Padma Shri  
Anant Agarwal  
CEO of edX, MIT, USA



Anuradha Agarwal  
Principal Research  
Scientist, MIT, USA

### Highlights of Sahyadri Conclave

- Science Project Exhibition
- Technical Exhibition
- Air shows
- Drones
- Mathematics Exhibition
- Vedic Science on River Bank

Supported by



# MS RAMAIAH INSTITUTE OF TECHNOLOGY



## PROJECT: LOCATION IDENTIFICATION FOR REAL ESTATE INVESTMENT USING DATA ANALYTICS (E. Sandeep Kumar 2019)

### *Collaboration Members:*

*E. Sandeep Kumar, Department of Telecommunication Engineering, M.S. Ramaiah Institute of Technology, Bengaluru, India*

*Viswanath Talasila, Department of Telecommunication Engineering, M.S. Ramaiah Institute of Technology, Bengaluru, India*

*Naphtali Rische, School of Computing and Information Sciences, Florida International University, Miami Dade, USA*

*T. V. Suresh Kumar, Department of Computer Applications, M.S. Ramaiah Institute of Technology, Bengaluru, India*

*S. S. Iyengar, Department of Computer Applications, M.S. Ramaiah Institute of Technology, Bengaluru, India*

*“The modeling and control of complex systems, such as transportation, communication, power grids or real estate, require vast amounts of data to be analyzed. The number of variables in the models of such systems is large, typically a few hundred or even thousands. Computing the relationships between these variables, extracting the dominant variables and predicting the temporal and spatial dynamics of the variables are the general focuses of data analytics research. Statistical modeling and artificial intelligence have emerged as crucial solution enablers to these problems. The problem of real estate investment involves social, governmental, environmental and financial factors. Existing work on real estate investment focuses predominantly on the trend predictions of house pricing exclusively from financial factors. In practice, real estate investment is influenced by multiple factors (stated above), and computing an optimal choice is a multivariate optimization problem and lends itself naturally to machine learning-based solutions. In this work, we focus on setting up a machine learning framework to identify an optimal location for investment, given a preference set of an investor. We consider, in this paper, the problem to only direct real estate factors (bedroom type, garage spaces, etc.), other indirect factors like social, governmental, etc., will be incorporated into future work, in the same framework. Two solution approaches are presented here: first, decision trees and principal component analysis (PCA) with K-means clustering to compute optimal locations. In the second, PCA is replaced by artificial neural networks, and both methods are contrasted. To the best of our knowledge, this is the first work where the machine learning framework is introduced to incorporate all realistic parameters influencing the real estate investment decision. The algorithms are verified on the real estate data available in the TerraFly platform. (E. Sandeep Kumar 2019)”*

# BMS COLLEGE OF ENGINEERING

Dr S S Iyengar from FIU and Dr G Poornima from BMSCE submitted a proposal to Ministry of Human Resource Development, Government of India under the scheme GIAN for the theme Towards Safe Cities: A Mobile and Social Networking Approach in March 2017 and the was approved in September 2017. The course was scheduled from 1 June 2018 to 6 June 2018.



The theme for the GIAN course attracted the students because of latest topics like Artificial Intelligence, Machine learning, Cloud Computing, Robotics and Autonomous Vehicle for Smart and Sustainable cities were also discussed and covered. The research scholars were benefitted with the varied dimensions of topics discussed. The impact on undergraduate and post graduate is they were able to realize the major components involved in a Smart System and all of the identify various domains of application, different modules required for the implementation and appreciate the importance of Smart City for the development of a Country in this digital Era.

Memorandum of Understanding was signed between BMS College of Engineering and Florida International University during FIU delegation on 30 August 2018 held at IISC, Bengaluru. As an agreement in the MOU it will open up the internship offers for the students of BMSCE at FIU for two months with sponsorship except the travel expenditure.



*MOU signing with representatives from B.M.S. College of Engineering*

The Department of Electronics and Communication Engineering, B.M.S. College of Engineering also organised an IEEE approved International Conference on Networking, Embedded and Wireless Systems that was scheduled on 27 & 28 of December 2018 for which Dr S S Iyengar was on the panel of International Advisory Board and also delivered a Key Note Session on Cloud Computing and Data Analytics.

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*“As a future collaboration we intend to work on submitting research proposal and have student exchange programs.*

*- Dr G Poornima, Associate Professor,  
BMS College of Engineering*

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# RV COLLEGE OF ENGINEERING



MoU drafting and Signing from Concerned authorities of FIU and RVCE



## Student Internship details from RVCE at FIU:

Program: Science without border summer training program - 2018

Area: AI and ML

Work carried out at FIU: Detection of click fraud in ad Networks

Duration: 2 Months, June 2018 – July 2018

Faculty mentors at FIU: Dr. S.S Iyengar and Mr. Thejas Gubbi Sadashiva



Dr. S.S. Iyengar invited as guest of honor to deliver talk on "AI and Deep Learning: A New Revolution in Software Development" at the IEEE International Conference on Computational Systems and Information Technology for Sustainable Solution at RV College of Engineering, Bengaluru, on 21st and 23rd December 2017

**PROJECT: PREDICTING THE BRAND POPULARITY FROM THE BRAND METADATA**

(Bhargavi K 2018)

**Collaboration Members:**

Bhargavi K,  
Department of Computer Science and Engineering, Siddaganga Institute of Technology, Tumakuru, Karnataka, India

Sathish Babu B,  
Department of Computer Science and Engineering,  
R V College of Engineering, Bengaluru, Karnataka, India

Dr. S.S. Iyengar  
Distinguished University Professor,  
FIU, Miami, FL, USA

“Social networks have become one of the primary sources of big data, where a variety of posts related to brands are liked, shared, and commented, which are collectively called as brand metadata. Due to the increased boom in E/M, commerce, buyer often refer the brand metadata as a valuable source of information to make their purchasing decision. From the literature study, we found that there are not many works on predicting the popularity of the brand based on the combination of brand metadata and comment’s thoughtfulness analysis. This paper proposes a novel framework to classify the comment’s as thoughtful favored or disfavored comment’s, and later combines them with the brand metadata to forecast the popularity of the brand in near future. The performance of the proposed framework is compared with some of the recent works w.r.t. thoughtful comment’s identification accuracy, execution time, prediction accuracy and prediction time, the results obtained are found to be very encouraging. (Bhargavi K 2018)”

**PROJECT: FLASH FLOOD SIMULATION AND EVACUATION PLANS FOR SELECTED AREAS IN INDIAN CITY**

**Collaboration Members:**

Dr. Shobha G  
Professor and HOD, CSE,  
R V College of Engineering, Bengaluru, Karnataka, India

Dr. B. Sathish Babu  
Professor, CSE, R V College of Engineering, Bengaluru, Karnataka, India

Dr. V. Ananthrama  
Assoc. Professor,  
Civil, R V College of Engineering, Bengaluru, Karnataka, India

Dr. S.S. Iyengar  
Distinguished University Professor,  
FIU, Miami, FL, USA



#### RESEARCH WORK IN PROGRESS:

Project: Development of a Drone based Security System (DBSS): for Social Security through Product Innovation

Collaboration Members:

Mr. Bhaskar K

Asst. Professor, Dept. of Aerospace  
R V College of Engineering, Bengaluru,  
Karnataka, India

Dr. Nagaraj G Cholli

Associate Professor, Dept. of ISE  
R V College of Engineering, Bengaluru,  
Karnataka, India

Dr. S.S. Iyengar

Distinguished University Professor,  
FIU, Miami, FL, USA

#### RESEARCH WORK IN PROGRESS:

Project: Developing deep learning models for health care and Signature verification

Collaboration Members:

Dr. B. Sathish Babu, Professor, CSE



#### FUTURE PLAN OF ACTIVITIES UNDER DR. S. S. IYENGAR'S GUIDANCE:

- Setting up a research laboratory under the mentorship of FIU faculty at RVCE.
- There are also plans of submitting Indo-US joint research proposals for funding from DST, PEER, USISTEF, etc.
- Initiating short-term and long-term activities for faculty exchange of RVCE and FIU.
- Deputing more students across branches for internships at FIU.
- Co-authorship in the areas of IoT, Cyber Security, Machine Learning, Biomedical engineering, Water and Environment, Supply chain management, Forensics, Engineering manufacturing, etc.
- Active participation of faculty and students of RVCE and FIU in jointly organized conferences and symposiums.

# NATIONAL COLLEGE



Dr. S.S. Iyengar delivered a talk at Bengaluru Science Forum at the National College, Bengaluru, Karnataka, India on 27th December 2017. His talk on the emerging software development areas i.e., Artificial Intelligence and Deep Learning inspired the audience.

**THE BANGALORE SCIENCE FORUM (Regd.) (Estd.1962)**  
 Founder: Padmabhushana Late Dr.H.Narasimhaiah  
**GOLDEN JUBILEE YEAR-2012**

International Year of Sustainable Tourism for Development

**Programme For The Month of DECEMBER 2017**

Place : Dr.H.N.Multimedia Conference Hall, Basavanagudi, Bangalore-560004.  
 Time : 6.00PM

DATE	SPEAKER	TOPIC
06-12-2017 Wednesday (2803)	SRI. H.P. RAGHAVENDRA PRASAD Global Security Manager Asia Pacific IBM India Pvt. Ltd., Bengaluru	Smart Phone Security - Hidden Facts and Impacts – Be Aware and Secure
13-12-2017 Wednesday (2804)	Dr. P. SUMA Consultant Pulmonologist, Excel Care Hospital, Bengaluru.	Allergy, Bronchitis, Air Pollution and Effects
20-12-2017 Wednesday (2805)	Dr. P. MOHAN CMUK Senior Consultant Vasan Eye Care Hospital, Bengaluru.	Journey to Eye DISORDERS
27-12-2017 Wednesday (2806)	Dr. S.S. IYENGAR Distinguished Ryder Professor and Director, Florida International University (U.S.A)	Artificial Intelligence and Deep Learning: A New revolution in Software development

# BENGALURU UNIVERSITY



The eighth International Conference on Information Processing (ICIP)-2014 was inaugurated by S.S. Iyengar, Director and Ryder Professor, School of Computing and Information Sciences, Florida International University. The conference was organised by The Society of Information Processing, Bengaluru, and the Department of Computer Science and Engineering, University Visvesvaraya College of Engineering (UVCE), Bengaluru, and sponsored by Alpha College of Engineering and Vijaya Vittala Institute of Technology, Bengaluru. Speaking on the occasion, Prof. Iyengar said it is necessary to convert innovative ideas in research into real industry applications.

Dr. S. S. Iyengar is part of the Advisory Board for REVA University. Dr. Iyengar recognized REVA to be one of the promising State private Universities in Karnataka with a drive for higher learning and Research activities. REVA University welcomed this opportunity to collaborate with Dr. Iyengar and Florida International University, considering the exposure it would bring to its students through joint research activities as well as student and faculty exchange programs.

## Vibrant Karnataka

[Click here for Kannada Blog](#)

Thursday, 23 June 2016

REVA University enters into an MoU with Florida International University, USA



**Bengaluru** : Florida International University, USA is a vibrant, student-centered public research university located in Miami, Florida, USA. The University has established its credentials in its commitment to learning, research entrepreneurship, innovation and creativity so that all graduated student of FIU are competent enough to succeed in global market challenges. FIU is a highly ranked university and is one of the top 10 largest public Universities in USA.

REVA University, an upcoming and promising State private University located in Bangalore, India having a state-of-the-art infrastructure, creating an environment conducive for higher learning and research. REVA University offers 18 full-time and 6 part time post graduate programs, 15 graduate programs and also doctoral programs in Engineering, Architecture, Science, Commerce, Management, Law and Humanities.

REVA University understands the importance of collaboration with leaders in the field to provide international exposure to their students. The MOU with Florida International University is basically to exhibit the firm commitment of REVA University towards student welfare and success. Hence, the MOU is a means to develop collaborative relationship for research activities, student and faculty exchange, joint international level conferences and seminars, international exposure programs, twinning programs and funded collaborative consultancy / research programs. The collaborative research in Cyber Security and IT Security is the highlight of the MOU.

All staff and students are the major beneficiaries of the MOU.

Dr. Shyamaraju, Hon'ble Chancellor, REVA University and Dr. S.S. Iyengar, Director and Ryder Professor, FIU have signed the MOU.

## TWO-DAY WORKSHOP ON CYBER SECURITY FOR NEW DECADES RESEARCH, TECHNOLOGY & EDUCATION

A workshop on Cyber Security was held on 19 & 20 May 2016 in association with Florida International University-USA. This workshop was specifically designed to provide the right knowledge to the aspiring Hacking and Cyber Security enthusiasts. The workshop practical introduced the students to various aspects of Cyber Crime such as Ethical hacking, an important tool in many national security agencies and even companies.

This workshop reviewed and presented a new paradigm of secured internet computing, including an overview on the methods and applications of preventing cyber threats. The information and results presented were from the pioneering efforts jointly developed by **S.S. Iyengar**, R. Srinivasan, J.F. Miller and others.



## PROJECT: FORECASTING TIME SERIES USING DATA APPROXIMATION AND PATTERN SEQUENCE SIMILARITY (R. H. VISHWANATH 2019)

Collaboration Members:

Vishwanath R Hulipalled

Assistant Professor

Department of Computer Science and Engineering

Sambhram Institute of Technology

Bengaluru, India

Srikantaiah K C

Associate Professor

Department of Computer Science and Engineering

S J B Institute of Technology

Bengaluru, India

P Deepa Shenoy

Professor, Department of CSE

UVCE

S.S. Iyengar

Distinguished University Professor,

FIU, Miami, FL, USA

“Time series analysis is the process of building a model using statistical techniques to represent characteristics of time series data. Processing and forecasting huge time series data is a challenging task. This paper presents Approximation and Prediction of Stock Time-series data (APST), which is a two-step approach to predict the direction of change of stock price indices. First, performs data approximation by using the technique called Multilevel Segment Mean (MSM). In second phase, prediction is performed for the approximated data using Euclidian distance and Nearest-Neighbor technique. The computational cost of data approximation is  $O(n \cdot n_i)$  and computational cost of prediction task is  $O(m \cdot |NN|)$ . Thus, the accuracy and the time required for prediction in the proposed method is comparatively efficient than the existing Label Based Forecasting (LBF) method. (R. H. Vishwanath 2019)”

PROJECT: SIMILARITY PATTERN SEARCH FOR STREAM TIME SERIES  
IMAGE DATA USING CLUSTER MEDIAN APPROACH (VISHWANATH R  
HULIPALLED 2012)

Collaboration Members:

Vishwanath R Hulipalled  
Assistant Professor  
Department of Computer Science and Engineering  
Sambhram Institute of Technology  
Bengaluru, India

K. Shreekrishna Kumar  
Director  
All India Council for Technical Education  
SWRO, Bengaluru

Venugopal K R  
Principal  
University Visvesvaraya College of Engineering  
Bengaluru University, Bengaluru

Dr. S.S. Iyengar  
Distinguished University Professor,  
FIU, Miami, FL, USA

“Stream Time Series retrieval has been a major area of study due to its vast application in various fields like weather forecasting, multimedia data retrieval and huge data analysis. Its original task is to identify those time series similar to pattern (query) time-series image data, where both pattern and time series image data are static. Presently, there is a demand for image data stream processing, quick searching and fast response of such online data. In this paper, we use a cluster median or segment median method for similarity matching between static/dynamic patterns and stream time series image data which can be computed with respect to change in temporal events and hence suitable for the temporal behavior. Mainly, we present an effective pruning technique on the multilevel representation of the image data. The objective of pruning technique is to reduce the search space and to retrieve the similar patterns very efficiently. Experiments show that our approach MCM performs well compared to existing methods DW T and MSM. (Vishwanath R Hulipalled 2012)”



## Siddaganga Institute of Technology

(An Autonomous Institution, Affiliated to Visvesvaraya Technological University, Belagavi, Approved by AICTE, New Delhi)

TUMAKURU - 572 103, Karnataka, India.

Website : [www.sit.ac.in](http://www.sit.ac.in)



**NIRF Ranking : 2016 - 70th Rank, 2017 - 72nd Rank and 2018 - 78th Rank**

## Florida International University Global Position Showcase (GPS)

Vision, Innovation, Cybersecurity and Forensic Science

## FIU and Partners Cybersecurity & Forensic Analysis Summit

Thursday, August 30, 2018

National Institute of Advanced Studies (NIAS)

Indian Institute of Science Campus, Bangalore



**FIU** FLORIDA  
INTERNATIONAL  
UNIVERSITY

## MoU Activities

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With a lead role of Dr. S S Iyengar, Director and Ryder Professor, SCIS, FIU, an MOU was signed between Florida International University (FIU) and Siddaganga Institute of Technology (SIT) on 5th January 2016.

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### JOINT RESEARCH ACTIVITIES IN COMPUTING DOMAIN

- Pramod T.C, Thejas G. S, S.S. Iyengar, N.R. Sunitha, CKMI: *Comprehensive Key Management Infrastructure Design for Industrial Automation and Control Systems* (Pramod T. C. 2019)
- Thejas G.S., Kianoosh Boroogeni, Kshitij Chandna, Isha Bhatia, S.S. Iyengar, N.R. Sunitha, *Deep Learning-based Model to Fight Against Ad Click Fraud* (K. B. Thejas G.S. 2019)
- Thejas G.S., J. Soni, Kshitij Chandna, S.S. Iyengar, N.R. Sunitha, N. Prabakar, *Learning-Based Model to Fight Against Fake Like Clicks on Instagram Posts* (J. S. Thejas G.S. 2019)
- Pramod, T. C., Boroogeni, K. G., Amini, M. H., Sunitha, N. R., & Iyengar, S. S, *Key pre-distribution scheme with join leave support for SCADA systems* (T. C. Pramod 2019)
- Thejas G S, Pramod T C , S S Iyengar , N R Sunitha , "Intelligent Access Control: A self-Adaptable Trust Based Access Control Framework (SATBAC) using Game Theory Strategy", *International Symposium on Sensor Networks, Systems and Security, Lakeland, Florida 33815-1509, USA, Aug, 31 – Sept. 2, 2017, Springer International Publication.* (Thejas G S 2017)
- Nidhi S Meda, Thejas G S, Sanjeev Kaushik Ramani, S.S.Iyengar, "Mobile WSN Testbed for Agriculture: Plant Monitoring System", *2nd IEEE International Conference on Emerging Computing and Information Technologies (ICECIT-2017), 2017, India.* (Nidhi S Meda 2017)
- Pathikrit Pal, Thejas G S, Sanjeev Kaushik Ramani, S.S.Iyengar, "A variation in the working of playfair cipher", *2nd IEEE International Conference on Emerging Computing and Information Technologies (ICECIT-2017), 2017, India. [Accepted and under publication process]* (Pathikrit Pal 2017)
- Mithil K M, Thejas G S, Sanjeev Kaushik Ramani, S.S.Iyengar, "Low cost multi-sensorial data fusion for high speed obstacle avoidance using 3D point clouds and image processing in self-balancing robots", *2nd IEEE International Conference on Emerging Computing and Information Technologies (ICECIT-2017), 2017, India.* (Mithil K M 2017)
- Kushal Nagaraj, Thejas G S, Sanjeev Kaushik Ramani, S.S.Iyengar, "Image feature based smoke recognition in mines using monocular camera mounted on arial vehicles", *2nd IEEE International Conference on Emerging Computing and Information Technologies (ICECIT-2017), 2017, India.* (Kushal Nagaraj 2017)
- Archana Sathish Kumar, Thejas G S, Sanjeev Kaushik Ramani, S.S.Iyengar, "Image processing approaches for autonomous navigation of terrestrial vehicles in low illumination", *2nd IEEE International Conference on Emerging Computing and Information Technologies (ICECIT-2017), 2017, India.* (Archana Sathish Kumar 2017)

- Pramod T.C, Thejas G.S, S.S. Iyengar, and N.R. Sunitha. *CKMI: Comprehensive Key Management Infrastructure Design for Industrial Automation and Control Systems. Future Internet* 2019. (Submitted) (T. G. Pramod T.C 2019)
- Bhargavi, K., and B. Sathish Babu. "Accelerating the Big Data Analytics by GPU-Based Machine Learning: A Survey." *International Symposium on Sensor Networks, Systems and Security. Springer, Cham, 2017.* (Bhargavi 2017)
- Bhat, Radhakrishna, and N. R. Sunitha. "A Novel Perfect Privacy PIR Scheme for Privacy Critical Applications." *International Symposium on Sensor Networks, Systems and Security. Springer, Cham, 2017.* (Bhat 2017)
- Kumar, KM Mahesh, and N. R. Sunitha. "Public Key Cryptosystem for Privacy Sensitive Location-Based Services." *International Symposium on Sensor Networks, Systems and Security. Springer, Cham, 2017.* (Kumar 2017)
- Shanthakumara, A. H., and N. R. Sunitha. "Techniques to Certify Integrity and Proof of Existence for a Periodical Re-encryption-Based Long-Term Archival Systems." *International Symposium on Sensor Networks, Systems and Security. Springer, Cham, 2017.* (Shanthakumara 2017)
- Pramod, T. C., and N. R. Sunitha. "SCADA: Analysis of Attacks on Communication Protocols." *International Symposium on Sensor Networks, Systems and Security. Springer, Cham, 2017.* (T. C. Pramod 2017)
- Ravi, N., and N. R. Sunitha. "Security Threats and Solutions for Virtualization and Migration in Virtual Machines." *International Symposium on Sensor Networks, Systems and Security. Springer, Cham, 2017.* (Ravi 2017)
- Pramod, T. C., and N. R. Sunitha. "Key pre-distribution schemes to support various architectural deployment models in WSN." *International Journal of Information and Computer Security* 8.2 (2016): 139-157. (T. C. Pramod 2016)



Sree Siddaganga Education Society(R)

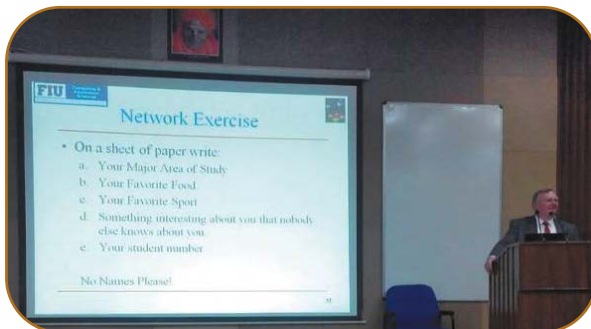
# Siddaganga Institute of Technology

An Autonomous Institute, Affiliated to VTU Belagavi, Approved by AICTE  
B.H. Road, Tumakuru - 572 103, Karnataka, India



A workshop on Cyber Security was organised with Dr. Jerry F. Miller, Colonel, U.S. Air Force (Ret.), Research Coordinator Discovery Lab (Robotics/Autonomous Vehicles), School of Computing and Information Sciences, FIU as the Resource Person

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An International Conference, ICECIT (International Conference on Emerging Computing and Information Technology) 2017 was jointly organised on 15th and 16th December 2017 in SIT campus. Dr. S S Iyengar, inaugurated the conference and delivered a Key note address on the topic “AI and Deep learning in Software Development”.

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## KEYNOTE ADDRESS AND GUEST LECTURES FROM DR. S S IYENGAR

Dr. S S Iyengar visited SIT during the International Conference, ICECIT-2013. He delivered the keynote address on “Distributed Sensor Network for 21<sup>st</sup> Century”.

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Dr. S.S. Iyengar has provided Internship and admission opportunities to bright Undergraduate students and Faculty to pursue higher degree in International Universities.

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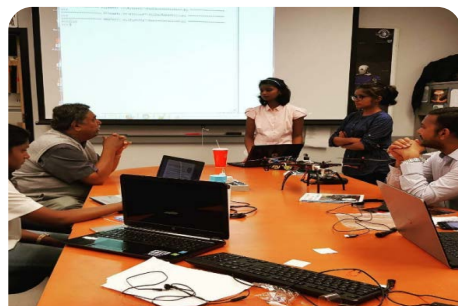


## RESEARCH EXPERIENCE FOR UG STUDENTS AT FIU

Every year selected students from UG programme are given an opportunity to work under Professors and their Research Team at FIU to gain Research Experience for a period of 2 months. This activity has resulted in publication by UG students.



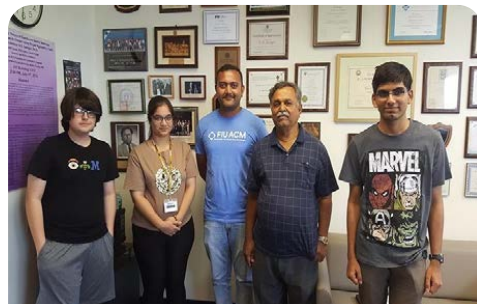
Science without Borders  
Summer Program 2017 June -  
July



A glimpse from one of the many  
weekly reviews that took place



Indian students proudly showcasing their  
certificates with their mentors and the  
Research coordinator of the  
Discovery Lab.



Science without Borders Summer  
Program 2018 June - July

## A shared vision

**BHUVANESHWARI S.**

**S**iddaganga Institute of Technology, Tumakuru has signed an MOU with Florida International University, Florida, USA.

Under this MOU, there is a provision for the development of educational exchanges, including student and faculty exchange, a provision for technical assistance, development of educational programmes, including leadership development, programme development and training courses and collaboration in research and sharing of research laboratories.

The MOU was signed by Dr. M.N. Channabasappa, Director of Siddaganga Institute of Technology and Dr. Sitharama. S. Iyengar, Director and Ryder Professor at Florida International University's School of Computing and Information Sciences in Miami, Florida.

Addressing a press conference on the premises of SIT, Dr. Channabasappa said that the MOU will benefit the students and faculty of both the institutions. The agreement is for three years.

### **Curriculum:**

Dr. S.S. Iyengar said that the curriculum needs to be constantly and strategically changed once in two years for an engineering course. The role of curriculum committee is very critical in framing the syllabus according to the present day's requirements.



He said what the students studied five years ago is irrelevant today and hence the curriculum should be framed in such a way that the right courses are taught.

### **Accreditation:**

Principal of SIT, Dr. Shivakumaraiah said that an expert team from National Board of Accreditation, New Delhi visited the campus and conducted an on-site evaluation of two programmes, i.e., Civil Engineering and Industrial Engineering and Management.

Based on the recommendation of the expert team, National Board of Accreditation has approved the accreditation status for the two programmes for five years under Tier-1. Dean of SIT, Prof. Basavarajaiah and other faculty members of SIT were present.

## » DISTRICT ROUND UP-TUMKUR



Sree Siddaganga Education Society(R)

# Siddaganga Institute of Technology

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## DR. S.S. IYENGAR'S DONATED LIBRARY AT SIT



*Inauguration Ceremony of Dr. S.S. Iyengar's books and articles collection library at the main library of Siddaganga Institute of Technology, Tumakuru, Karnataka, India.*

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*"Dr. S S Iyengar regularly shares academic materials whenever he visits India or over e-mail on latest developments in computing which initiates research activities. Our library has recently received journals, books and articles on emerging technologies sponsored by Dr. S S Iyengar."*

*- Dr. N R Sunitha,  
Professor, Dept of CS&E, SIT*

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## DR. S.S. IYENGAR BLESSED BY DR. SREE SIVAKUMARA SWAMIJI, FOUNDER OF SREE SIDDAGANGA EDUCATION SOCIETY



AUGUST 2018 INTERNATIONAL DELEGATION TO INTEGRATE INDIAN UNIVERSITIES BY DR. S.S. IYENGAR AT NIAS, IISC, BENGALURU KARNATAKA.



# DR. S.S. IYENGAR'S FELICITATION AT SHESHADRIPURAM PRE-UNIVERSITY COLLEGE



# Felicitations!

## **Chapter 7**

# **Iyengar Medical & Educational Foundation (IMEF)**

*If you can't feed a hundred people, then feed just one.*

*-Mother Teresa*



## The rise of hope towards the humanity

The creation of the Iyengar Medical & Educational Foundation (IMEF) started in the early 2004 among Prof. Iyengar, Mrs. Manorama Iyengar and their sons Dr. Puneeth Iyengar, Mr. Veneeth Iyengar, and Dr. Vijeth Iyengar. The foundation was inaugurated on 25<sup>th</sup> and 26<sup>th</sup> December 2009 at Soladevanahalli in PVV Farms, Bengaluru, Karnataka, India. The foundation inauguration took in the presence of former Karnataka Police Commission Shankar Bidari and Dr. Kaarthkian, Former Karnataka CBI Director.



## IMEF Founders



**Mrs. Manorama Iyengar and Dr. S.S. Iyengar**



**Dr. Puneeth Iyengar**

*Radiation Oncologist and  
Assistant Professor, UT  
Southwestern Medical Center*



**Mr. Veneeth Iyengar**

*Asst. Chief Administrative  
Officer at The Office of the  
Mayor-President of Baton Rouge*



**Dr. Vijeth Iyengar**

*Brain Health Lead and Technical  
Advisor to the Deputy Assistant  
Secretary for Aging*

## IMEF Mission

The IMEF for India aims to work as a non-profit organization raising funds for education, prevention, research, and treatment of multiple medical conditions - cancer, infectious diseases, cardiovascular disease, mental health, and endocrine disorders / diabetes - in India. These funds will be raised with the assistance of generous corporate and individual donors and will then be distributed to organizations or individuals working in any of the above areas which ultimately focus on giving patients a better quality of life.

One of IMFI's immediate objectives is to increase awareness and screening for highly curable cancers. Starting in 2008, we will annually select a type of cancer in the hopes of increasing awareness and public knowledge of that disease. At our foundation center in Bengaluru, we will hold screening sessions, health education fairs, and

information sessions for those in the healthcare field. Education of nurses and support staff is as important as the education of physicians to the success of these screening practices. Hopefully, the knowledge gained from our programs can be used in all settings - towns, villages, and larger urban centers. As an example, we may choose prostate cancer as the focus of our efforts in year 2008. We will hold conferences to educate the masses on the signs and symptoms associated with prostate cancer. We will perform serum measurements of PSA, a highly predictive marker for prostate cancer, for as many participants as possible. We will also explain the consequences of various PSA measurements and describe when there is a need for tissue biopsy. A detailed overview of the types of treatments for prostate cancer will be provided from expert physicians and scientists from all over the world including the United

States. Ultimately, it is IMFI's hope that standard practices for screening and treating prostate cancer are adopted by more and more communities after being educated by our organization. We want to bring international practices of cancer care to the poorest people and the smallest villages in India.



## An Integrated Approach to Improving Health

Working with public health organizations, youth agencies, state and local governments and the nation's premier medical research institutions, we offer a wide array of services and programs focused on improving health outcomes and creating healthier physical environments for people to live in. The Foundation's various areas of expertise include:

- Qualitative and quantitative research
- Medical research grant making
- Health communications, materials and media development
- Program development and management
- Community assessment and planning processes
- Training and capacity building
- Information and Referral Services

## ABOUT IMEF

The Iyengar Medical Foundation is a nonprofit organization with a staff of health professionals, social scientists and physicians with demonstrated experience in program management, health communications, evaluation and assessment, training and the development and oversight of medical research grants programs. The foundation is committed to excellence, innovation and caring in health care, education and research.

The IMEF is intend to work with other nonprofit organizations, medical research institutions, community coalitions and neighborhood groups to advance public health and medical research. Whether it is working to reduce youth access to tobacco or supporting new discoveries in cancer research, the Iyengar Medical Foundation will be at the forefront of efforts to improve the health of individuals and communities in the Bengaluru area and throughout the country. Their combination of public health expertise and medical research philanthropic experience will lead to new advances and innovative efforts in community health improvement. The Bengaluru division will be staffed by many distinguished and experienced doctors from across the country to provide a full range of care for the Bengaluru and neighboring residents.



## IMEF SERVICES

The IMEF health division offers an array of services designed to support advances in prevention and health promotion while our Medical Research Grants Division offers the only philanthropic advisory service in the country that specializes in the creation and management of medical research grants programs.

India with its natural resources and environment, which would also have a huge impact on health. It is imperative for India to develop and promote application strategies that can incorporate new technologies on conservation and efficient utilization of water (i.e., quality, utilization, contaminants free such as lead, arsenic and their impact on public health, etc.) and energy (i.e., efficient utilization, emission standards, alternate resources, impact on public health, etc.). Alternate resources could include solar energy-derived products and their beneficial impact on the Indian economy and public health. So, a strategic application of new technologies becomes critical as India becomes more and more sensitive to many environmental issues such as water, food production, biodiversity and health.

## Technology Transfer

Technology Transfer opportunities from developed countries are significant openings for India to move into translational medicine much more quickly and produces products for the global market. This model will also help India develop its R & D infrastructure with the revenue that might come from the sale of the products. In the opinion of the Institute, there are numerous emerging opportunities for 'licensing-in' potential technologies from developed countries. This topic is of tremendous interest to India because of the increasing demand and use. As the population grows, there is going to be an increased constraint for



# Biotechnology

The growth and vitality of the biotechnology industry around globe depend on the availability of well-trained scientists with expertise in such areas as microbiology, molecular genetics, biochemistry, bioprocess engineering, plant and animal cell culture technologies, metabolic engineering, biomaterials, macromolecular structure analysis, hybridoma technology, tissue engineering, and separation technologies. The biotechnology sector tends to be highly dynamic, research and investment intensive. In the past 10-12 years, this industry has experienced massive R & D expansion and technological development, which also extend to both core processes within R & D and the procurement processes.



**Iyengar Medical & Educational Foundation**  
healing through education, treatment & research



**Dr. Puneeth Iyengar, MD, Ph.D.**  
(M.D. Anderson Cancer Inst, USA)

**Dr. D.N. Bhadra M.D.**

**Brig. Dr. S. Purkayastha M.D.**

**Technical Advisors**

**Dr. Sankarnath Mukhopadhyay**  
Chancellor & Retired IGP

**Prof. Bob Mann**  
Professor  
LSU, USA

**Dr. Rob Roy** Vice President,  
SAI Technology, Inc, USA

**Dr. Swati Bhattacharya**  
Lounza,  
Bangalore, India

**For more information contact**

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Hesaraghatta Hobli,  
Bangalore - 560088,  
Karnataka,  
India.  
Ph: 98454-61643  
imf@gmail.com

## Free Medical Screening (Dec 25- 26, 2009)

The Iyengar Medical & Educational Foundation will be offering free Medical Screening Tests for various ailments such as:

- Hypertension
- Diabetes

This Free Medical Screening service will be done by distinguished doctors from USA and India. **People from rural areas and those who are financially disadvantaged are encouraged to avail this service.**

**Facts:**

The number of cases of diabetes in India (2002): 31.7 million.  
Estimated number of diabetes cases in India for 2030: 79.4 Million.  
Extrapolated undiagnosed Prevalence of Hypertension: 58,735,509 (population estimated used : 1, 065, 070,6072)  
prevalence of hypertension has increased by about 30 times among urban dwellers and by about 10 times among the rural inhabitants.

Venue	Date & Time
Iyengar Medical Foundation, Soladevanahalli, Hesaraghatta Hobli, Bangalore - 560088, Karnataka,	Dec 25-26 — 2009 8 AM—5 PM

Sponsored by:



<http://ssiyengarfoundation.org>

## Research and Intellectual Work

The foundation community also made a great impact in research direction in collaboration with other organizations. One of its invention in the field of engineering and medical is “A device to indicate pressure in the eye due to GLAUCOMA”.

Glaucoma is a group of diseases of the optic nerve involving loss of retinal ganglion cells in a characteristic pattern of optic neuropathy. Raised intraocular pressure is a significant risk factor for developing glaucoma (above 22mmHg). One person may develop nerve damage at a relatively low pressure, while another person may have high eye pressure for years and yet never develop damage. Untreated glaucoma leads to permanent damage of the optic nerve and resultant visual field loss, which can progress to blindness.

people who are at high risk of getting their retina damaged by increased intra-ocular pressure, such as those with high blood pressure or a genetic history of glaucoma.

Paul Marcuzzo is the President of Punta Gorda Energy & Design. The company is focused on portable energy applications and water purification systems. Following a career designing and managing PC hardware and software support systems, Marcuzzo moved to Punta Gorda and became immersed in the alternative energy industry, where he focused initially on wind and solar power generation. PG Energy & Design is introducing the first in a family of protective cases for personal electronics that include integrated solar charging features.

This year's winner, Thomas Contreras, has lived in Charlotte County since he was 14 years old. For the past 28 years he has successfully run his own window tinting business. He has been an avid scuba diver for many years and because of his love for div-



Dr. Sitharama S. Iyengar, Ph.D. is presented the third place check.

ing he developed a desire to help protect the marine environment and has spent much of his time developing inventions revolving around nautical safety

aids.

His first patented invention consists of a lobster snare with an innovative design, which is the first of its kind to have a dive flag built into the handle. This is the only snare on the market to ever include a snare with a dive flag to form one self-contained unit, which is now considered a safety aid device.

Thomas' unlimited imagination and unique problem-solving ability has led to many other eco-friendly inventions which are approaching patent as well. For example, a concrete gun remover, and for the home owner, a solar-powered navigational device that a boat owner can use to look out a window in his/her home to see if the boat is tide-ready to navigate.

Thomas shared, "Being an entrepreneur most of my life has led me to follow my dreams." His drive to succeed, as with every entrepreneur, will take him the rest of the way.



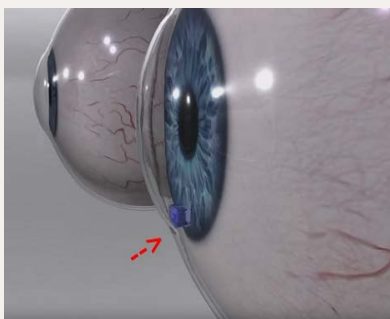
IN BUSINESS SINCE

### News article in SWF BT

Two ground breaking works were developed to address the above said problems and which are transformed as US patents (published/filed). Firstly, “Context Based Algorithmic Framework for Identifying and Classifying Embedded Images of Follicle Units”, were the subject invention provides a method for detecting and analyzing the hair follicles on a scalp to assist with hair follicle transplantation. The methods of the

subject invention are able to count the number of hair follicle groups and the number of follicles within each group based upon a microscopic image of a sample from a human scalp. An algorithm is then used to cluster the follicles and generate a neighboring connected graph to calculate the inter object distances. A report can then be generated that provides information regarding the density, placement, and percentage of hair follicle type in different areas of the scalp. This report can be used to generate a hair follicle transplant strategy to assist a physician or robotic system (Md Mahbubur RAHMAN 2016). Secondly, “**Monitor Intra Ocular Pressure using Pattern and Color Changes**”, were a Device which enables a person to see for himself changes in Intra Ocular Pressure when he looks at his eye in the Mirror, in the routine course of everyday, as everyone likes to see his Own face and eyes in the Mirror every day. The device being Tiny and inserted surgically with minimum incision between Iris and Cornea, enables early indication of IOP in people with high risk of Glaucoma due to high blood pressure and genetic reasons and old age, the early indication enabling timely treatment before retinal damage. The device works on pattern changes due to pressure change which is compared with fixed background pattern and changes in spacing between lines of Diffraction grating and Hologram leading to color changes due to interference effect of light. Mirror with an area of concave surface and Magnifying device along with comparison Chart enables proper monitoring of drug efficacy (S. S. Iyengar 2016) (Madhusudhanan Balasubramanian 2007) (Roland Zahn 2009).

One more invention in the area of augmented reality was the patent “**Systems and Methods for Augmented Reality Interaction**”, were an augmented reality system is described that comprises a movable object comprising an object hardware component; a control hardware component for wirelessly transmitting and receiving signals via a communication link to the object hardware component; and a software component stored on a non-transitory computer-readable medium and in operable communication with the control hardware component. An application user interface is provided for enabling a user to provide command input for controlling the movement of the movable object via the object hardware component (Jong-Hoon KIM 2018).



**New Eye Implant Device Could Save Glaucoma Patients' vision**

## Chapter 8

# Press and Media Attention



**WATCHING** a provision store assistant adding up a bill in a matter of seconds with the aid of a simple calculating machine reminded me of man's ingenuity circumventing the wearisome drudgery we have long been accustomed to.

Centuries ago, the Chinese harnessed the abacus, which was a pioneer aid to calculating and, even now, remains after 25 centuries, still very much in



*Dr. S. S. Iyengar*

vogue. Next came logarithms, but the first actual calculating "machine," as far as commercial needs were concerned, came a little short of a century ago.

Today, computers can perform over 20,000,000 additions per second and can multiply 14 digit numbers at the rate of over 10 million a second. None-the-less, computers have only about a ten-thousandth part of the performance of the human brain although the gap is closing.

All this came to me as I sat opposite Dr. S. Satharama Iyengar, Associate Professor for Computer Science at the Jackson State University, Mississippi, in the United States.

Young, intelligent with a mop of unruly, wavy hair and on the heavy side, he was formerly a student of the National College, Bangalore and he passed his B.E. from the University College of Engineering here. He completed his M.E. at the Indian Institute of Science and his Ph.D. in Engineering and Computer Sciences in the Mississippi State University.

In the field of research, he is concentrating on developing mathematical models for Stochastic Systems and designing Operating Systems in the computer network and has already published extensively in these areas of research interest.

Young Dr. Iyengar was a Visiting Professor at the University of Bonn, Germany during May this year and also visited Maxwell Plank Research Institute at Frankfurt.

He has also visited the Bell Research Laboratories in New Jersey, where he was called upon to deliver a series of advanced lectures.

*Deccan Herald, June 5<sup>th</sup> 1977*

He will be lecturing at the Indian Institute of Technology, Kanpur, and IIT, Madras, during July and August, and will be similarly lecturing at the University of Bonn's Department of Mathematics on his way back to the United States.

Dr. Iyengar's attractive wife, Manorama, was a former model who sails from Bangalore inci-

dentally, but she fought shy of the photographer and insisted that her husband got all the publicity!

## Star War robot

**T**HERE'S this Indian professor in the US who's designing a robot for Star Wars. No, it's not a mate for Ceethreepio in George Lucas' fantasy, but a thinking machine to be used in war, for President Reagan's Strategic Defence Initiative programme.

A Bangalorean and an IISc alumnus, Dr. S. Sitharama Iyengar runs the Robotics Research Laboratory at Louisiana State University. He and his team are designing an intelligent autonomous mobile robot for the SDI programme, a project being done jointly with the Oakridge National Laboratory where Dr. Iyengar is a visiting professor in the Department of Computer Science.

Many American universities are involved in different aspects of the Star Wars project, said Dr. Iyengar. His own role is to design a brain-like architecture, a neural network (similar to the network of neurons or brain cells) that can be mapped onto a robot. Since it is not possible to build a machine exactly like a human being, the idea is to simulate the functioning of the brain as closely as possible.

The SDI project requires a tele robot, that is, a robot which can operate in a space lab. It should be able to recognise orbital phases. When it finds unexpected obstacles it should relay the information. It has to keep track of oncoming vehicles and their speed, velocity, trajectory and other details.

The SDI robot should thus be capable of parallel thinking, that is, it must be able to think of several things at the same time, as the human brain does. It should be able

to learn by itself, re-configure available data and take decisions.

All this requires a machine with a very high degree of intelligence. Dr. Iyengar and his team have already developed a mathematical model for such a robot, which they will illustrate at the forthcoming International Conference on Neural Net-



**Dr. S. Sitharama Iyengar**

works. Dr. Iyengar says he is hopeful of designing the neural network within 10 years.

The Robotics Research Laboratory is also working on other types of robots. Dr. Iyengar and his team are designing a robot which will work in a nuclear environment; in case of a radiation leak in a plant, the robot will turn off the valve within a specified time. The team is working on a robot which can drive land vehicles; this could be of use in the army. The laboratory is also trying to develop a good vision system in the robot, so that it can analyse moving objects and see many objects at the same time.

Finally, the team is designing what the average American yearns for most — a robot that can mow the lawn!

*Deccan Herald, Monday, June 8, 1987*

INDIAN EXPRESS Bangalore Monday June 12 1989

*Introducing . . .*

## *Maker of machine men*

Bangalore, June 11: Intelligent robots who can think and act for themselves may be here sooner than we think.

A Bangalorean who keeps track of advanced robotics research in the US is, Dr. S. S. Iyengar, Professor of Computer Science at the Louisiana State University and visiting scientist at Oak Ridge National Laboratory. At this lab rapid research on robots is progressing under a massive project called "Autonomous Land Vehicles."

Dr. Iyengar, who graduated in mechanical engineering from the University Visvesvararaya College of Engineering in 1968, is one of the few Indians in the field of robotics in the US where he has been teaching and conducting research since he received his Ph.D from the Mississippi State University. He is in the City delivering a series of lectures at the Indian Institute of Science (IISc), where he did his ME in 1970.

Dr. Iyengar and a team of scientists are trying to create a robot that can act alone, comprehend and analyse facts when it is faced with a specific situation and come out with a proper response. In other words, an autonomous intelligent robot.

"In about five years we will have a robot that can function in hazardous environments," says Dr. Iyengar. The applications of the autonomous mobile robots (AMRs), as they are called, are significant in that they replace human beings in very complex tasks and hazardous conditions. For example, a robot grappling with controls and valves to arrest a



leak in a nuclear plant is the focus of the current research funded by the US Energy Department. Then there are robots that could be deployed in space missions for exacting tasks like fabricating structures in outer space.

The general idea is to create robots that can reason, make sensible judgments, learn through experience, be able to use common sense in certain unexpected conditions, understand its own limitations and request external help when a task is beyond its reach.

Dr. Iyengar acknowledges that the state of the art in robotics is far advanced in US and Europe.

Given the enormous expenses (a robot can cost a million dollars), robotics research is not a priority area in India. Some efforts are on and Dr. Iyengar is one of those who hope that Indian institutes and laboratories will create facilities for robotics research. — CM.

# Towards 'thinking' robots

By A. Ram Babu.

COMPUTERS are like foolish pundits; they can accomplish astounding feats but draw a blank in routine tasks that humans do. The wonder machines have proved their worth in as complex areas as underwater exploration, space travel and discovering minerals buried deep down in the earth. All these are the result of programming devised by experts. But can computers compete with human intelligence and come anywhere near the cognitive powers of the human brain? The answer to this question may be "yes," if the concerted research by a few groups of like-minded scientists in the US are any indication.

One of the scientists involved in the efforts to design computers that can

research has undergone various stages of development over the years. In the earliest stages, there were robots which could be programmed to perform simple tasks such as welding and painting. At present, several companies in the US, Japan and other technologically advanced countries are using robots for lay-out of printed circuit boards in the manufacture of chips, assembling process and transport of light-weight articles. They are fitted with sensors, a camera and a computer-processed information system.

"Our area of research," he says, "has to do with autonomous systems

half a dozen Indian students, two Chinese and two American students — is developing processes to achieve the above mentioned characteristics.

The key areas of his research are: intelligent sensing and navigation, distributed computing, fusion of multiple sensor inputs, on-line and off-line tracking, and neural networks and massively-parallel machines.

He says his team is exploring different methods of sensing and navigation because AMRs must continuously use the sensors to learn about the environment and process the information gained to build and modify on environment models. The resulting model is used by the AMRs for path-planning to reach desired goal positions.

What is distributed computing?

S.S.I: It is a process of computation



A robot hands over a book to Dr. Sitharama Iyengar

think and behave like human beings is Dr. S. Sitharama Iyengar, an ex-student of the Indian Institute of Science, Bangalore, who is now professor of computer science and Director of the Robotics Research Laboratory of the Louisiana State University.

Dr. Iyengar is currently on a brief visit to his home-town, Bangalore, to engage himself in "a meaningful interaction" with the local scientists. At various centres in Bangalore, he is giving informal lectures to robotics students.

"We at the Louisiana State University's robotics research laboratory are trying to embed some intelligence into the architecture of robots," says Dr. Iyengar.

The research his group is involved in aims at development of Autonomous Mobile Robots (AMRs). How are these AMRs different from the robots that are commonly understood by laypersons?

Dr. Iyengar explains that robots

which could replace humans to perform complex tasks under hazardous conditions. If successful, these autonomous systems could help eliminate human error when used to perform tasks that people find monotonous and tedious. These robots will be of immense help in building space platforms and performing crucial tasks in nuclear plants. ("In case of a radiation leak, the safest proposition would be to have a robot to go there and turn off the valve.")

In his latest status report, Dr. Iyengar points that there are four important characteristics of AMRs: the ability to reason under uncertainty; the ability to learn from experience; the ability to use "common sense"; and the ability to understand itself.

COMPUTERS with common sense? "Yes, don't be too amazed about such a possibility. Such computers will be a reality much sooner than most people think," he asserts. His research team — consisting of

at different sites in a computer network. The resulting computation can be used for making meaningful inferences of a particular task.

What is fusion of multiple sensor inputs?

S.S.I: It is a process of combining signals from sensors located in different places. This is very similar to data fusion and is used in tele-robot operations for satellite servicing.

What is on-line and off-line tracking?

S.S.I: It is a process of tracking components of a multiple robot in a distributed environment. This system is useful in space applications for tracking of targets. When fully developed, this system can greatly help in Star Wars-like space programmes.

What are neural networks, and massively-parallel machines?

S.S.I: Neural network is a connection scheme of neurons which exploits massive parallelism. This is a very

Continued on page IV

Deccan Herald,  
Thursday, June  
15, 1989

## Towards 'thinking' robots

*Continued from page 1*

important area for developing a neuro-computer which can have its application in intelligent robots that can react like human beings. On this project alone, the American Government is planning to spend \$500 million.

Dr. Iyengar and his group are not alone in their research to design thinking robots. The Louisiana State University research is being done in co-operation with researchers in other universities and organisations. Dr. Iyengar has joint projects with Purdue University, Carlton University, the Jet Propulsion Laboratory at Caltech, Oak Ridge National Laboratory and the Department of Naval Research. Each of the joint projects is designed to work on a particular aspect of this super robot.

"The research project funded by Oak Ridge is developing a robot with enormous computing power and flexibility so as to perform complex func-

tions such as navigation, on-line planning, sensor-based vision and external threat monitoring," he said.

The research with the Jet Propulsion Laboratory is directed at developing artificial neural network or brain channels for a variety of problems critical to robotics, signal processing and planning. The research sponsored by the Department of Navy is aimed at developing remote sensing and vision functions.

Two months ago, Dr. Iyengar was awarded 'Phi, Beta, Kappa' prize by his University for distinguished research. He has so far authored (co-authored) more than 75 research papers in parallel algorithms, data structures, navigation of intelligent robot, etc. He says he had the rare honour of serving as a guest editor for a special issue on autonomous intelligent machines in a computer magazine brought out by the prestigious Institution of Electronics and Electrical Engineers. In 1985, he served as a visiting professor at the Indian Institute of Science, Bangalore.

*Deccan Herald,  
Thursday, June  
15, 1989*

## MULTIPURPOSE ROBOTS STILL A DREAM

DEC 15  
1989

A catastrophic incident at one of the US nuclear reactors set the pace for developing a thinking Robot. Though many years of research has gone into it, the multi purpose Robot is still elusive to the scientists.

Speaking at the Club Meeting, Mr. Sitharama Iyengar, who is doing research in Robotics at the Missouri University, said the existing Robots have been designed to do specific jobs. To develop a Robot which can do many things needs lot of planning. It has to recognise objects. The line of research now is on to develop a system like the actual functions neurons in a human brain does.

It takes nearly four years to build a Robot for particular task and costs nearly 25 million dollars. But the out put by such a



costly Robot is not great. In order to develop a Robot for automotive navigation, a video camera is installed as an eye. The picture taken by this camera is digitised and coded by a computer. This process enables the Robot to circumnavigate hurdles.

A computer is very good at digital work but not in comparing pictures. A super computer is one which can do the digital work faster than other computers.

Research is also on to build Robots with sensory processing, which can have a sense of smell, or super sensory processing where a Robot can keep track of nearly 100 satellites.

The most intelligent Robot that has been created so far is considered to be equivalent to a four year old child's reasoning capability. On the domestic front Robots are being developed to open the door and use the vacuum cleaner.

Though Robots are being used in industries, they are normally preferred in hazardous areas, like Electronic industry and oceanography work. The automobile industries like General Electric Co., use Robots for collecting mail and in Post offices for sorting mail.

B. R. Prasad.

*Rotary Club News,  
Bengaluru December  
15<sup>th</sup>, 1989*

### Robotics expert

Dr. S. Seetharama Iyengar, an ex-student of the Indian Institute of Science, has earned a high reputation in the field of research into third generation robotics. The objective of such research is to develop robots that can make intelligent decisions and determine optimum production techniques.

This scientist, currently on a visit to Bangalore, is Director of the Robotics Research Laboratory of Louisiana State University, USA. He has been awarded the Williams Evans Fellowship of the University of Otago, New Zealand.

This is just another feather in his cap. His research awards (from several federal agencies) to date total one million dollars, he says. His previous awards have come from such prestigious agencies as the Jet Propulsion Laboratory, Caltech, Oakridge National Laboratory, US Naval Research and National Science Foundation.

Dr. Iyengar says he has always felt deeply attached to his hometown Bangalore. He hopes to return and settle down here to help contribute to the growth of robotics research.

*Deccan Herald,  
Monday, January 14<sup>th</sup>, 1991*

**INDIANS ABROAD**



**Ram S. Ramachandran**, who is on the technical staff at EG & G Mound, Miamisburg, Ohio, was recently honored by its department of energy with the 1992 Productivity Improvement Program Award. The award was in recognition of his technical contribution that helped save costs. He perfected the design for an experimental study of an automated "unipunch" system that proved that tooling could be certified to eliminate the need for inspection of parts. In 1986 Ramchandra received the Monsanto Achievement Award for his contribution toward the data package acceptance used at the Galileo and Ulysses space program at Mound. He is also active in community affairs, serving as president of the Hindu temple in Dayton.



**Sumit Dasgupta** has been named as Senior technical staff member at IBM, East Fishkill, New Jersey. Dasgupta was given the position because of the significant impact his work has had on the business in the areas of research, development and manufacturing engineering. He joined the company in 1969. By 1986, he was senior engineer and by 1987 he was project manager. Dasgupta is con-

sidered a technical expert in electronic design automation. Currently he is the manager of chip workbench products. He received a doctorate in computer and information science from Syracuse University in 1977.



**Amarjeet S. Sawhney**, professor of architecture at Miami Dade Community College, Florida, has been awarded the teaching chair in architecture at the college. He will hold the post for three years. The award, including a check for \$7,500, was given to the best 25 among 1,200 faculty members, who had to write a "portfolio" about their teaching and civic activities. Sawhney was the only Indian of the 25. He is a graduate of the College of Architecture, Chandigarh, and finished his master's at Cornell University, Ithaca, New York. He has been teaching 20 years.



**Dr. S.S. Iyengar** has been named chairman of the computer science department at Louisiana State University. He has directed the university's robotics research laboratory since its inception in 1986. Iyengar has been involved with research in algorithms and data structures. He received his Ph.D in 1974, and has served as principal investigator on re-

search projects supported by the Office of Naval Research and the National Aeronautics and Space Administration. He has also edited two books and published 80 archival journal papers. He was given the "best teacher" award in 1978 and in 1989 received the Phi Delta Kappa research prize for distinction at L.S.U.



**Asha Shah**, sales associate at Weichert, Realtors, Ridgewood, New Jersey, has earned membership to the New Jersey State Million-Dollar Sales Club. Her membership was announced recently by Weichert for outstanding achievements in 1991. A real estate professional, Shah has been listing and selling houses for five years. Before joining the company, she was an accountant for 14 years.



**Dr. Shirish Patrawalla** has been elected president of Irvington General Hospital medical staff. The hospital is located in New Jersey. Currently he is the director of the intensive-care unit and the department of cardiology. Patrawalla is also involved with voluntary services. He is a board member for the Share and Care Foundation, a community service organization.

December 9, 1994

INDIA ABROAD

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**SCIENCE**

**L.S.U. Professor Hailed for Robotics Work**

By a Staff Writer



S.S. Iyengar, professor and chairman of computer science at Louisiana State University in Baton Rouge, has been named a 1994 fellow of the Institute of Electrical and Electronics Engineers in recognition of his contributions to robotics and image processing.

He will receive an award from the National Computer Society at the IEEE conference Jan. 4-5. It will cite his "fundamental contributions in computer-related areas in the past 20 years."

Iyengar, through his research, is credited with discovering new areas in algorithms, data structures and computational aspects of robotics.

FRIDAY JULY 12 1996

THE INDIAN EXPRESS BANGALORE 3

**Award for US  
Professor  
EXPRESS NEWS SERVICE**

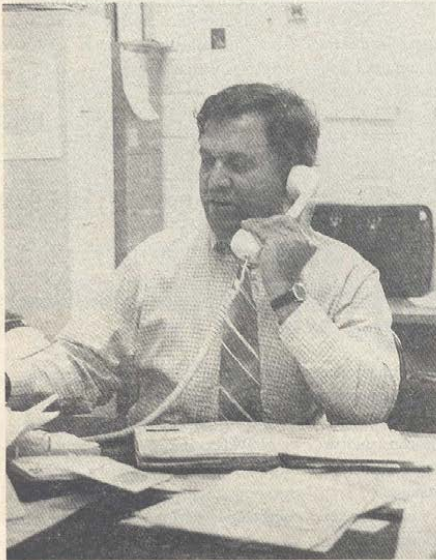
BANGALORE, July 11: Prof Iyengar, Chairman of the Department of Computer Science at Louisiana State University, USA, has been awarded the 'Distinguished Faculty Award for Excellence in Research' for his contribution in the area of high performance computing.

A Bangalorean by birth, Prof Iyengar is an alumnus of the Indian Institute of Science.

He has also received many national awards such as IEEE fellowship, Member of NY Academy of Sciences and NASA Faculty Fellow Award.

Indian Express Bengaluru-July 12<sup>th</sup>, 1996

# 'Intelligent Robots can enhance productivity'



S. Sitharam Iyengar, Prof. & Chairman of the Department of Computer Science, Director, Robotics Research Laboratory, Louisiana State University, US

*Dr.S.Sitharama Iyengar is one of those very few Indians who have made it big at the US academia. His life is a saga of hardwork, perseverance and clear vision which has elevated him to the position of one of the top-most scientists in computer research in the US today. Even though Dr.Iyengar has achieved great success in his life and is respected both by the academia and the industry worldwide, he hasn't lost the basic human qualities of humility and sincerity. Being an American citizen hasn't prevented him from coming down to his motherland to associate himself with Indians. He delivers guest lectures, selects students to work on his research and visits his parents in Bangalore regularly. Technoworld was fortunate to get an exclusive audience with Prof. S.S.*

*Iyengar on his recent visit to India to conduct a workshop on 'Distributed problem solving using multirobot co-operative systems' in Bangalore. G.P.Vinayababu spoke to Prof. S.S. Iyengar at length about the concept of agile manufacturing, his research and profession. Excerpts.*

#### How would you describe AMS, FMS and CIM in a nutshell?

Agile Manufacturing (AMS) is a method designed to take care of the changing needs of masses in the industrial environment by essentially customising the products. Large amount of inputs are taken from the needs of the customers.

Let's say we have a manufacturing company which manufactures nuts and bolts and all of a sudden a nuclear reactor company comes and asks for special types of nuts and bolts for their requirement. Then this company has to customise the nuts and bolts to suit the nuclear reactor requirements. That's essentially what we call as being in touch with the needs of the real population for special applications.

In flexible manufacturing (FMS), we are interested in technological innovations of the product. It deals with using new technologies to increase productivity of quality products.

CIM is a simulation based tool which is used for large scale manufacture of high quality products.

#### How can agility be brought into the manufacturing systems?

Agility can be introduced into a manufacturing system by using robots to perform complex tasks quickly and effectively with reasoning and decision making capabilities. Agile manufacturing involves adopting manufacturing methodologies which can deliver according to the customer needs by suitable modifications in the manufacturing systems.

#### How to incorporate reasoning into robotic systems?

This is achieved by a knowledge based system. This knowledge based system essentially is a rule based software tool which exactly describes the specific nature of requirements. This tool will be

embedded as a part of the execution sequence on the robotic machine. These software tools have to be designed in such a way taking into account all the specifications the customers require. So the idea of agility comes into picture by essentially adopting the application of robots to the needs of the people who are expecting new things.

#### You are talking about intelligent systems? How do you define



*'Agility can be brought into a manufacturing process by using robots which perform complex tasks quickly and effectively with reasoning and decision making capabilities'*

#### intelligence with respect to robotic systems?

Intelligence is making decisions based on facts. For eg: when I look at a person and if I have certain knowledge about that person, I appropriately engage my conversation with him in a way which suits the situation and the person. Here I am essentially coming up with a good decision making process myself, and incorporating them in my communication with others. Similarly,

when we have to manufacture some parts in an industry, especially using robots, they have to have an ability to make independent decisions. Such robots can enhance productivity.

#### Does it also involve learning?

You learn when you experience. There are certain things called as image understanding systems. These are systems which can understand images. And there are systems which can communicate in a natural language as we do—of course, in a limited way. You can't compare these with human brain, as it requires enormous amounts of computing power to reach anywhere near human brain capacity. The bottomline is you need to have a very high performance computer. Unfortunately, we don't have such high performance computers which can simulate human brain as of now.

#### What is the level of penetration of Agile manufacturing in US and other parts of the world?

Agile manufacturing as such is a fairly new terminology. But the concept was there much before. As early as in 1968 itself, speech understanding systems were developed by Dr. Reddy and others which could synthesise natural languages/speech. In terms of manufacturing industry, knowledge based systems have been used, but only partially. Now we see them being used extensively to enhance production, to eliminate human mistakes. For eg: We have autonomous land vehicles in US designed by Carnegie Mellon University which are vehicles driven without drivers. These can understand roads, traffic conditions and rules. They are able to make autonomous decisions on their own using excellent knowledge based softwares.

#### Which segments of industry can

**benefit from AMS?**

Manufacturing industries like automobile, aircraft, nuclear, etc. just about all sorts of industries use this concept. Chemical industries use it in toxic waste disposal.

**Do you think there is a requirement for a knowledge based system in these industries? Don't you think ordinary robots can do these on specific commands?**

Robots are being used for two reasons. Firstly, places where you don't want humans to go like diffusing a bomb or detecting mines, underwater exploration, space exploration and working in hazardous environment like toxic and nuclear radiations. Secondly, in manufacturing - while manufacturing a very important component which is complex, automation is needed. For eg. In the manufacture of PCBs, you can have a good layout designed, drawn, drafted and implemented by using intelligent robots. Robots are also used for security purposes.

**How do you think India can benefit from this?**

I think India is progressing very well, especially in software. In the next millennium, India is going to be one of the leaders in software. But they need to catch up. In the manufacturing sector, we don't compete well with China, Korea and other Asian countries. Korea and China would be India's immediate competitors. Only by using such modern technologies can we hope to catch up with them.

**Throw some light on 'distributed problem solving using multi robot systems'.**

If there is a task to be accomplished in a manufacturing environment several robots can work in co-ordination to complete the task. One robot will be

**S.S. Iyengar - Profile**

S. Sitharam Iyengar is a professor of computer science and supervisor of robotic research and parallel algorithms at Louisiana State University (LSU), Baton Rouge. He has authored and coauthored more than 250 research papers on topics such as parallel algorithms, data structures, and navigation of intelligent mobile robots. He is currently studying the application of neural network techniques for path planning and learning mobile robots. His research has been funded by NASA, Oak Ridge National Laboratory, the US Navy, and Caltech's Jet Propulsion Laboratory.



**Dr. Sitharama Iyengar**

Iyengar has been on program committees for several major conferences in the US and in Europe and has been an ACM national lecturer since 1986. He received the PhD degree from Mississippi State University in 1974. This year he has been awarded the Phi Beta Kappa research award of distinction at LSU.

Iyengar's address is Department of Computer Science, Louisiana State University, Baton Rouge, LA 70803-4020. E-mail: iyengar@bit.csc.lsu.edu

responsible for carrying some equipment from one part of the industry to the other, another machine will be responsible for picking up a part and bringing it to the assembly line and so on. There is a constant interaction of all these robots, to accomplish one major task. Certain amount of autonomous decision making powers in each of these robots will be seen. This is distributed problem solving. But this is still in the experimental stages. It is very expensive as each of these robots have to be highly sophisticated in terms of vision, on board computing etc.

Dr. Lynn Parker is heading a group in developing 'co-operative multi robots' in firefighting in the US. Lot of prototype testings elsewhere on various applications are also being done.

**UNIVERSITY INDUSTRY INTERACTION**

**In US, it is the universities which come up with innovative ideas. But in India, it is the other way round. Where do you think we are going wrong?**

I was very surprised that even at the university college of engineering, we don't see much of an interaction although Prof. Chowdharia is trying to do a lot of things. The most important thing is to build a close co-operation between industries and universities. Industries should define as to what kind of problems they are interested in and fund the projects in universities. In US, most original ideas start at universities and research labs and our ideas will become real applications in industries.

**How many of your papers are used for real time industrial applications?**

I have written 250 research papers and several text books. I have generated about \$3 million research funding in the last 10 years. I am also an IEEE fellow (an honoured position).

Many of my ideas have been used for real applications. US army is developing a tactical movement analyser, something like a navigator of the land vehicle based on my research. Our work has also been implemented in oceanographic images. Lot of such ideas have been practically used.

**PROFESSION**

**What made you shift over from mechanical engineering to computer science?**

Well, of course, my basic degree is in mechanical engineering. But, I was very strong in mathematics right from the beginning. When I got an opportunity to work on problems using computers my interest grew in them. In US, there is not much of a difference among different branches of engineering. So I could easily adapt myself to the computer field.

**INDIANS IN US**

**How are Indians in US treated?**

Indians in the education sector are respected very much in US. I am one of the topmost and highly paid professors in the Louisiana University out of a faculty strength of 2,500. I am respected just as any other US professor. America is a great country of opportunities. I don't think I would have got such opportunities in India.

**What do you think about the Brain Drain?**

This is quite natural. Here the opportunities are very less. Today, it is

not all that bad as a lot of multinationals are coming to India. It is just like a river. It always moves in the direction of the gradient.

Because of the corrupt bureaucratic procedures, insufficient infrastructure, it becomes harder for India to retain brilliant performers. The temptation of money is also there.

**How do you compare the scientists working in India to those Indian scientists working in America?**

Indian scientists are very good intellectually, but again because of the

*Industries should define as to what kind of problems they are interested in and fund the projects in universities. In US, most original ideas start at universities and research labs and our ideas will become real time applications in industries'.*

*- Dr. S.S. Iyengar*

local problems, I see them being not productive at all. By and large, the environment, which I saw when I was a student is not there. Some departments in places like IISc are below average.

**Can people like you make a difference to this situation?**

I think I can make some difference. I hire

some students from Indian institutions, I support some students financially, I give large number of talks even in small colleges here.

Lot of bright students are there in India, only that they are not well motivated, so they lack discipline. All these things make discipline a problem.

**What is your advice to students?**

They have to work hard and should have a vision of what they really want to do in life. If they have to be successful, they have to have priorities in life. They have to learn to work with people.

We all have a chance once in our lifetime to make it big and once that is lost we'll never be able to do it. Again this comes with discipline.

**How has your family supported you?**

I left this country when I was 22 year old. We were below average in terms of financial status. My father was a clerk in AG's office. It was a difficult life in those days. But poverty has its own virtues.

I had this self motivation right from the beginning and my vision was to be the best in whatever I do. That kind of vision and focus has helped me a lot.

My wife has been a great support all along. My first son is now doing his MDPHD in Albert Einstein Medical School. Second son is also studying in the university and third son is 10 year old and is in 4<sup>th</sup> grade. They have all seen me working hard and that has motivated them to scale greater heights.

**What are your future plans?**

I am writing some text books. I will continue to work on my research. Hire some more students from India and other places. I eventually would like to come back to India and work with students and industries – not for money but purely on voluntary basis for personal satisfaction. □

## **S.S. Iyengar - Profile**

S. Sitharam Iyengar is a professor of computer science and supervisor of robotic research and parallel algorithms at Louisiana State University (LSU), Baton Rouge. He has authored and coauthored more than 250 research papers on topics



**Dr. Sitharama Iyengar**

such as parallel algorithms, data structures, and navigation of intelligent mobile robots. He is currently studying the application of neural network techniques for path planning and learning mobile robots. His research has been funded by NASA, Oak Ridge National Laboratory, the US Navy, and Caltech's Jet Propulsion Laboratory.

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# ರಾಜ್ಯವಾರ್ತೆ

ಬೆಂಗಳೂರು, ಏ. 6

## ಅಭಿನಂದನೆ

ಕಂಪ್ಯೂಟರ್ ಕ್ಷೇತ್ರದಲ್ಲಿನ ಸಾಧನೆಗಾಗಿ ಅಮೆರಿಕದ ಲೂಸಿಯಾನ ರಾಜ್ಯ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಕಂಪ್ಯೂಟರ್ ವಿಜ್ಞಾನ ವಿಭಾಗದ ಅಧ್ಯಕ್ಷ ಪ್ರೊ.ಎಸ್.ಎಸ್. ಅಯ್ಯಂಗಾರ್ ಅವರಿಗೆ 1997ರ 'ಪ್ರಗತಿ ತಾಂತ್ರಿಕ ಸಾಧನೆ ಪ್ರಶಸ್ತಿ' ಲಭಿಸಿದೆ.

ಬೆಂಗಳೂರಿನವರಾದ ಅಯ್ಯಂಗಾರ್ ಅವರು ಈ ಪ್ರತಿಷ್ಠಿತ ಪ್ರಶಸ್ತಿಯನ್ನು ಪಡೆದಿರುವುದಕ್ಕಾಗಿ ಬೆಂಗಳೂರು ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕ ಜಿ.ಎಂ.ವರದರಾಜ್ ಅಭಿನಂದಿಸಿದ್ದಾರೆ.

Prajavani April 7<sup>th</sup> 1998

## India sure to emerge as super power

BANGALORE: Karnataka Minister of State for Information B.K. Chandrashekhara today said data warehousing and data mining would go a long way in effective management of organisations and institutions in the next millennium, as modern management heavily depended on Information Technology for its success.

Speaking after inaugurating a one-day national workshop on 'Data Warehousing and Data Mining for Manufacturing the Next Millennium' organised under the aegis of the Centre for Development of Advanced Computing (C-Dac) here, he said 50 years ago nobody thought of information as a tool of the management. But with the advent of computers and the data support systems (DSS), integral to management, has provided tremendous results.

Bangalore University vice chancellor Dr K. Siddappa said considering the top position occupied in the IT sector, country was sure to emerge as one of the super-powers in the world in the near future.

Referring to the excellence achieved in the IT, he said the number system was the contribution of Ancient India to the world which perhaps answered our doing well in the sector. —UNI



ಬೆಂಗಳೂರಿನಲ್ಲಿ ಇತ್ತೀಚೆಗೆ ಸಿ-ಡ್ಯಾಕ್ ಸಂಸ್ಥೆಯಲ್ಲಿ ನಡೆದ ಕಂಪ್ಯೂಟರ್ ಸಾಫ್ಟ್‌ವೇರ್ ಕುರಿತ ಕಮ್ಮಟವನ್ನು ವಾರ್ತಾ ಸಚಿವ ಬಿ. ಕೆ. ಚಂದ್ರಶೇಖರ್ ಉದ್ಘಾಟಿಸಿ ಮಾತನಾಡುತ್ತಿರುವುದು.

## ವಿ.ವಿಯಲ್ಲಿ ಉನ್ನತ ಕಂಪ್ಯೂಟರ್ ಶಿಕ್ಷಣ ಕೇಂದ್ರ

ಬೆಂಗಳೂರು, ಜ. ೫- ಉನ್ನತ ಶಿಕ್ಷಣ ಪಡೆದ ವಿದ್ಯಾರ್ಥಿಗಳು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದಲ್ಲಿ ಹೆಚ್ಚಿನ ಜ್ಞಾನಾರ್ಜನೆ ಪಡೆಯಲು ಕಂಪ್ಯೂಟರ್ ತರಬೇತಿ ಉತ್ಕೃಷ್ಟತಾ ಕೇಂದ್ರವನ್ನು ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯದಲ್ಲಿ ಪ್ರಾರಂಭಿಸಲು ಸರ್ಕಾರ ಉದ್ದೇಶಿಸಿದೆ ಎಂದು ಉನ್ನತ ಶಿಕ್ಷಣ ಸಚಿವ ಡಾ. ಬಿ. ಪರಮೇಶ್ವರವರು ತಿಳಿಸಿದ್ದಾರೆ.

ಮೊದಲಿಗೆ ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯದಲ್ಲಿ ಈ ಉತ್ಕೃಷ್ಟತಾ ಕೇಂದ್ರ ಪ್ರಾರಂಭಿಸಲಾಗುವುದು. ಈ ಕೇಂದ್ರದಿಂದ ಉಂಟಾಗುವ ಸಾಧಕ-ಬಾಧಕ ಅರಿತು, ನಂತರ ಎಲ್ಲಾ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳಲ್ಲಿ ಕೇಂದ್ರಗಳನ್ನು ಪ್ರಾರಂಭಿಸಲಾಗುವುದು ಎಂದು ಪತ್ರಿಕಾಗೋಷ್ಠಿಯಲ್ಲಿ ಇಂದು ತಿಳಿಸಿದರು.

ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದ ಲಾಭವನ್ನು

ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ದೊರಕಿಸಿಕೊಡಲು ಪಾಗೂ ಹೊಸ ಕಾರ್ಯಕ್ರಮಗಳ ಯಶಸ್ವಿ ಜಾರಿ ಮತ್ತು ರೂಪ-ರೇಷೆ ರೂಪಿಸಿ ಸರ್ಕಾರಕ್ಕೆ ವರದಿ ಸಲ್ಲಿಸಲು ಸಿ-ಡಾಕ್(ಸಿ-ಡಿಎಸ್)ನ ನಿರ್ದೇಶಕ ಪ್ರೊ. ಎನ್. ಚಂದ್ರಶೇಖರ್ ಅಧ್ಯಕ್ಷತೆಯಲ್ಲಿ ಪರಿಗಣಿತ ವಿಶೇಷ ಪಡೆಯನ್ನು ರಚಿಸಲಾಗಿದೆ ಎಂದು ಹೇಳಿದರು.

(ಕೊನೆ ಪುಟ ನೋಡಿ)

## ವಿ.ವಿಯಲ್ಲಿ ಉನ್ನತ ಕಂಪ್ಯೂಟರ್ ಶಿಕ್ಷಣ ಕೇಂದ್ರ

(ಒಂದನೇ ಪುಟದಿಂದ)

ಅಮೆರಿಕಾದ ನ್ಯಾಸ ಕಾರ್ಯಕ್ರಮದ ಯಶಸ್ವಿ ರೂಪಾಂತರವಾಗಿತ್ತು. ಸೀತಾರಾಮ ಅಯ್ಯಂಗಾರ್, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿ.ವಿ.ಯ ಉಪ ಕುಲಪತಿ ಪ್ರೊ. ಎನ್. ರಾಜಶೇಖರಯ್ಯ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ಇಂಜಿನಿಯರಿಂಗ್ ಕಾಲೇಜಿನ ಪ್ರೊ. ಶಿವಶಂಕರ್, ಭಾರತೀಯ ವಿಜ್ಞಾನ ಸಂಸ್ಥೆಯ ಪ್ರೊ. ಎಲ್.ಎಂ. ಪಟ್ಟಾಯ್, ಐ.ಎಸ್.ಎಸ್.ಎ. ಅಧ್ಯಕ್ಷ ಡಾ. ಶ್ರೀನಿವಾಸನ್, ವಿಪ್ರೋ ಡಾ. ಕೆ.ಎಲ್. ರಾವ್, ಡಾ. ವೇಣುಗೋಪಾಲ್‌ವರು ಈ ಸಮಿತಿಯ ಸದಸ್ಯರಾಗಿದ್ದಾರೆ.

ಈ ಸಮಿತಿ 15 ದಿನಗಳಲ್ಲಿ ವರದಿ ಸಲ್ಲಿಸಲಿದೆ ಎಂದು ಹೇಳಿದರು.

ಈ ತರಬೇತಿ ಕೇಂದ್ರದಲ್ಲಿ ಉದ್ಯೋಗ ವಕಾಶಕ್ಕೆ ಉಪಯೋಗವಾಗುವ ಬಗ್ಗೆ ತರಬೇತಿ ನೀಡಲಾಗುವುದು ಎಂದು ಹೇಳಿದರು.

ಪ್ರವೇಶಕ್ಕೆ ಮಿತಿಯಿಲ್ಲ, ನಿಗದಿತ ಶುಲ್ಕ ಪಾವತಿಸಿ ತರಬೇತಿ ಪಡೆಯಬಹುದಾಗಿದೆ ಎಂದು ಹೇಳಿದರು.

ಆಪಾಚಿಕ್ ಎನ್.ಎ.ಟಿ.ಇ. ಮತ್ತಿತರ ಖಾಸಗಿ ಕಂಪ್ಯೂಟರ್ ಶಿಕ್ಷಣ ತರಬೇತಿ ಸಂಸ್ಥೆಗಳು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಶೋಷಣೆ ಮಾಡುವುದನ್ನು ತಪ್ಪಿಸಲು ಅಗತ್ಯ ಕ್ರಮ ಕೈಗೊಳ್ಳಲಾಗುವುದು ಎಂದು ಹೇಳಿದರು.

Sanjaya Vani  
January 5<sup>th</sup> 2000

## ಸೆಮಾಂಟಿಕ್ ವೆಬ್ ಮೂಲಕ ಕ್ಷಣಾರ್ಧದಲ್ಲಿ ಮಾಹಿತಿ, ಚಿತ್ರ

ಬೆಂಗಳೂರು, ಜು.26: ಇಂಟರ್ ನೆಟ್‌ನಲ್ಲಿ ಸೆಮಾಂಟಿಕ್ ವೆಬ್ ನೆಟ್‌ವರ್ಕ್‌ನಿಂದ ಕ್ಷಣಾರ್ಧದಲ್ಲಿ ಅಗತ್ಯ ಮಾಹಿತಿ ಹಾಗೂ ಚಿತ್ರಗಳನ್ನು ಪಡೆಯಲು ಸಾಧ್ಯ ಎಂದು ಅಮೆರಿಕದ ಲೂಸಿಯಾನ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಕಂಪ್ಯೂಟರ್ ವಿಜ್ಞಾನ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥ ಡಾ.ಸೀತಾರಾಂ ಅಯ್ಯಂಗಾರ್ ಇಂದು ಇಲ್ಲಿ ತಿಳಿಸಿದರು.

ಮೆಸೆಪಾಲ್ ಇಂಟರ್‌ನ್ಯಾಷನಲ್ ಇನ್‌ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಇನ್‌ಫಾರ್ಮೇಷನ್ ಟೆಕ್ನಾಲಜಿ (ಎಂಬಿಐಟಿ) ಸಂಸ್ಥೆಯಲ್ಲಿ ಅವರು ಉಪನ್ಯಾಸ ನೀಡುತ್ತಿದ್ದರು.

ವೆಬ್‌ಮೈನಿಂಗ್‌ನಿಂದ ಚಿತ್ರಗಳು, ಮಾಹಿತಿಗಳು ಹಾಗೂ ನಕ್ಷೆಗಳು ಸ್ಪಷ್ಟವಾಗಿ ಕಂಪ್ಯೂಟರ್ ತೆರೆಯ ಮೇಲೆ ಮೂಡುತ್ತವೆ. ಇದರಿಂದ ಟೆಲಿಮೆಡಿಷನ್, ರಕ್ಷಣಾ ಕಾರ್ಯಗಳಿಗೆ ಸಹಾಯಕವಾಗುತ್ತದೆ. ಇಂಟರ್‌ನೆಟ್ ಉಪಯೋಗಿಸುವವರಿಗೆ ಕಾಲವ್ಯಯವಾಗುವುದಿಲ್ಲ ಎಂದರು.

ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ ಕ್ಷೇತ್ರದಲ್ಲಿ ಹಲವಾರು ಕಂಪನಿಗಳು ಬಹುತೇಕ ಮಾಹಿತಿಗಳನ್ನು ವೆಬ್‌ನಲ್ಲಿ ಇಟ್ಟಿರುತ್ತವೆ. ನಿರ್ದಿಷ್ಟ ಮಾಹಿತಿ ಹಾಗೂ ಚಿತ್ರಗಳನ್ನು ಪಡೆಯಲು ಈಗ ಸಮಯಾವಕಾಶ ಬೇಕಾಗುತ್ತಿದೆ. ಸೆಮಾಂಟಿಕ್ ವೆಬ್ ಸರ್ವ್ ಇಂಜಿನ್ ಮೂಲಕ ಸಮಯ ಉಳಿಯುವ ಜೊತೆಗೆ ಸ್ಪಷ್ಟ ಚಿತ್ರಣ ದೊರೆಯುತ್ತದೆ ಎಂದರು.

ಸೆಮಾಂಟಿಕ್ ವೆಬ್ ನೆಟ್‌ವರ್ಕ್ ಮೂಲಕ ಯಾವುದೇ ವೆಬ್‌ಸೈಟ್‌ನಲ್ಲಿನ ಯಾವುದೇ ಇಮೇಜ್ ಅಥವಾ ಮಾಹಿತಿಯನ್ನು ನೇರವಾಗಿ ಒಂದೇ ಕ್ಲಿಕ್ ಮೂಲಕ ಪಡೆಯಲು ಸಾಧ್ಯ ಎಂದು ವಿವರಿಸಿದರು. ಕೈಗಾರಿಕೆಗಳು, ಸುದ್ದಿಸಂಸ್ಥೆಗಳು

ಹಾಗೂ ಪರಸ್ಪರ ಸಂವಹನಕ್ಕೆ ಈ ನೆಟ್‌ವರ್ಕ್ ತಂತ್ರಜ್ಞಾನ ಬೆಳವಣಿಗೆ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಅತ್ಯಂತ ಉಪಯುಕ್ತವಾಗಿದೆ. ಈ ನೆಟ್‌ವರ್ಕ್ ಪ್ರತಿಯೊಬ್ಬರಿಗೂ ತಲುಪಿಸುವುದೇ ತಮ್ಮ ಉದ್ದೇಶ ಎಂದು ಹೇಳಿದರು.



ಬೆಂಗಳೂರಿನ ಮೆಸೆಪಾಲ್ ಇಂಟರ್ ನ್ಯಾಷನಲ್ ಇನ್‌ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಇನ್‌ಫಾರ್ಮೇಷನ್ ಟೆಕ್ನಾಲಜಿ (ಎಂಬಿಐಟಿ) ಸಂಸ್ಥೆಯಲ್ಲಿ ಗುರುವಾರ ನಡೆದ ಸಮಾರಂಭದಲ್ಲಿ ಅಮೆರಿಕದ ಲೂಸಿಯಾನ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಕಂಪ್ಯೂಟರ್ ವಿಜ್ಞಾನ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥ ಡಾ.ಸೀತಾರಾಂ ಅಯ್ಯಂಗಾರ್ ಅವರು, 'ಸೆಮಾಂಟಿಕ್ ವೆಬ್ ನೆಟ್ ವರ್ಕ್ ಮತ್ತು ಇಂಟರ್‌ನೆಟ್‌ನಲ್ಲಿ ಅದರ ಬಳಕೆ' ಕುರಿತು ಉಪನ್ಯಾಸ ನೀಡಿದರು.

UdayaVani, Bengaluru June 25th 2000

# Call for policy to help students pursue higher edn

DH News Service

BANGALORE, Jan 5

Higher Education Minister G Parameshwara today stressed the need for evolving a national policy on providing loans to students to pursue higher studies.

Speaking after inaugurating a one-day workshop on "computer in higher education" organised by Bangalore University here, the minister said the State government would soon write to the Centre to introduce such a policy.

Mr G parameshwara said that loan facility for students pursuing higher studies had become essential as most of the subsidies were allotted to primary education.

"When we are not in a position to provide subsidies or reduce the fees for higher education, loans should be provided to enable the poor and the rural students take up higher studies," the minister said.

The minister suggested that loans could be provided to undergraduate and post-graduate students. Loans should be extended to the students on a long-term basis with low interest.

Dr Parameshwara said that a centre of excellence in IT would soon be set up in Bangalore University. The centre would provide the students with all the latest knowhow in the IT sector, he added.

He reiterated that the government was committed to accord priority to computer education and promote IT in the State.

He said that there was no



Higher Education Minister G Parameshwara at a workshop on 'computer in higher education' held in Bangalore on Wednesday. Prof S Seetharam Iyengar from Lusiana State University, USA, Bangalore University Registrar M S Thimmappa, Vice-Chancellor K Siddappa and C-DAC Director N Chandrashekar are also seen. DH photo

change in the government's stand to start computer education in schools from standard five.

Computer training programmes for students should be introduced early so that they would be familiar with computer applications at least at the pre-university level.

Speaking on the occasion, Bangalore University (BU) Vice-Chancellor K Siddappa reiterated that the university would soon start a compulsory computer ap

plication paper at post-graduate and under-graduate levels in a phased manner.

The computer application paper would be first introduced at the post-graduate level and later extended to the under-graduate level, BU vice-chancellor K Siddappa said.

Speaking on "Information Technology - Scenario", Prof S Seetharam Iyengar from Lusiana State University said curriculum

should be framed keeping in mind the latest development and progress in computing.

Prof N Chandrashekar, director of C-DAC, said that efforts should be made to make computer technology and internet accessible and effortable to the masses.

Registrar M S Thimmappa, Dr H N Shivashankar, dean, faculty of engineering, Registrar (Evaluation) K H Aswathanarayana Gowda spoke.

Indian Express, January 5<sup>th</sup> 2000

## Task force to broadbase computer education

The Times of India News Service

BANGALORE: The Karnataka government has set up a task force comprising information technology experts to introduce computer education in a big way. The panel will submit its report within 15 days.

Higher Education Minister G. Parameshwara told reporters that the panel headed by N. Chandrasekharan, director of the Centre for development of Advanced Computing (C-DAC) will have representatives from Indian Institute of Science, Infosys and Motorola, besides scientists and academicians.

The committee will make recommendations on how to broadbase computer education in the state. The aim is to enable students from the state to compete in the global market. The panel will suggest how IT could be put to best use at the degree level.

The government will set up a centre of excellence at the University Visvesvaraya College of Engineering (UVCE) to provide computer training to fresh graduates, irrespective of their faculty at the degree level.

"This will be broadbased and not profit oriented."

Similar centres of excellence will be set up in other technical institutions of the state. In all, 50 super-computers will be installed for training purposes.

The government will also come out with a mechanism to regulate computer training institutes which are "exploiting" students by charging exorbitant fees, the minister added.

# Give priority to computer studies: Minister

EXPRESS NEWS SERVICE

**Bangalore, Jan 5:** Higher Education Minister G Parameswara on Wednesday regretted that "higher education is a non-priority sector in India with universities sustaining without any subsidies".

Inaugurating a one-day workshop on 'Computer in Higher Education' at Central College, here, Parameswara stressed that top priority should be given to computer education at the university level. The university syllabus which was updated once in 10 years, will now be updated every session, he added.

He also said that the Government should not only aim at promoting Information Technology in the State, "but also prepare the students with a deeper knowledge to do their best in the industry, when they go out of the university." "With the alarming increase of internet users in the country, it is important to know the impact of computer education in our day-to-day life," Parameswara added.

Expressing concern over high fee structures, especially in private educational institutions, he proposed a national policy of extending loans to students with a small repayment structure, in order to facilitate their education.

Parameswara lauded the efforts of Bangalore University Vice Chancellor K

can make better use of it. Apart from training students in computers, centres should come up to develop more software with self-finance. Higher education should no longer look to Government and people for help," he added.

Seetharam Iyengar of Louisiana University, USA, and Director of C-DAC, Chandrashekar N spoke on the Information Technology scenario.

Bangalore University Vice Chancellor K Siddappa in his presidential address said that, "after the introduction of computer applications at post-graduate level, within a year it will be started at the undergraduate level too."

He also called on teachers to not only help students understand the subject, but also motivate them to develop software. The employment potential of every student should be improved and the professional prominence and confidence of every student enhanced, he said.

Bangalore University Registrar M S Thimmappa, Registrar K H Ashwathnarayana Gowda and H N Shivashankar, Dean of Engineering, BU, were present.

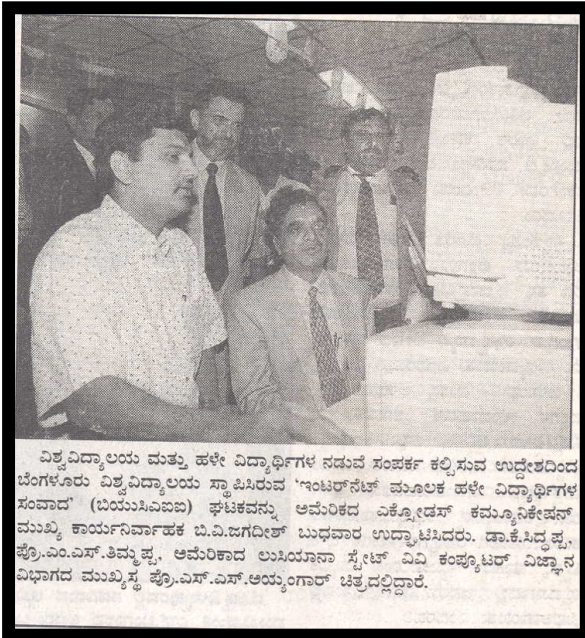
***Employment possibilities would increase and the professional prominence and confidence of students would be enhanced if computer studies are introduced***

Siddappa for taking the first step in educating people on the importance of computers in higher education.

He also reiterated the assurance given by Chief Minister S M Krishna on a proposed project to provide computer education at the primary school level, from the fifth standard onwards. This will enable students to pursue the subject in their higher education.

"With Rs 2 crore worth of software exports from the State, Bangalore University

Indian Express, January 6<sup>th</sup> 2000



ವಿಶ್ವವಿದ್ಯಾಲಯ ಮತ್ತು ಹಳೇ ವಿದ್ಯಾರ್ಥಿಗಳ ನಡುವೆ ಸಂಪರ್ಕ ಕಲ್ಪಿಸುವ ಉದ್ದೇಶದಿಂದ ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯ ಸ್ಥಾಪಿಸಿರುವ 'ಇಂಟರ್‌ನೆಟ್ ಮೂಲಕ ಹಳೇ ವಿದ್ಯಾರ್ಥಿಗಳ ಸಂವಾದ' (ಬಿಯುಸಿಎಐಐ) ಘಟಕವನ್ನು ಅಮೆರಿಕದ ಎಕ್ಸ್‌ಟ್ರಾಡಿಸ್ ಕಮ್ಯೂನಿಕೇಷನ್ಸ್ ಮುಖ್ಯ ಕಾರ್ಯನಿರ್ವಾಹಕ ಬಿ.ವಿ.ಜಗದೀಶ್ ಬುಧವಾರ ಉದ್ಘಾಟಿಸಿದರು. ಡಾ.ಕೆ.ಸಿದ್ದಪ್ಪ, ಪ್ರೊ.ಎಂ.ಎಸ್.ಶಿವಪ್ಪ, ಅಮೆರಿಕಾದ ಲುಸಿಯಾನಾ ಸ್ಟೇಟ್ ವಿವಿ ಕಂಪ್ಯೂಟರ್ ವಿಜ್ಞಾನ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥ ಪ್ರೊ.ಎಸ್.ಎಸ್.ಅಯ್ಯಂಗಾರ್ ಚಿತ್ರದಲ್ಲಿದ್ದಾರೆ.

June 6<sup>th</sup> 2000

## Dream of improving education quality in BCC schools coming true

EXPRESS NEWS SERVICE

**Bangalore, June 28:** After listening to a one-hour computer-aided presentation of teachers of Bangalore City Corporation (BCC) schools on Tuesday, B V Jagadeesh was a satisfied man. His dream of improving the quality of education in BCC schools is slowly gaining shape.

Jagadeesh, co-founder of a globally successful US-based IPO, Exodus and also the director of Erudite, an education portal, contributed \$ 1 million for the development of 35 BCC schools recently.

The first phase of imparting computer-based training to high school teachers was reaching completion.

"This is the first phase of our three-year programme. And I am quite satisfied with the progress you have made. It is a good start," Jagadeesh told the 50-odd teachers who completed training.



B V Jagadeesh

The teachers, who were trained in basic computer skills, produced a 45-minute tenth standard computer-aided lesson.

"You should create a library of all these computer-aided lessons so that they can be exchanged. In the long run, a data base should be developed," Jagadeesh said.

If the programme is effective, there will be an improvement in the SSLC results. "Otherwise, all our efforts would become futile," he told teachers.

"My goal is to make people aware of the problems of this country and get as many people as possible to contribute to peoples causes," Jagadeesh later told this newspaper.

According to him, there are many US-based Indians willing to help the country but don't know how to go about it.

"There are sections of Indians who want to improve our country but don't want their contributions to be pocketed by politicians and officers. With this programme, I want to invite all of them to contribute," he said.

Education, according to Jagadeesh, is the panacea of all ills. "Be it poverty, unemployment or any problem our country is currently facing, it is the lack of education that is the fundamental and cause. By concentrating on BCC schools, I want to produce more entrepreneurs, managers, engineers and other professionals from middle-class families,"

he said.

And to realise his dreams, a trust Seva Sangam Prathishtan was formed comprising his brother B V Kumar, his teacher K E Radhakrishna. Eminent educationist and former Bangalore Vice-Chancellor H Narasimhaiah is an advisor. The Trust has tied up with School Net, an organisation for networking schools, to provide the training component of the programme. An elaborate study was conducted before the actual implementation of the programme. "There has been great support from BCC authorities and I am very grateful for their cooperation," he said.

What are Jagadeesh's long-term goals? "At the grassroots level, I want to ensure quality education system. At the higher level, I want to help create intelligence in the form of a large number of entrepreneurs, managers and self-employment units.

Indian Express- Jagadeesh, June 2000

## Varsity gets alumni connected

EXPRESS NEWS SERVICE

**Bangalore, June 28:** The Bangalore University has created an internet cell to enable its alumni to interact with each other. It was set up at the University Visveswaraya College of Engineering (UVCE), here on Wednesday.

The idea behind the Bangalore University Cell for Alumni Internet Interaction (BUCAII) was to bring together on the net all former students of the UVCE and the University. B V Jagadeesh, CEO of the US-based Exodus Communicati-

ons, and an alumnus of the UVCE, inaugurated the Cell.

In his presidential address, K Siddappa, Vice-Chancellor, Bangalore University, said he would work toward transforming Bangalore University into Stanford University and UVCE into the California Institute of Technology. Though Bangalore is globally acknowledged as the Silicon Valley of India and Asia, Bangalore University is lagging in many areas, he said.

Internet connections will be made available in all departments of Bangalore University

and it will go 'hi-tech' in information resources in a couple of months, he said.

The BUCAII will enable easy connectivity among alumni in different parts of the globe, said Prof S S Iyengar, former UVCE student, and chairman of the Computer Science department, Louisiana State University, USA.

Jagdeesh also inaugurated the internet connection for 24 computers in the college. He said telecommunication network and computer resources in UVCE and the University will be improved in a year's time.

Arjuna Rao Chavala  
felicitating Prof. S. S.  
Iyengar - June 2000

### Report on IEEE talk by Prof. S.S. Iyengar

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Arjuna Rao Chavala felicitating Prof. S.S. Iyengar

of sensor fusion. Marzullo's fault tolerant integration algorithm takes a list of intervals representing the sensors as the input and gives an interval representing the sensor values as the output of the preprocessor. The development of a new algorithm whose computational complexity is  $O(n \log n)$  and which yields better results than Marzullo's algorithm and Schmid-Schossmaier's algorithm is described. This algorithm is based on applying the wavelets and neural networks theory to the problem. This algorithm has potential applications in several diverse areas such as Remote sensing, Distributed data mining.

# Prepare citizens for IT

## Minister asks experts to guide State, public

FROM OUR BUREAU

Hyderabad, Dec. 17: Roads and Buildings Minister K Vijaya Rama Rao on Sunday called upon IT specialists to evolve specific strategies to guide the State government in its endeavour to use IT for the benefit of the common man.

"Effective use of information technology for education, health care, rural development, employment generation and poverty alleviation requires the joint effort of the government and the private sector," Vijaya Rama Rao said.

He was delivering the inaugural address at an international conference, "Systematics, cybernetics and

informatics — Advances in information technology in 21st century," held on the premises of the Indian Institute of Information Technology, Gachi Bowli.

The conference was organised by the International School for Information Technology, a wing of the National Institute of Research and Social Action.

To realise the State government's vision, the first challenge is to deliberate on how to take communication and Information Technology to all citizens. The second, and an even more formidable challenge lies in preparing citizens, including those in rural areas, to recognise and grab these opportu-

nities faster than people in other parts of the world.

"As part of the Vision 2020 document, the State government aims to transform Andhra Pradesh into a knowledge society. For this, the State government has catalysed the creation of world class infrastructure starting with the Hitec City with companies like Microsoft and Oracle setting up development centres," he said.

Louisiana State University computer science department chairman and professor S S Iyengar, Planning Commission former member D Swaminadhan and IT specialists from all over the country participated.

*Deccan Chronicle, Hyderabad, December 18<sup>th</sup> –2000*

## Elected Fellow of ACM

● Prof S S Iyengar, Chairman, Department of Computer Science, Louisiana State University, has been elected Fellow of the Association of Computing Machinery (ACM). Prof Iyengar who holds Master's Degree from Indian Institute of Science, Bangalore, was recognised for his fundamental research in algorithms and data structures in parallel computing, image processing and sensor fusion.



He will be inducted into the Association at the University of Toronto's Hart House in Canada on April 27, 2002. The ACM, the first society in computing, was founded in 1947, has branches in 100 countries and a worldwide membership of 80,000.

*Deccan Herald – December 14<sup>th</sup> 2001*



## B'lore varsity plans credit system for PG courses

DH News Service  
BANGALORE, Jan 7

Bangalore University will be introducing the semester scheme of examination with a "choice-based credit system" for all post-graduate courses from this academic year. Besides, the students will also have to mandatorily opt for an unrelated subject as an elective paper every semester.

BU Vice-chancellor Dr K Siddappa told reporters here that under the new scheme, all post-graduate students seeking admission for the academic year 2002-03 will have to appear for the semester scheme and will be evaluated by the credit system. Besides, the students will have to opt for an "unrelated subject" as an elective other than his or her chosen field of study every semester.

Explaining the concept by providing an example, Dr Siddappa said a physics PG student will have the option of studying environmental science as a subject for one semester, similarly a political science student can opt to study sericulture. "The options are not restricted. The student can choose the topic of his liking and interest. This is to bring out the innate talent of the student in other subjects besides his field of study. The scheme will not only usher in flexibility in course selection, but will also provide a wider base of employment opportunities," Dr Siddappa said.

Under the credit system of evaluation, the student will have to secure a minimum number of credits in each subject and the semester as a whole for securing admission to the next semester. The Board of Studies in each department are working out the modalities of the scheme and is likely to be completed soon, he said.

Dr Siddappa said the proposed autonomous institutions of Physics and Biotechnology at the university campus will come up soon. Under the auspices of these institutions, five-year integrated MSc courses and BSc (Hons) courses will be started from the next academic year.

ALUMNI: Meanwhile, a host of Bangalore University alumni who have made their mark in the software sector around the world have made a commitment to help out students here by providing them financial, technical and moral support to meet their aspirations and ambitions.

The alumni, most of them from the US, have decided to form a committee which will be headed by the co-founder of Exodus Communications B V Jagadish. "They will not only be providing financial support but also using their good offices to provide moral and technical support for the students", Dr Siddappa said.

Two well known alumni of Bangalore, Prof S S Iyengar, distinguished professor of information technology, Louisiana State University, USA and Dr H Siddalingaiah, former senior scientist, NASA, who were present at today's press conference said they will contribute their mite for the development of the university.

*Deccan Herald, June 28<sup>th</sup> 2002*

## Satish Dhawan professorship for Dr Iyengar

DH News Service

BANGALORE, June 28

Dr S S Iyengar, Professor and Chairman of the Department of Computer Science at Louisiana State University, USA has been awarded the prestigious Satish Dhawan chaired Professorship at the Indian Institute of Science, Bangalore.

This professorship was created

in honour of late Prof Satish Dhawan, who served as the director of the Indian Institute of Science and also as the chairman of Indian Space Research Organisation (ISRO).



Prof Iyengar has received a number of awards including the IEEE Computer Society Technical Achievement Award for outstanding contributions in algorithms and data structures. He has published over 13 books. Prof Iyengar has been on the Computer Science Accreditation Board for Association for Computing Machinery (ACM) and IEEE and was a member of the Information Technology Board established by the Karnataka Government, according to a press release.



**Dr S S  
Iyengar**

### FOR THE RECORD

⇒ The Indian Institute of Science's most prestigious 'Satish Dhawan Chaired Professorship' instituted in honour of Prof Satish Dhawan, former Director of IISc and Chairman of ISRO, has been conferred upon Dr S S Iyengar. Dr Iyengar is Chairman of the Department of Computer Science at the Louisiana State University, USA.

⇒ Prof Vijay Mahajan from the University of Texas at Austin has taken over as Dean of the Indian School of Business.

⇒ Sunil P Rasquinha has been elected President of the St Joseph's College of Business Administration Alumni Association at its recently-held Annual General Meeting. Aparna Naroatham is the Treasurer and Leetha Chacko has been elected Secretary for the year 2002-03.

*Indian Express –  
July 4<sup>th</sup>, 2002*



ABOVE: S. Sitharama lyengar, right, chairman of LSU's computer science department, and grad student Qishi Wu are working on software that makes sensors 'think' more intelligently.  
 LEFT: Until now, most sensor networks have been limited to military use, but with the size and cost of sensors shrinking, civilian applications are possible, said Rajgopal Kannan, assistant professor in the LSU computer science department.

Advocate staff photos by Arthur D. Lauck

*Tracking Terrorists- Advocate, May 19<sup>th</sup> 2002*

# Sensor-ing the distributing network

By Sofia Tipoo  
TIMES NEWS NETWORK

**Bangalore:** Dropping a few thousands of dainty bits that resemble miniature circuits into a contaminated river or lake can find the cause of pollution in that region.

Or, drill these minuscule pieces into hard water beds and you can find the presence of water.

Or airdrop those diminutive shining pieces into a forest and you can trace the path of a forest fire.

These hot little things in the world of computing are nothing but minute bits of wireless sensors that form a vital part of a distributed sensor network (DSN).

Currently a rapidly growing area of research and development, DSN is a set of geographically distributed intelligent sensors which are designed to collect measure-



S. Iyengar

ments from the environment. And, the data collected from each local sensor is processed into abstract sensor estimates.

Although sensors have been around for a while, the latest trend is getting them to operate in a dynamic environment and trace a pattern unseen and undetected by human senses.

Sensors fall into three main categories – acoustic, seismic or infrared. They can be mounted on buildings, could be portable ones, ground-based, disposable, underwater deployable or airborne sensors.

Says Dr Sitaram Iyengar, professor and chairman, Dept of Computer Science, Louisiana state university,

who has been working in the DSN field for over 15 years, "The millions of signals that come out of these independent sensors are transmitted through a communication network and integrated with the information gathered from other parts of the network."

The applications would typically be in areas like target location (underground mines, real time tracking (satellite sending signals), surveillance and monitoring (for forest fires).

After the 9/11 attack, more millions of dollars are being pumped in R&D in this area. For instance, the research being done in the Louisiana State University is supported in part by Defence Advanced Research projects Agency (DARPA) and by the Office of the Naval Research as well as Ballistic Missile Defence Organisation and

the Engineering Research Program of the US Dept of Energy.

According to Iyengar, one of the main advantages of the distributed computing paradigm is that it adds a new dimension of robustness and reliability to computing.

"One of the examples for a large scale distributed computing system is a wireless sensor networks which would typically consist of millions of devices sending out various kinds of signals," he added.

The major challenge in these networks is the requirement of unattended operation in uncertain, dynamic environment. "Wireless sensor networks are often unattended, autonomous systems with very little battery life.

The low-end individual nodes have limited reliability

too. In such conditions, self organising, energy efficient, fault tolerant algorithms are required for network operations," Iyengar explained.

These sensors are intelligent and even if some fail, it does not effect the transmission because the others are able to find themselves and talk to each other and pass on the information to the network.

Iyengar is currently working along with another professor Dr Srikumar, on a book that would contain all the sensor networks of the world.

This would contain enormous amount of classified work critical for real time operation.

From being tiny, dormant pieces, wireless sensors are now scaling to new heights and innovative applications in the high performance world of computing.

Times New Network, Tuesday December 24, 2002

Tuesday, March 4, 2003

The Times of India, Bangalore



## Award for professor

TIMES NEWS NETWORK

**Bangalore:** The Council of the Indian Institute of Science and the Indian Institute of Science Alumni Association on Monday gave the 'Distinguished Alumnus Award', 2001, to Prof S. Sitharama Iyengar of the Department of Computer Science, Louisiana State University, USA, and currently Satish Dhawan professor of IISc.

The award was presented on the birth anniversary of the Institute's founder Jamsetji N.Tata.

Prof Iyengar has made contributions in computa-

Indian Institute of Science Director Prof. Govardhan Mehta presents the 'Distinguished Alumnus Award' for 2001 to Prof. S. Sitharama Iyengar, Department of Computer Science, Louisiana State University, USA, in Bangalore on Monday.

tional science. His discoveries on high performance algorithms and various applications have been acclaimed.

His paper, 'Virtual Quad-trees' solved an important problem of image representation; his work on 'Balancing Algorithm' has also become a benchmark for evaluating other algorithms in time and space complexity.

Earlier in the day, Prof. Govardhan Mehta led staff and students in paying tributes to the founder. The Tata Memorial Sports Club and students forum 'Prastutha' also conducted a science quiz for students.

The Times of India, Bengaluru, Tuesday, March 4, 2003

# Experts see better plan to revive ITIs

TEAM TOI July 9, 2004

The revival of industrial training institutes (ITIs) across the country is expected to improve the productivity of the unorganised sector, hence increasing the per capita income.

Finance minister P. Chidambaram's announcement to reorient 500 ITIs over the next five years has been welcomed by the department of employment and training in the state, which runs 104 government ITIs.

"Not only is it essential to add ITIs, the existing ones need to be overhauled. There is a serious shortfall in the allocation of funds for running these institutes in the state. Additional funding from the Centre is necessary to make them more efficient," Lakshmi, assistant director, employment and training, said. This year, against the required amount of Rs 30 crore, the state government released only Rs 12.96 crore.

Prof. U.R. Rao, former chairman, Indian Space Research Organisation (ISRO), who also headed the technical education committee on behalf of the AICTE, said: "Reorientation of ITIs is extremely important. The total workforce in the country is around 40 crore and about 93 per cent of them are in the unorganised sector. Most of them do not have ade-

quate training, which leads to under-productivity. The unorganised sector contributes around half of the GDP and the remaining half comes from just 7% of the organised sector. People can now get trained or re-trained at ITIs, which in the long run helps improve per capita income. Infrastructure at these institutes will also have to be modernised."

Visiting Dhawan professor at Indian Institute of Science and computer scientist at Louisiana State University, USA, Iyengar said: "The existing potential of ITIs have not been fully harnessed. Though a large number of students are acquiring training in these institutes, they have not been able to offer quality training."

However, S. Sadagopan, director, Indian Institute of Information Technology, passed the buck to the government.

"Traditionally, ITIs contributed a lot to manufacturing sector. They can contribute more provided the manufacturing industries are allowed to grow. The government has virtually killed industrial sector through the Inspector Raj. India can be a manufacturing powerhouse, provided government allows the sector to flourish," he said.

## Best research paper award

Prof SS Iyengar, an eminent computer scientist at Louisiana State University, USA and Visiting Dhawan Professor at the Indian Institute of Science, and his research group members were presented with the "Best research paper award" at the 18th international conference on Advanced Information Networking and Applications held in Tokyo in March this year.

## Research award

Noted computer scientist Prof Sitarama Iyengar along with his research group Prof Duresi, Prof Kannan and Parachuri have been awarded the best



Research Paper Award at the 18th International Conference on Advanced Information Networking and Applications held in Tokyo during March. Iyengar is presently working at Louisiana State University, USA, and is also a visiting Dhawan professor at the Indian Institute of Science.

## Award for an Indian scientist

**A team of Indian scientists have been given the 'Best Research Paper Award' for their work on the attack-originating Autonomous System.**

At the 18th International Conference on Advanced Information Networking and Applications (AINA-2004) held in Tokyo, Japan in March 2004, Professor Iyengar, an eminent computer scientist at Louisiana State University, USA and Visiting Dhawan Professor at the Indian Institute of Science and his research group, Prof. Durresi, Prof. Kannan and Mr. Parachuri were awarded the Best Research Paper Award, for presenting new ideas.

Their work presents lightweight schemes for tracing back to the attack-originating Autonomous System (AS) instead to the exact origin itself.

Once the attack-originating AS is determined, all further routers in the path to the attacker are within that AS and under the control of a single entity; which can presumably monitor local traffic in a more direct way than a generalised, Internet scale-Packet marking scheme can. Distributed denial-of-service (DDOS) attacks pose an immense threat to the internet, and consequently many defence mechanisms have been proposed to combat them. The highlights of this work are:

- If a victim is able to determine the path of the attacking packets in near real-time, it would be much easier to quickly stop the attack and facilitate the identification of the attacker. Even finding out partial path information would be useful because attacks could be throttled at far routers.

- All of earlier studies have aimed at identifying the exact origin of the attacks and for this purpose, they require that every router in the Internet to participate in the trace-

back algorithm. The team believes that that this requirement might not be realistic. For technical and political reasons or due to lack of clear incentives, many routers might not participate in the traceback mechanisms. Thus, the algorithms proposed so far either fail completely in identifying the origin or provide an approximate location of the origin.

- In this work, a new technique to the traceback problem that addresses the needs of both victims and network operators has been discovered. The solution is to probabilistically mark packets with AS numbers rather than with IP addresses.

Once the attack-originating AS is determined, all further routers in the path to the attacker are within that AS and under the control of a single entity; which can presumably monitor local traffic in a more direct way than a generalised, Internet scale. Packet marking scheme can.

- The work also presents a lightweight algorithm to mitigate the problem of compromised routers. This prevents compromised routers from changing the contents of a packet and forging the marking of uncompromised routers.

Dr Iyengar has been awarded most recently prestigious 'Distinguished Alumni Award' for the year 2003 at the Indian Institute of Science, Bangalore. Prof. Iyengar worked at Oak Ridge National Laboratory and Jet Propulsion Laboratory at California Institute of Technology and has been an eminent Computer Scientist for 35 years in USA.

He has won more than 100 research Awards and many of his ideas have won best Paper Awards in US and International Conferences including the prestigious IEEE Computer Society Technical Award for outstanding contribution in Algorithms and Data Structures from the President of the Society.

DH Photo: Srikanta Sharma R

Millions of nodes, small as dust effectively doing a job that thousands of humans would not have been able to do. That's the power of wireless sensor network.

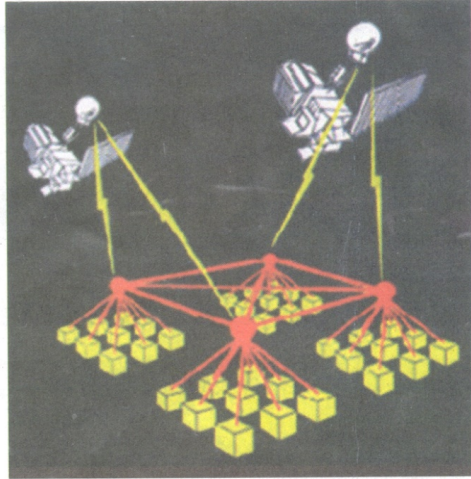
There is information that the city lake has been poisoned with a very toxic chemical. Is the information true? If so, what is the chemical used? What are its dangers? The 'army' is deployed to check out the situation. Constituting a million and odd foot soldiers, all in touch with each other and the commander, they spread out over the lake in a matter of a few minutes and get into action as quickly. Soon information is pouring into the headquarters. What is the extent of damage? What can be done? And so on. All within a matter of a few minutes.

Lives are saved by timely action of the army. But the 'army' is lost in the process. But never mind, another such situation and there is another 'army' waiting to get into the act.

The 'army' we are talking here is the wireless sensor network, comprising a million and more tiny sensor nodes working in unison to achieve a single task. This is no future scenario. They are already here, working invisibly and furiously in unfriendly terrains, doing work as varied as enemy surveillance, erosion studies, bird migration patterns, etc. But there are many challenges in the field that pose interesting research subjects for scientists.

In the words of Prof S S Iyengar, one of the pioneers in the field, sensor technology is among the ten top emerging technologies today. "In your office right now, you see lights and switches. Those would be wirelessly networked. You see smoke detectors and heat detectors. Those would be networked. These are all existing infrastructure. So the idea of networking is already there. But now things that are not currently part of any kind of network will also be networked."

Prof Iyengar, an eminent computer scientist at the Louisiana State university, was last year awarded the prestigious Distinguished Alumni Award at the Indian Institute of Science and is a visiting Satish Dhawan fellow, something which sees him back in his country every summer



Tiny nodes are vital links in a sensor network.

travelling extensively, giving lectures.

The professor and his team at LSU have been among the first people to think of novel ideas in sensor networking and continue to work on these.

What exactly is a sensor network? This can be viewed as a distributed autonomous system for information gathering, performing data-intensive tasks. Essentially the elements of the network are a sink that sends queries and collects data from the sensors, which monitors phenomenon and reports to the sink. The sensor nodes rely on wireless channels for transmitting and receiving data from other nodes.

The nodes in turn are battery powered, equipped with integrated sensors that sense variations in pressure, radiation, motion, temperature, seismic activity, audio, video, etc. They have data processing capabilities which means they have a small computer inside. To communicate, they use short-range radio waves. The tiny nodes are equipped with substantial processing capabilities, enabling them to combine and compress their original data.

The sensor network is an embedded (independent) system having the following properties: it has no fixed topology. The nodes connect and reconnect in a random manner according to the situation. It can self-configure without any human intervention. When some nodes go out of power, some

others get connected without requiring a total reconfiguration of the system. The network is also able to scale up after testing on a small number of nodes.

A typical sensor node consists of the sensing elements, battery (AA sized battery), processor (less than 20 MHz), memory (less than 1MB), communicating equipment made up of a transmitter and receiver.

The processor used in the sensor node performs several important functions like memory management, maintenance, turning off communication equipment when not in use to save power (this is done by reducing voltage when load is low and even by reducing frequency of operation).

As to the software requirements, main among these are an open sourced software which is simple in design, has efficient memory utilisation, works on a robust, low power operating system, etc.

The battery clearly forms the heart of the sensor system as it decides the lifetime of the system. While the battery has to be small enough to fit into the node, it also has to be very energy efficient. Batteries with energy scavenging capabilities are being designed to increase the lifetime of the sensor system, says Prof Iyengar. For instance, at a time 30-40 percent of the nodes are not working. Hence sensors are assigned duty cycles so that only a few of them are operating at

# Bandit can be nabbed in 2 days!

## US-made sensors could be the nemesis for brigand

By K.R. Sreenivas/TNN

**Bangalore:** Imagine tracking down elusive bandit Veerappan in just two days. For the Special Task Force and the governments of Karnataka and Tamil Nadu, this could be a dream come true.

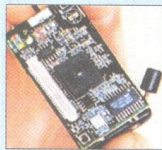
The sensor network — developed by the Louisiana State University with contributions from the Indian Institute of Science, Bangalore — can track down any person in any part of the world, even if he is hiding in dense forests or in harsh environments.

“Yes, it is possible,” said S.S. Iyengar, who has been involved in the project and is currently at the IISc, Bangalore, as a Satish Dhawan Chair professor. He told *Sunday Times of India* that he can help the government in the project though tracking of Veerappan has to be done through the STF, the ISRO or the ministry of defence. It is not expensive. It involves only buying the sensor nodes and then one must have a good strategic plan. “It will take just two days to track Veerappan down,” he claims.

Manufactured by some top American companies, the sensor network can be used to trace movements in unstructured terrains like those in Afghanistan or Iraq.

Roy Paul Daniels, professor and

### A PEEKABOO INTO ITS WORKING



- It's a small battery-powered monitoring device with intelligent nodes.
- It helped US soldiers track down Saddam Hussein.
- Each sensor costs \$60-\$70, and STF may need 10,000 sensors.
- It has features of self-configuration, self-healing, dynamic routing and multi-hop.

chairman of the Department of Computer Science, Louisiana State University, and Iyengar said the US had already adopted the sensor network for some classified operations.

The sensors have to be imported from Crossbow Technologies Inc, San Francisco, or other companies in the US. Each sensor device will cost about \$60 to \$70. The STF operation may require about 10,000 sensor devices. Each sensor can cover 100 feet.

For tracking Veerappan, different types of sensing devices will have to be air-dropped at different places in the forest area where he operates. The moment some movements can be identified on the terrain, the STF should put focused sensors. There are also portable

sensors, which the STF policemen could carry with them. US soldiers wore the sensors embedded in their coats in the Iraq war, helping them track down Saddam Hussein.

“We use distributed localised algorithms that achieve a global goal by communicating with nodes in neighbourhoods,” Iyengar said.

Once the nodes are deployed, it will start sensing, signalling and start collecting the data. “It then communicates from one node to the other in the entire network and pass on information to the base station.

This integrated information is then fed to the Internet and passed on to the authorities for appropriate action.

● **TO THE POINT:** Will the veil come off the prolonged ransom mystery? page 5

a given time and the rest of them are kept in the sleep mode which consumes less power. This constitutes a subject of much ongoing research.

It has been recognised that energy savings can be retained by pushing computation within the network to the form of local algorithms at the nodes.

At the nodes, the algorithm checks the energy difference between each node and its neighbour. Where this is too high, the node is replaced!

“Also there is a lot of garbage information that the nodes pick up requiring programmes to filter all that junk. As we have seen sensing, computing, communication all of this uses energy. So we need data mining algorithms to conserve energy,” points out Prof Iyengar.

Nodes are prone to failure due to harsh environment, battery failure, so developers need to build in some tolerance.

Iyengar's team has come up with the concept of a mobile agent where along with the information that moves from node to node, so does the programme. They used the genetic algorithm that borrows fundamentals from genetic crossing between parents. It sees to it that in a routing no node is repeated, the weak ones are eliminated and so on.

Security is another serious concern, especially for military and highly confidential applications. The sensor network should be resilient to capture which can result in jamming of the radio frequencies used, flooding with information and even virus attacks.

This calls for some amount of coding of the information.

Another key challenge is to determine a sensor field architecture that optimises cost, provides high coverage, has resilience to sensor failures, has appropriate communication/computation cost trade-offs. The nodes need to be able to locate themselves in various environments and on different distance scales. Sensor placement therefore is also important.

Wireless sensor networks requires a considerable amount of a priori knowledge about possible targets. A sensor is expected to yield a yes/no detection outcome in every case. Inherent uncertainty associated with sensor readings, sensor detection have to be modelled in while writing algorithms.

So it is clear that while this is an exciting field, hurdles are many, and that presents exciting challenges to bright minds. Prof Iyengar was particularly impressed with the number of young people at his talks in his home city and believes that even if he can inspire two young minds to become Ramanujams, his job will be done!

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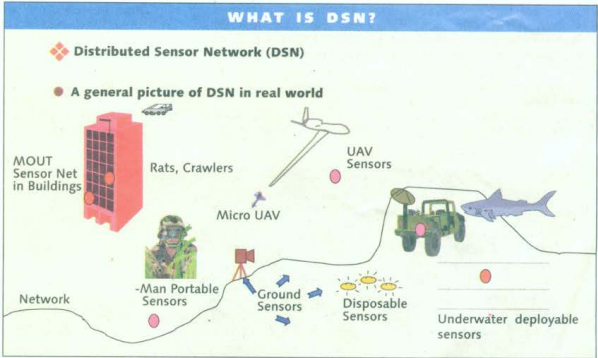
JAYALAKSHMI K

Prof S S Iyengar is a member of various academies worldwide.

He is a member of the Information Technology Board of the Karnataka government.

He has written many books and the latest is one titled 'Frontiers in distribution sensor network'.

He can be contacted at iyengar@bit.csc.lsu.edu



A graphic representation of a Digital Sensor Network.



# THE HINDU

INDIA'S NATIONAL NEWSPAPER SINCE 1878

**JAGAT SINGH INTERROGATED**  
PAGE 12

**COLOMBO FOR PEACE TALKS**  
PAGE 16

**AKMAL STARS IN PAK'S VICTORY**  
MAIN SPORTS PAGE

Printed at Chennai, Coimbatore, Bangalore, Hyderabad, Madurai, Delhi, Visakhapatnam, Thiruvananthapuram, Kochi, Vijayawada, Mangalore and Trichirapalli

## KARNATAKA 5

### National College diamond jubilee today

S. Rajendran

**BANGALORE:** The National College, Basavanagudi, one of the oldest and well-known educational institutions of the city, will celebrate its diamond jubilee on Friday. To mark the occasion, it plans to start a new combination of science and arts undergraduate courses for the first time in the country.

Governor T.N. Chaturvedi will inaugurate the celebrations on Friday. The college itself was started in 1945 to mark the silver jubilee of the National High School which was founded in 1917 by Annie Besant.

National Education Society President A.K. Rama Rao told *The Hindu* here on Thursday that the autonomous status granted to the college has come in handy to chalk out a new methodology in imparting education. Consultations have begun with national and international experts to frame new syllabi.

The National Education Society runs a chain of institutions, including the National Colleges at Sravanabelagola and Mysuru and the National High School.

Dr. Rama Rao said plans were afoot to start degree courses with subject combinations of Physics, Computer Science and Mathematics, Physics, Mathematics and Electronics, Physics, Chemistry and Mathematics, and Mathematics, Electronics and Computer Science. Computer Science and Mathematics were also a subject of study in the erstwhile. Nanotechnology as a subject will be introduced at the undergraduate level. Japan has introduced Nanotechnology as a subject of study at the primary school level in the country.



**LEARNING TALENT:** P. Balaram, Director, IISc (left) and Mayor Munira Begum greeting the attendees at the International Conference on Intelligent Sensing and Information Processing in Bangalore on Thursday. — ENJOICE K. GUHATHATHAN

### 'Networked sensor devices can warn of disasters'

It may be used for traffic control and urban planning, says Mayor

Special Correspondent

**BANGALORE:** Mayor Munira Begum on Thursday inaugurated the third International Conference on Intelligent Sensing and Information Processing, organised by Institute of Electronic and Electrical Engineers, Defence and Research Development Organisation and University of Melbourne.

Networked sensor devices can help cities such as Bangalore get adequate warning of natural disasters such as the heavy rainfall in October, pinpoint the worst-affected areas and rush help on time, she said. As the technology becomes more easily available, it may become possible to use it for traffic control and urban planning, she said.

Director of Indian Institute of Science (IISc) P. Balaram said research relating to intelligent sensors and their networking is already under way at the IISc and a centre dedicated to the field is to be set up.

#### Collaboration

Research in the subject will continue with collaborations from overseas institutions and Government agencies, he said.

M. Palaniswamy of Melbourne University explained the scope of the conference, which is focused on a fast developing and futuristic technology.

B.N. Thyagaraja and M. Chowdagarwala of the Institution of Engineers (India) - Karnataka Chapter addressed the inaugural session.

The three-day conference will conclude on Saturday.

### 'Remote sensors can help detect tsunami'

Special Correspondent

**BANGALORE:** Remote sensors can help in early detection and warning of tsunami of the kind that struck India last year.

S.S. Iyengar of the Louisiana State University at the third International Conference on Intelligent Sensing and Information Processing, which began here on Thursday.

Iyengar, who is also a Senior Distinguished Professor at the Indian Institute of Science, Bangalore, said the many practical applications of networked sensors have evolved inherent in finding trained personnel by some organisations in the U.S.

"Remote intelligent sensors that can be networked are tiny devices, the largest the size of a FDA. Commercial use can include smart ID cards, radiation chip for cell phones and other devices, which can be miniaturised. The Araval Purva can possibly use it for border monitoring, tracking targets and during actual combat.

With terrorist threat affecting critical installations, they can also be used for surveillance of harbours and airfields, Dr. Iyengar said. Civilian applications can include instances of urban planning from its extended neighbourhoods.

Networked sensors have to move two modes—gathering and delivery of data—and will eventually move from being interceptable to being uninterceptable, he said.



# Third International Conference on Intelligent Sensing and Information Processing

14-17 December 2005, Bangalore, India  
URL: [www.icisip.org](http://www.icisip.org)

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Vibha Lakshmikanth, BIT

## Call for Participation

After two successful conferences (ICISIP 04 and ICISIP 05) the organizing committee has decided to hold the third International Conference on Intelligent Sensing and Information Processing in Bangalore during 14-17 of December 2005 at Hotel Le Meridien, Bangalore.

This interdisciplinary conference, co-sponsored by University of Melbourne, integrates several advanced research themes such as intelligent sensing and adaptive learning with a view towards solving problems in smart systems. The conference will provide an international forum for researchers and academicians in the fields of Intelligent Sensors, Sensor Fusion, Neural Networks, Support Vector Machines, Fuzzy Systems, Evolutionary Computers, Biometrics, Bioinformatics, Biomedical, Radar Signal Processing and Intelligent Multimedia Processing. The conference committee encourages the international community interested in this field to submit original papers. The options for participation range between contributing a paper, presenting a tutorial and exhibit a new technology.

## Invited Speakers

**Dr. Sivathanu Pillai**, Distinguished Scientist, Chief Controller, Research and Development, DRDO, Ministry of Defence, New Delhi and Chief Executive Officer, BrahMos Aerospace, New Delhi  
**Prof. Vittal S Rao**, Program Director, NSF, USA

**Prof. P R Kumar**, Franklin W. Woeltge Professor, Department of Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, USA

**Prof. Rammanoharao Kotagiri**, Chairman, Department of Computer Science, University of Melbourne, Australia

**Prof. Susha Venkatesh**, Cochin University, Australia

**Prof. S S Iyengar**, Chairman, Department of Computer Science, Louisiana State University, USA

**Prof. Anil Thakoor**, Supervisor, Bio-inspired Technologies and Systems Group, Jet Propulsion Laboratory, California Institute of Technology

## Tutorials

**Sensor Networks- Dr. Rajgopal Kannan, LSU, USA**

**Pervasive Computing and Communications - Prof. Mohan Kumar, University of Texas-Arlington, USA**

**Cryptography - Dr. Madhusudhana, Novell, India and Dr. Udaya Parampalli, UniMelb, Melbourne, Australia**

Full Conference Registration		Early Bird Registration (Till November 15th 2005)	Onsite Registration (After November 15th 2005)
		Academic Staff	Rs. 2500
	Students	Rs. 1000	Rs. 1500
	Others (R&D, Industry)	Rs. 4500	Rs. 5000
Tutorial	Academic Staff	Rs. 500	Rs. 750
	Students	Rs. 300	Rs. 400
	Others (R&D, Industry)	Rs. 750	Rs. 1000
Extra Conference Proceedings: Rs. 600.			

## Organized by





PUBLISHED FROM: BANGALORE, CHITRADURGA, GANAKAVATI, GUBBERGA, HASSAN, HUBLI-DARWAD, MANGALORE, MYSORE, SHIMOGA

A vendor arranges Allahabad's famous red guava in a roadside shop



A soldier performs a daredevil stunt during an army show in Kolkata



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FRIDAY, DECEMBER 16, 2005

VOL. 3 ISSUE 306 PAGES 16+4+4 BANGALORE



Mayor Mumtaz Begum at the Third International Conference on 'Intelligent Sensing and Information Processing' in Bangalore on Thursday. VI Photo

## IISc plans research unit for wireless sensor networking

VIJAY TIMES NEWS

**Bangalore:** The Indian Institute of Science (IISc) is planning to set up a centre of excellence to conduct research in the nascent field of wireless sensor networking, applications of which would revolutionise science in the years to come.

This is aimed at exploiting an emerging multi-crore industry of intelligent sensing in nanotechnology, information technology, biotechnology, and communication technology.

N Balakrishnan, Chairman, Information Science Division, IISc, said though the plans are in the initial stages and "a lot of time would be taken to make it a reality" the effort was being supported by S S Iyengar, Roy Paul Daniels Chaired Professor and chairman, Computer Science Division, Louisiana University, USA, considered an authority in this area of technology.

Plans entail setting up the centre with IISc's own funding. But the main concern is to ensure that we have a definitive India-centric programme. "Indianising the programme would take some time," he said.

Iyengar, in his presentation on 'Futuristic distribution networks' at the international conference on intelligent sensing and information processing, said the industry in USA was already aggressively pursuing development and commercial applications of sensing technologies.

He said the commercial applications in USA included personal appliances, buildings, highways, personnel identi-

### FEW APPLICATIONS

- ▶ Cleaning up arteries to eliminate by-pass surgeries in future
- ▶ Retinal sensor implants to restore normal vision among the partially or totally blind
- ▶ Drug delivery systems that would phase injections out
- ▶ Sensors monitoring glucose levels in blood
- ▶ Low cost nano-computers that could be carried in pockets

### What is a sensor?

A typical sensor is a rectangular node less than half an inch in length. It consists of:

- Sensing elements
- Battery
- Processor (less than 20 MHz)
- Memory (less than 1MB)
- Transmitter and receiver as communication equipment.

Sensors can be sprayed over a area, allowing them to monitor and relay data back to base.

fication, global climate monitoring, agriculture and livestock, entertainment, aviation, natural disaster warning and security.



PUBLISHED FROM BANGALORE BANGALORE MYSORE MANGALORE HASSAN HUBLI-DHARWAD GULBARGA GANAKOT CHITTAURGA BANGALORE



**Spin bowler Anil Kumble received a memento on the occasion of his 100th Test at Ahmedabad on Sunday. India ended the first day of the third Test against Sri Lanka at 247 for 6.** **Report, P 14**



**Veteran Bollywood star Dev Anand inaugurating an AIDS awareness rally in Hyderabad on Sunday**



**Bill, Melinda Gates and rock star Bono were named 'Persons of the Year' by Time magazine for their charitable work on Sunday** **Report, P 10**

www.vijaytimes.com

MONDAY, DECEMBER 19, 2005

BANGALORE

VOL. 3 ISSUE 308 PAGES 16+4+4+4

## Indian scientist develops smart sensor to boost agriculture

NIRAD MUDUR

**Bangalore:** In a few months, growing crops may require minimum manual monitoring by farmers. An Indian Scientist in USA is developing an artificial intelligence-based expert system using a smart sensor wireless network to increase crop quality and productivity.

**S S Iyengar**

The system, being developed by S S Iyengar, Chairman, Computer Science dept, Louisiana State University, USA, will be shortly field tested on a land in Hessarghatta and in Madurai. It is expected to minimise or completely eliminate the need for pesticides.

Iyengar, who is also Satish Dhawan Professor of ISRO Chair at IISc, told Vijay Times that the sensors embedded in the soil where the crop is grown would relay relevant information in real time to the farmer monitoring crop health from his house using a computer.

The low-cost sensors would be placed at regular intervals in the field to enable them to monitor soil condition, salinity, moisture, temperature, and crop condition, besides alerting the farmer about presence of diseases.

The system would help farmers take immediate corrective action in case sensors detect any disease, thus preventing spread of infection to the entire crop.

The soil embedded artificial intelligence-based system will work in a wireless mode, with each sensor independently relaying the information from time to time, or network with other sensors to provide a complete picture of the entire crop being grown on the field, said Iyengar, who is internationally acclaimed as a pioneer



### SENSOR TIPS

- ▶ System to eliminate need for pesticides
- ▶ Farmer can monitor crop health from house
- ▶ Low-cost sensors to be placed at regular intervals
- ▶ System to help farmers take corrective measures

in the field of sensor networks.


He explained that a typical sensor would be a rectangular node less than half an inch in length, and each would have sensing elements, a battery, a processor (less than 20 MHz), memory (less than 1MB), and transmitter and receiver as communication equipment to relay and take command from the farmer at the base monitoring station.

Iyengar hit upon the idea of applying this technology to agriculture in Louisiana when the sensors successfully detected chemical presence in solutions.

He is presently in the country to spread awareness on the merits of the use of sensors in agriculture.

## Sensor networks centre likely in IISc

**DH News Service** BANGALORE Indian Institute of Science, Bangalore, may house a centre to replace the area of sensor networks in the near future, said Prof P Balaram, Director IISc, on Thursday. Giving the presidential address at the third International Conference on Intelligent Sensing and Information Processing, jointly organised by the University of Melbourne and Institute of Engineers, Karastaba State Centre, he said that work on this technology that is shaping the future of human kind and having an impact on the quality of life, needed to be furthered in India. The main objective is to open this technology and provide opportunities in the areas of environment, security and health at an affordable cost across the nation. Prof Vittal Rao, Programme Director, National Science Foundation, USA, who spoke on the 'Role of Sensor Networks in Cyber Infrastructure Systems' said that there needed to be an interdisciplinary system between the major research topics of Information Technology, Nano Technology and Bio technology. As many as 35 research papers will be submitted.



**INDIAN INSTITUTE OF SCIENCE**  
BANGALORE - 560 012 (INDIA)

Prof. Goverdhan Mehta, FNA, FASc  
Director

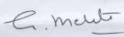
R(IA)007(AA)/2002- 4-069  
13 November 2002

Dear Prof. Iyengar,

I am glad to inform you that it has been decided to confer on you the 'Distinguished Alumnus Award' of the Institute for the year 2001. I am personally delighted that you will join the distinguished company of the earlier recipients of this award.

The award shall be made during the Founder's Day Celebrations on 3<sup>rd</sup> March 2003. The time and venue of the presentation of the distinguished award will be intimated to you in due course. I shall appreciate your making it convenient to be present on that day to receive the award in person.

With kind regards,

Yours sincerely,  


✓ Prof. S S Iyengar  
Professor and Chairman of the Dept. of Computer Science  
Director, Robotics Research Laboratory  
Coates Hall, Room # 298  
Department of Computer Science  
Louisiana State University  
Baton Rouge, Louisiana 70803 - 4020, USA

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July 15, 2004

Prof. S. S. Iyengar,  
Satish Dhawan Professor,  
Indian Institute of Science,  
Supercomputer Education & Research Centre,  
Bangalore – 560 012.

Dear Prof. Iyengar,

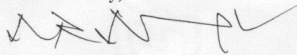
It was a pleasure to receive your letter. I do remember meeting you with Vasu.

Thank you very much for connecting me with Dr. Raymond T. Yeh. I will be happy to talk to him.

I will be out of country till July 25<sup>th</sup> and will be in town for a couple of days on July 26<sup>th</sup> and 27<sup>th</sup>. Please do visit us. It will be a pleasure to meet you.

Best regards.

Yours sincerely,



N. R. Narayana Murthy  
Chairman of the Board



*Receiving Award from the Vice Chancellor of  
Bengaluru University*



*Professor Mehtha, Director of the IISc awarding the Medal during the  
felicitaton Process, March 3rd 2003*



*Professor Mehtha along with Professor Swamy IIT Madras Director awarding the certificate, March 3rd 2003*



*Award Ceremony in the Faculty Senate Hall on March 3rd 2003.*





ALUMNI ASSOCIATION

## INDIAN INSTITUTE OF SCIENCE ALUMNI ASSOCIATION BANGALORE

The Council of the Indian Institute of Science and the Indian Institute of Science Alumni Association take great pleasure in conferring the "Distinguished Alumnus Award" for the year 2001 on Professor S. Sitharama Iyengar, Department of Computer Science, Louisiana State University, USA, and currently Satish Dhawan Professor at the Indian Institute of Science, Bangalore.

Born on 26 August 1947, Sri Iyengar obtained his Bachelors degree from the University College of Engineering, Bangalore, in 1968, Master's degree in Engineering from the Indian Institute of Science, Bangalore, in 1970, and Ph.D from the Mississippi State University, USA in 1974.

Prof. Iyengar has made pioneering contributions in Computational Science. He developed data structure techniques for image processing and modeling systems, developed efficient computational techniques and image processing and made fundamental contributions in distributed sensor networks. He initiated, developed and enriched several important lines of research on the theory of data structure for various applications.

His paper titled "Virtual Quadrees" solved an important problem of image representation. He discovered a forest based representation thereby creating a new area of research, which became a topic of research at a number of Universities. Prof. Iyengar discovered a new data structure called Translation Invariant Data Structure for storing 2D/3D images. Based on these eminent discoveries, he was invited to edit a special issue in the area of image databases for IEEE Transaction on Software Engineering, which laid the foundation for research in the area of Computational Sciences. His work on Balancing Algorithm has also become a benchmark for evaluating other algorithms in time and space complexity.

At a time when the use of highly parallel computers became a need to solve many computationally intensive problems, he discovered NC algorithms for recognizing Chordal Graphs and K trees. This breakthrough result led to the extension of designing fast parallel algorithms by researchers around the World. Prof. Iyengar's work strongly influenced the community in Computational Science to focus on parallel algorithms for various computational problems.

Prof. Iyengar focused attention on investigating the difficult problem of multidimensional sensor fusion and several techniques to generalize and exploit principles of invariance in representation and computation. In a series of papers extending over several years, Prof. Iyengar showed how robust multi-sensor fusion algorithms can handle imperfect inputs. These investigations led to the most widely used text books in the areas of multi-sensor fusion with

Discoveries of Prof. Iyengar on high performance algorithms and various applications have been highly acclaimed by the international scientific community and he has been invited to give lectures/plenary talks at various institutions and scientific meetings. He has received a number of awards including the IEEE Technical Field Award for contributions in Algorithms and Data Structures. He has published over 350 research papers in IEEE, ACM and other journals and refereed Proceedings. His best results are in the area of Distributed Sensor Networks, Data Mining and Networking Techniques. He has published/edited over 13 books, which have been used in many well-known Universities. Over 32 Ph.D. students have graduated under his supervision. His research is funded by NASA, ONR, DARPA, DOE, and NSF etc and has secured over 8 million dollars in the last 10 years. He has been a visiting Professor in the University of Paris, the University of Bonn, and the Indian Institute of Science, Bangalore. He has been the Chairman for many National and International conferences. Professor Iyengar is a member of the New York Academy of Sciences, a Fellow of the Association for Computing Machinery (ACM), Fellow of the Institute of Electrical and Electronic Engineers (IEEE), Fellow of the American Association of Advancement of Science.

Prof. Iyengar has contributed richly to the scientific and human resource development in the area of Computational Science and also has made remarkable contributions in India in promoting Science and Technology in the form of INDO-US workshops and keynote lectures at various premier Institutions. Being a member of the Karnataka State Information Technology Programmes, Prof. Iyengar has been the main driving force behind the development of many computer science programme initiatives in India and other Asian countries. As the Chairman of the Department of Computer Science and being on the editorial board of many journals, he has promoted collaborative and interdisciplinary research in computational science with many industries.

Dr. Iyengar has contributed richly to the body of scientific knowledge in computational sciences. In conferring this Meritorious Award the Alumni Association is honoring itself that one of its members should have risen to the level of such distinction and achievements.

Prof. G. Mehta  
Director  
Indian Institute of Science

Prof. N. V. C. Swamy  
President  
Alumni Association  
Indian Institute of Science

Bangalore, 3 March 2003



DEPARTMENT OF AEROSPACE ENGINEERING



INDIAN INSTITUTE OF SCIENCE  
Bangalore-560012, India

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## AEROSPACE SEMINAR

TITLE : NEW APPLICATIONS OF DISTRIBUTED  
SENSOR NETWORKS

SPEAKER : Prof. S.S. Iyengar  
Roy Paul Daniels Professor and Chairman  
Department of Computer Science  
Louisiana State University, USA  
And  
Visiting Satish Dhawan Chaired Professor  
IISc, Bangalore-12, India

DATE & TIME : **Wednesday, July 14th 2004, Time: 4.00 pm**

VENUE : AE CONFERENCE HALL

**ALL ARE WELCOME**

CHAIRMAN

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**Abstract:**

Intelligent Sensor Processing , a rapidly emerging discipline in scientific and engineering research , aids researchers in developing systems that "see" and "comprehended " their environment using a new type of sensor networks developed by Iyengar and others over the last 10 years. The seminar focuses on the structure and behavior of complex systems used in various applications such as environmental monitoring, target tracking in various applications such as environmental monitoring, target tracking and profiling terrorists. This type of systems share many similar properties of ad-hoc wireless networks. Finally network analysis will be discussed as a next step forward by integrating information from various disciplines to provide insight that is not available from a traditional network.

Professor S.S. Iyengar is a Fellow of ACM, Fellow of IEEE, Fellow of AAAS, Member of European Academy of Science, Member of NY-Academy of Science, Fellow of Information Science and Technology etc. He has received the Distinguished Alumnus award from the Indian Institute of Science, and has authored 350 papers and 13 books in the areas of parallel algorithms, sensor fusion, wavelets for image processing, among others, published by John-Wiley, Prentice Hall, and the CRC Press. Professor Iyengar is also the winner of many IEEE Awards, and his research has been funded by, among others, the NSF, DARPA, ONR, NASA, the US Army Research Office, and DOE-ORNL. He has brought 10 million dollars of research funding from various federal agencies. Prof. Iyengar has served numerous panels for US National Science Foundation, National Research Council, DARPA, National Institute of Health in the area of medical informatics. He has been a visiting professor at University of Paris, University of Bonn etc. He has been a distinguished lecturer for SIAM, ACM, IEEE and NIH. He has conducted workshops in Boeing, Raytheon, JPL-Caltech etc.



**Supercomputer Education & Research Centre**  
**Indian Institute of Science**  
Bangalore 560 012

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**DISTRIBUTED SENSOR NETWORKS:  
EXPLORING BEYOND THE BOUNDARIES**

**Prof. S.S. Iyengar**

Roy Paul Daniels Professor and Chairman  
Department of Computer Science  
Louisiana State University, USA

And

Visiting Satish Dhawan Chaired Professor, IISc, Bangalore-12, India

July 12<sup>th</sup> 2004, SERC-Seminar Hall

Time: 4.00 pm

**Abstract:**

The most compelling computing technology advance of this decade is deploying wireless networks of heterogeneous smart sensor devices for complex information gathering tasks. The search for efficient, fault tolerant architectures for Distributed Sensor networks has become an important research area in computer science. This talk provides a systematic development of high performance computing solutions arising from the complexities of these systems.

**Professor S.S. Iyengar** is a Fellow of ACM, Fellow of IEEE, Fellow of AAAS, Member of European Academy of Science, Member of NY-Academy of Science, Fellow of Information Science and Technology etc. He has received the Distinguished Alumnus award from the Indian Institute of Science, and has authored 350 papers and 13 books in the areas of parallel algorithms, sensor fusion, wavelets for image processing, among others, published by John-Wiley, Prentice Hall, and the CRC Press. Professor Iyengar is also the winner of many IEEE Awards, and his research has been funded by, among others, the NSF, DARPA, ONR, NASA, the US Army Research Office, and DOE-ORNL. He has brought 10 million dollars of research funding from various federal agencies. Prof. Iyengar has served numerous panels for US National Science Foundation, National Research Council, DARPA, National Institute of Health in the area of medical informatics. He has been a visiting professor at University of Paris, University of Bonn etc. He has been a distinguished lecturer for SIAM, ACM, IEEE and NIH. He has conducted workshops in Boeing, Raytheon, JPL-Caltech etc.

**THE INSTITUTION OF ENGINEERS (INDIA)**  
Karnataka State Centre, Bangalore

Cordially invites you to attend a Lecture Meeting

On

**NEW APPLICATIONS OF DISTRIBUTED SENSOR NETWORKS -  
AN EMERGING TECHNOLOGY**

By

**Dr. S.S. IYENGAR**  
Chairman & Roy Paul Daniels Distinguished Professor  
Louisiana State University, USA

On

**SATURDAY, 17<sup>th</sup> JULY, 2004 AT 6.00 PM**

At the Institution of Engineers (India) premises  
No. 3, Dr B R Ambedkar Veedhi, Bangalore 560 001

**Er. K. N. SUBBA RAO**  
Chairman, IEE, Karnataka State Centre

Will Preside

**TEA : 5.30 P M**

B.N. Thyagaraja, FIE  
Honorary Secretary

Prof L.M. Patniak, FIE  
Convener, Computer Engg Divn.

**Synopsis**

Intelligent Sensor Processing, a rapidly emerging discipline in scientific and engineering research, aids researchers in developing systems that "see" and "comprehend" their environment using a new type of sensor networks developed by Iyengar and others over the last 10 years. This seminar introduces novel ideas of sensor networks for implementing real time systems that can handle imperfect inputs. The seminar focuses on the structures and behavior of complex systems used in various applications such as environmental monitoring, target tracking and profiling terrorists. This type of systems share many similar properties of ad-hoc wireless networks. Finally network analysis will be discussed as a next step forward by integrating information from various disciplines to provide insight that is not available from a traditional network.

PTO for Speaker's Bio-data



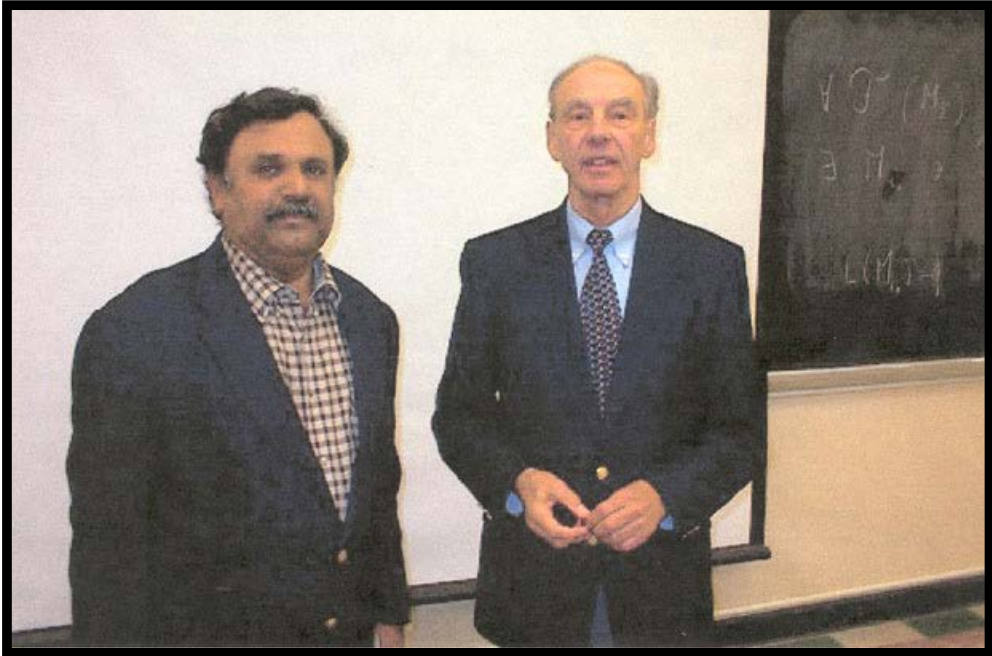
*Dr. Iyengar and his wife with Infosys Chairman Dr. N R Narayana Murthy during their visit to Bengaluru, Summer 2004*

*Invited Speaker at Infosys, Bengaluru,  
December 28, 2004, India.*



*With Professor C.V. Rama Moorthy from UC Berkeley and  
Dr. Doris Carver*

*With Professor Hartmanis (Turing Award Winner) from Cornell University during his visit to LSU—October 25<sup>th</sup> 2001*



*Professor C.N. R. Rao talking during the Chancellors Distinguished Lectureship series, February 25<sup>th</sup> 2002*

*With Professor Raj Reddy  
(Turing Award Winner)  
during his visit to LSU  
April, 25<sup>th</sup>, 2004*



*Deccan Herald - July 12, 2007*

## Work on cyber-centric sensor surveillance system on

**BANGALORE, INDIA:** Indian computer scientist Dr S S Iyengar working at the Louisiana State University and his colleagues at Louisiana Tech have been funded with \$3.6 million to create a cyber-centric sensor surveillance system in the US, which could then become a global system.

"This centre will be able to predict, detect and control anomalous behaviour in cyber space," said Dr Iyengar, talking to Deccan Herald. "We would basically be looking at a database collection, an intelligent database over ground, water and air, which is what we call cyberspace."

Beginning with rare event pattern identification



**Dr S S Iyengar**

to fabricating the right micro-sensors, computation, data placement as also sensor placement and sensor data fusion, this system will incorporate expertise from many fields. It could also play a big role in natural disaster warning and battlefield environments.

He went on to elaborate how such a system would be relevant in a present day scenario of spreading global terrorism. "We would be looking at people whose movements are suspicious and profiling them, tracking them. In the present Bangalore case itself, maybe if we had profiled these youth much earlier in the day, things would have been different."

This will be the first such integrated effort to have such a system in place, he said. More importantly, being a 'smart' system, it will help to take intelligent decisions. The prototype will be ready by next year, he added. Dr Iyengar is on the lookout for some Indian

computer scientists, who could be drawn into the work, as he sees it as crucial for India to have such a surveillance system in place.

Dr S S Iyengar was recently conferred a visiting professorship of Homi-Bhabha Research Institute for a period of three years. He will be mainly working at the Indira Gandhi Centre for Atomic Research, Kalpakkam.

He and his team had earlier worked on a project that used the neural network approach to allocate Web page requests to servers, to speeden up the process. It was showcased among the world's best technology in May. For details, contact 9845481543.

*Data Mining Workshop – NRSA, Hyderabad*



# Indian scientist develops smart sensor to boost agriculture

NIRAD MUDUR

Bangalore: In a few months, growing crops may require minimum manual monitoring by farmers. An Indian Scientist in USA is developing an artificial intelligence-based expert system using a smart sensor wireless network to increase crop quality and productivity.



S S Iyengar

The system, being developed by S S Iyengar, Chairman, Computer Science dept, Louisiana State University, USA, will be shortly field tested on a land in Hessarghatta and in Madurai. It is expected to minimise or completely eliminate the need for pesticides.

Iyengar, who is also Satish Dhawan Professor of ISRO Chair at IISc, told Vijay Times that the sensors embedded in the soil where the crop is grown would relay relevant information in real time to the farmer monitoring crop health from his house using a computer.

The low-cost sensors would be placed at regular intervals in the field to enable them to monitor soil condition, salinity, moisture, temperature, and crop condition, besides alerting the farmer about presence of diseases.

The system would help farmers take immediate corrective action in case sensors detect any disease, thus preventing spread of infection to the entire crop.

The soil embedded artificial intelligence-based system will work in a wireless mode, with each sensor independently relaying the information from time to time, or network with other sensors to provide a complete picture of the entire crop being grown on the field, said Iyengar, who is internationally acclaimed as a pioneer



## SENSOR TIPS

- ▶ System to eliminate need for pesticides
- ▶ Farmer can monitor crop health from house
- ▶ Low-cost sensors to be placed at regular intervals
- ▶ System to help farmers take corrective measures

in the field of sensor networks.

He explained that a typical sensor would be a rectangular node less than half an inch in length, and each would have sensing elements, a battery, a processor (less than 20 MHz), memory (less than 1MB), and transmitter and receiver as communication equipment to relay and take command from the farmer at the base monitoring station.

Iyengar hit upon the idea of applying this technology to agriculture in Louisiana when the sensors successfully detected chemical presence in solutions.

He is presently in the country to spread awareness on the merits of the use of sensors in agriculture.

# Scientists plan counter-terror in cyber space

By NIRAD MUDUR

Bangalore, July 14: Days may be numbered for modern terrorists, like Bangalore's Kafool Ahmed, to covertly depend on cyber space to exchange coded data while planning destructive activities.

Scientists have embarked on a crucial project to detect and trap terrorists who, in the hope of being undetectable, are taking advantage of the world wide internet labyrinth.

A team of scientists from Louisiana State University and Louisiana Tech in the USA have been cleared for \$3.6 million funding to create a centre for predicting, detecting and controlling anomalous behaviour in cyber space.

The smart cyber-centric sensor surveillance system to be developed by them would be capable of providing real-time detection and identification of both usual and rare patterns of activities.

Dr S S Iyengar, Roy Paul Daniels professor and Chairman of Louisiana State University's department of computer science, who will play a crucial role of sensor fusion in the project, told the New Indian Express that this system would help detect intrusions in cyber infrastructure and keep cyber vigil on parties showing a sudden increase in exchanging data on a particular area of interest.

"This would be imperative for early warning and response capabilities of modern surveillance systems," the team of scientists state in their proposal on the project titled 'Engineering smart cyber-centric sensor surveillance systems for large geographical domains'.

The centre is planned to network globally with emerging centres in the world including Indian Institute of Science (IISc) in Bangalore and Bhabha Atomic Research Centre (BARC), Trombay near Mumbai.

He explained that to have world wide cyber surveillance, plans involved having in place a network of sensors at crucial points in the world wide web that can interact and 'collaborate' with each other and provide crucial data to enable a critical response to natural and man-made disasters.

The project however would originate from the Centre for Excellence for Cyber Security Research in Louisiana and would begin by working with the US Air Force's Cyber Command at Barksdale Air Force Base, Louisiana.

Dr Iyengar, who was recently conferred the Visiting Professorship at the Homi Bhabha Research Institute at IGCAR, is visiting several institutions in India to recruit young scientists for the project.

Vijay Times December 19, 2005

Sunday Express July 15, 2007

FOR DISCOVERING FASTER WAY TO ACCESS INFO FROM WEBPAGE

## City-based scientist gets US patent

DH News Service

BANGALORE: Professor S S Iyengar, a US-based scientist of Bangalore origin, has been awarded a US patent for discovering a faster way of accessing information from a web page.

Presently Prof Iyengar is the Chairman and Roy Paul Daniels Chaired Professor of Computer Science at the Louisiana State University.

He shares the award with two other professors — Kan-

nan of the same university and Phobos of Louisiana Tech University — for their work on 'Fast Web Page Allocation on a Server Using Self-organizing Properties of Neural Networks' last month.

Visiting professor

Prof Iyengar is also a visiting Satish Dhawan Professor at the Indian Institute of Science.

"The discovery is a part of a multilayer distributed system. With this innovation,

one can access, analyse and sort information in a much faster way," he said.

Prof Iyengar has been involved with research in high performance algorithms, data structures, sensor fusion, data mining and intelligent systems since 1974.

He has guided over 40 PhD students.

In the year 2003, Prof Iyengar received the Distinguished Alumnus Award from the Indian Institute of Science.



Professor S S Iyengar

Deccan Herald - December 27, 2006

# They think and act as a team!

We are talking of thinking machines that learn from interaction. They are here!

Robots have now been rubbing shoulders with humans for some time. They fetch and serve and do sundry to risky jobs, based on a trial and error method. In what is perhaps a new achievement, a team of robots have been developed to think autonomously and act in real time. And they do this in a dynamic environment which is unpredictable.

That is what Prof S S Iyengar of the Louisiana University and a team from the Naval Research Lab in the US have tested successfully in the lab using 30 robots. They now plan to test it in dynamic conditions.

"Our research has been about sensor networks and how to take data from different sensors and fuse them. This is about making machines think. We are using underwater unmanned vehicles to detect mines, for instance. Say, 5-6 robots are scavenging 3-4 square miles of the ocean floor. Our algorithm allows them to learn by sensing the surrounding and then operate autonomously," says Prof Iyengar.

## Detecting mines

Using sonar waves the leader gives direction to others to follow. Collecting all the information from the others the leader takes a decision. The ultimate goal is that the robots adapt and are able to capture information and detect mines in real-time. "The other important aspect of this learning is the memory hierarchical structure, much like how our brains operate. Memory is accessed when needed," he says adding that



Prof S S Iyengar

this memory based learning iteratively improves upon the information.

Given the time constraint there is no time for trial and error as there is no time for exhaustive search. "The robots are constantly changing the goal. As data is mined, what is redundant is removed continuously."

## Communication

In the lab the robots communicated using chirps much like birds do when flying in a flock, he says. "A chirp to the left means a turn to the left, and to the right means turn right. The leader can distinguish between each member through the frequency."

This method has the advantage of data interoperability where it can be used in other situations. Navigation underwater relies on some external infrastructure placed in known positions but this limits operations. That is why the UUV team has to be able to navigate to an area, do its task and return, requiring expensive systems.

But the way the team

communicates with each other using sensor footprint brings down costs. Due to the varying nature of the environs, the control strategies have to be strong. The method used here uses data acquisition to generate controllers without a priori knowledge or repetition of solutions. The random but purposeful controller uses sensor feedback to continue or change actions accordingly.

The individual robots independently follow the leader. The formations are the result of emergent behaviour that results from local or bottom-up activity, notes Prof Iyengar. This does not require a central controller and reduces complexity and saves communication bandwidth.

## Patent

Prof Iyengar recently won a patent for an algorithm he discovered with two others. It was for faster web page allocation using properties of a neural network.

He explains: "The experiment with the robot is an application of the algorithm. Once the information is there, the question is how to send this to different people when the Net traffic is high. Using neural network or how the brain operates, we were able to sort out similar content from many websites and post it separately. This way you can access data in real time without going in a queue."

The professor has been working with data structures, sensor fusion, data mining and intelligent systems. He is a Satish Dhawan professor with the IISc. He can be contacted at iyengar@csc.lsu.edu or on phone when in India at 9845461643.

JAYALAKSHMI K

NASA to give

DECCAN HERALD  
**Science & Technology**  
Tuesday, January 2, 2007, Page III



# Robots to help detect earthquakes

By SHIVANI MOOY  
DH News Service

**BANGALORE:** In a world where things are getting unpredictable it would be a boon to have someone informing you about the next earthquake.

"We can place a sensor network robot at the bottom of the sea. Any change in the water can be communicated, saving disastrous outcomes," said Professor S S Iyengar, Louisiana State University USA, speaking on distributed sensor networks.

Sharing his thoughts

with *Deccan Herald*, Prof Iyengar at the International Conference on Information Processing (ICIP) said, "In the US, we are looking at creating algorithms for biochemical sensors to detect terrorist activities."

## Areas of concern

"Cyber security is the main area of concern in this regard."

Prof Iyengar also informed, "Working with the Bhabha Atomic Research Centre we are looking to develop nuclear sensors to measure temperature, pressure in reactors. We even

plan to develop robots which will move into the hazardous areas and make the necessary changes."

One of the other uses of these sensor networks is for creating smart chairs. These chairs are fitted with sensor networks that can be connected to the doctors or hospitals.

## Initiative

The University Visvesvaraya College (UVC) of Engineering, Bangalore organised the ICIP conference between 10-12 August, 2007 in the city. This first ever initiative

by UVC on information processing, is a venture to understand the importance and applications of information processing in collaboration with the Society of Information Processing. The conference attracted about 300 papers and 200 delegates from countries such as the USA, UK, Bangladesh, Singapore, Malaysia, Thailand etc attended the event.

## Ethics

Speaking at the inaugural session, Minister for Science and Technology Ramachandran Gowda, said,

"As science advances, we move away from the realities in the country. It is essential that we maintain our ethics in this regard."

The areas covered in the conference ranges from computer networks, information security pattern recognition, image processing, data mining, information retrieval.

One of the focus areas is the biometric recognition which 75 papers related to this topic for discussion. The conference also saw the release of a book and international journal on information processing.

*Deccan Herald -  
August 13, 2007*

# DIAT for tie-ups with US, UK military

TIMES NEWS NETWORK

**Pune:** The country's premier defence technology university, the Defence Institute of Advanced Technology (DIAT) at Girinagar near here is working on tie-ups in strategic areas of studies with leading military and science institutes in the US, UK and Israel.

Speaking to reporters on the sidelines of a function on Wednesday, DIAT vice-chancellor Prof Lalit M Patnaik said, "We are seeking tie ups with the Naval Postgraduate School (NPS), Monterey in California, US; the Royal Military College of Science (RMCS) at Cranfield, UK; and the Weizmann Institute of Science at Rehovot, in Israel."

He said, "All three institutes have evinced keen interest on getting into collaborative academic initiatives with us."

For instance, Weizmann is keen on an initiative in the field of cryptography, which refers to a multi-disciplinary approach involving mathematics, computer science and engineering, to convert data into scrambled code for applications in defence, banking and several other fields, he added.

As for the US and the UK institutes, Patnaik said, "The proposed tie ups will be in areas ranging from security to cryptography, computer modelling and simulation, sensor network, image processing and face recognition technology, among others."

The NPS, Monterey is an accredited research university run by the US Navy and offers a master's degree and doctoral programmes while the RMCS, Cranfield, ranks among the oldest institutions in the UK, known for hosting academia and officers from the British armed forces for research and teaching in defence management, science and technology.

The DIAT, which was established by the defence research and development organisation (DRDO), primarily offers advanced post-graduate (PG) and short-term courses in defence technologies to officers from the Indian armed forces and scientists from the defence research and development organisation. Also, it has been extending academic and technical inputs to the mission mode projects undertaken by the DRDO labs.

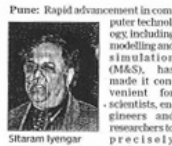
Patnaik pointed out that the institute also hosts research students from several foreign nations like Ethiopia, Kazakhstan, Myanmar, Singapore, Malaysia and Britain, among others. The proposed tie-ups would extend a new dimension to teaching and learning at the DIAT.

Initially established as the Institute of Armament Technology (IAT), the institute's name was changed to DIAT after it secured deemed university status in 2006. The institute serves as a first contact point for young engineers joining the defence services, as they undergo intensive four-month induction training in academics and research methodologies.



# 'Technological advancement made data analysis convenient'

TIMES NEWS NETWORK



Sitaram Iyengar

**Pune:** Rapid advancement in computer technology including modelling and simulation (MAS), has made it convenient for scientists, engineers and researchers to precisely analyse huge data sets involved in the development of products and applications, said Sitaram Iyengar, professor of computer sciences at the Louisiana State University (LSU) in US.

Iyengar was speaking on 'M&S of large data sets and cloud computing', while delivering the keynote address at a national conference on modelling and simulation, which got underway at the Defence Institute of Advanced Technology (DIAT), Girinagar, near here on Wednesday. Vice-chancellor of DIAT Lalit Patnaik, presided over the session.

The M&S involves use of high-end software tools and processes like sorting out and classifying data obtained from different sources; data mining; and computation of mathematical models, among others,

for designing and developing products and applications.

Iyengar, who is the Roy Paul Daniels Chair Professor at the LSU focussed on issues like the ways to sort out large data sets; challenges faced in sorting out data and the M&S techniques required for analysing the data, during his 45-minute power point presentation.

He said the emerging technique of cloud computing, which refers to an internet-based development and use of computer technology, provides a more cost-effective and scalable option for M&S applications. He described cloud computing as a paradigm of computing in which dynamically scalable and often virtualised resources are provided as service over the internet.

According to Iyengar, "This is good for large data sets and comes with the advantages of access to resources on demand and reliable backup up and disaster recovery systems."

Although, he said, cloud computing has some inherent disadvantages like it does not allow users to physically possess the data and the responsibility of data storage and control lies in the hands of the service provider. This makes the user dependent on the provider and then there are issues relating to security and confidentiality of data.

Later, speaking to reporters,

Iyengar pointed out that the use of M&S tools and techniques extends to fields as varied as tracking enemy movement in a war zone, identification of an enemy tank and the quantum of explosives carried by it, detecting exact location and magnitude of landmines, night vision systems etc."

Similarly, techniques like data mining and sensor networking have applications in intelligence surveillance and profiling of people moving in and out of a country — as is being done in US to check terror elements, post-9/11 attacks.

Besides, applications in astro-physical problems; banking and financial transactions; detecting credit card frauds; customer relationship management and even in anticipating natural disasters like floods, earthquakes, tsunamis and in disaster recovery management, he said.

Iyengar said, "Post-9/11, the US authorities developed a system wherein all airports are provided with a comprehensive list of suspected terror elements and the same is fed into a computer-aided system that scans travellers arriving or leaving the country, for a common factor. In case they come across a common factor, the concerned traveller is held up for questioning to the point of verification and satisfaction of the authorities."

*Times of India -  
December 17,  
2009*

# ಹೊತ್ತಿತೋ ಹೊತ್ತಿತು ವಿಜ್ಞಾನ ಕಂದೀಲು



**ಮೂವತ್ತೆರಡು ವರ್ಷಗಳ ಹಿಂದೆ** ಡಾ.ಎಚ್.ನರಸಿಂಹಯ್ಯ ಅವರು ರಾಮನಾಮ ಸಂಗೀತೋತ್ಸವಕ್ಕೆ ಹೋಗಿದ್ದ ಸಂದರ್ಭದಲ್ಲಿ 'ರಾಮನಾಮ ಸಂಗೀತೋತ್ಸವ, ಗಣೇಶೋತ್ಸವ ನಡೆಯುತ್ತವೆ ಎಂದಾದರೆ ವಿಜ್ಞಾನೋತ್ಸವವನ್ನು ಬೇಕೆ ಅಂದೇಬೇಕಾದರೂ' ಎಂದು ಕೇಳಿದ್ದನ್ನು ಮೆಚ್ಚಿ ನ್ಯಾಷನಲ್ ಕಾಲೇಜು ಅಧ್ಯಕ್ಷ ಡಾ.ಎ.ಎಚ್.ರಾಮರಾವ್ ನೆನಪಿಸಿಕೊಂಡರು.

ವಿಜ್ಞಾನ ಎಂಬುದು ಕಲ್ಪನಾ ಕಡಲೆಯಾಗಿದೆ ಪ್ರತಿಯೊಬ್ಬರಿಗೂ ದಕ್ಕಬೇಕು. ವಿಜ್ಞಾನಿಗಳಿಗೆ ಅಭದ್ರ ಪ್ರತಿಯೊಬ್ಬರೂ ವಿಜ್ಞಾನದ ಮಹತ್ವವನ್ನು ಅರಿಯಬೇಕು ಎಂಬ ಧೈರ್ಯವನ್ನುಟ್ಟುಕೊಂಡು ನರಸಿಂಹಯ್ಯ ಅವರು 33 ವರ್ಷಗಳ ಹಿಂದೆ ವಿಜ್ಞಾನೋತ್ಸವವನ್ನು ಆರಂಭಿಸಿದರು. ಇದಕ್ಕೂ ಮೊದಲು, ಅಂದರೆ 1962ರಲ್ಲಿ ಡಾ.ಎಚ್.ನರಸಿಂಹಯ್ಯನವರೇ 'ಬೆಂಗಳೂರು ವಿಜ್ಞಾನ ವೇದಿಕೆ'ಯನ್ನು ಆರಂಭಿಸಿದರು.

ಈ ವೇದಿಕೆಯ ಮೂಲಕ ಬಹುವಗುಡಿ ನ್ಯಾಷನಲ್ ಕಾಲೇಜು ಆವರಣದಲ್ಲಿ ಪ್ರತಿ ಬೃಹದಾಚಾರ ವಿಜ್ಞಾನ ಕ್ಷೇತ್ರದಲ್ಲಿ ಆಯ್ದಿರುವ ನೂತನ ಅಧ್ಯಾಪಕರು ಹಾಗೂ ಸಂಶೋಧನೆಗಳ ಕುರಿತು ಉಪನ್ಯಾಸ ಆಯೋಜಿಸಲಾಗುತ್ತಿತ್ತು. ಆದು ಇಂದಿಗೂ ನಡೆಯುತ್ತಲೇ ಇದೆ. ಬಹಿಷ್ಕಾರವಿರದ ವಿಜ್ಞಾನೋತ್ಸವ ಸಹ ನಿರಂತರವಾಗಿ ವಿಜ್ಞಾನಾತ್ಮಕ ರಜಾ ನಡವಳಿಯ ತಳಹದಿಯೇ ಬಂದಿದೆ. ಇದುವರೆಗೂ ನ್ಯಾಷನಲ್ ಕಾಲೇಜು ಬಟ್ಟು 2315 ವಿಜ್ಞಾನಕ್ಕೆ ಸಂಬಂಧಿಸಿದ



ಡಾ. ಎ.ಎಚ್. ನರಸಿಂಹಯ್ಯ.

ಉಪನ್ಯಾಸಗಳನ್ನು ಆಯೋಜಿಸಿದೆ. "ನೋಬೆಲ್ ಪುರಸ್ಕೃತರಾದ ಸರ್.ಸಿ.ವಿ.ರಾಮನ್ ಹಾಗೂ ರೋಸೆಲಿ ಹೆನ್ರಿನ್ ಅವರಂಥ ವಿಶ್ವವಿಖ್ಯಾತ ವಿಜ್ಞಾನಿಗಳಿಂದ ಹಿಡಿದು ಹಿರಿಯ ವಿಜ್ಞಾನಿಗಳಾದ ಪ್ರೊ. ಸಿ. ಎನ್. ಆರ್. ರಾವ್, ಡಾ. ಕಸ್ತೂರಿ ರಂಗನ್, ಪ್ರೊ. ಯು. ಆರ್. ರಾವ್ ಅವರಂಥ ಸಮಕಾಲೀನ ವಿಜ್ಞಾನಿಗಳೂ ವಿಜ್ಞಾನೋತ್ಸವದಲ್ಲಿ ಉಪನ್ಯಾಸ ನೀಡಿ ವಿಜ್ಞಾನೋತ್ಸವದ ಹಿರಿಮೆಯನ್ನು ಹೆಚ್ಚಿಸಿದ್ದಾರೆ. ಇದೇ ಪರಂಪರೆಯನ್ನು ಮುಂದುವರೆಸಿಕೊಂಡು ಬಂದಿರುವ ಬೆಂಗಳೂರು ವಿಜ್ಞಾನ ವೇದಿಕೆ ಇಂದಿಗೂ ಹಿರಿಯ ಹಾಗೂ ಯೌತ ವಿಜ್ಞಾನಿಗಳಿಂದ ಒಂದು ತಿಂಗಳ ಕಾಲ ಉಪನ್ಯಾಸ ಕಾರ್ಯಕ್ರಮ ಆಯೋಜಿಸುತ್ತಲೇ ಬಂದಿದೆ" ಎಂದು ರಾಮರಾವ್ ತಿಳಿಸಿದರು.

ಜೂನ್ 30ರಂದು ಸಂಜೆ 6ಕ್ಕೆ ಬಹುವಗುಡಿ ನ್ಯಾಷನಲ್ ಕಾಲೇಜು ಆವರಣದಲ್ಲಿ ಬಾಹ್ಯಾಕಾಶ ಸಂಸ್ಥೆ (ಇಸ್ರೋ) ಅಧ್ಯಕ್ಷ ಡಾ.ಕೆ. ರಾಧಾಕೃಷ್ಣನ್

ವಿಜ್ಞಾನೋತ್ಸವ ಉದ್ಘಾಟನೆ, 'ಶೈಲ್ ಅಪ್ಪಿಕೇವನ್, ಇನ್ ಇಂಡಿಯಾ- ಟೆಂಟ್ ಲೈವ್', ವಿಜಯ ಕುರಿತು ಉಪನ್ಯಾಸ ನೀಡಲಿದ್ದಾರೆ. ಮುಂದೂ ದಿನಗಳ ಈ ಉತ್ಸವದಲ್ಲಿ ನಿತ್ಯ ಒಂದೊಂದು ಉಪನ್ಯಾಸ ನಡೆಯಲಿದೆ. ಪ್ರಮುಖವಾಗಿ 'ಮೆಟಾಬೊಲಿಕ್ ಸರ್ಕಲ್' (ಡಾ.ಕೆ.ಲಕ್ಷ್ಮಣ್, ಜುಲೈ 1), 'ಫೈಬರ್ ಆಫ್ ಹಾರ್ಟ್ ಸರ್ಕಲ್' (ಡಾ.ವಿ.ಕೆ. ಜವಳಿ, ಜುಲೈ 8), 'ಮನೋರಂಜಿ ಅಂತ್ಯ ವಿಷುವರ್ತನೆಯ ಆಫ್ ಆಯರ್ ಸ್ಕೌಲ್' (ಡಾ.ಎಚ್.ಸೀತಾರಾಮ ಅಯ್ಯಂಗಾರ್, ಜುಲೈ 10), 'ಕೆಮಿಕಲ್ ಆನಾಲಿಸಿಸ್ ಇನ್ ದಿ ವರ್ಲ್ಡ್ ಆಫ್ ಬಯೋಲಿಜಿ' (ಜಿ.ಎಚ್.ಸಿ ನಿರೋಶಾ ಡಾ.ಬಲರಾಮ್, ಜುಲೈ 13), 'ಆಂಟಿಬಯೋ ಲೋಜಿ' (ಡಾ.ಮುಕುಂದ ಭಟ್ಟ, ಜುಲೈ 13), 'ಲಾಜ್ ಹೆಡ್ವಾಸ್ ಕೊಡೆಡಲ್' (ಡಾ.ವಿ.ವಿ.ಲಾಲ್ ಭಟ್, ಜುಲೈ 17) ಹಾಗೂ ಸಮಾಲೋಚನಾ ಸಮಾರಂಭದಲ್ಲಿ (ಜುಲೈ 30) ಡಾ.ಬಿ.ಪದ್ಮನಾಭನ್ ಅವರು 'ಮಾಡರ್ನ್ ಟೆಲಿ, ಓ ಇಂಪ್ರೂವ್ಡ್ ಫ್ಯೂಡರ್ ಇನ್ ಅಗ್ರಿಕಲ್ಚರ್' ಕುರಿತು ಉಪನ್ಯಾಸ ನೀಡಲಿದ್ದಾರೆ.

"ಈ ವರ್ಷದ ವಿಜ್ಞಾನೋತ್ಸವ ಹಾಗೂ ಉಪನ್ಯಾಸಗಳಿಗಾಗಿ ನೂತನವಾಗಿ ನಿರ್ಮಿಸಿರುವ ಡಾ.ಎಚ್.ನರಸಿಂಹಯ್ಯ ಮಲ್ಟಿಮೀಡಿಯಾ ಸಭಾಂಗಣ ಸಜ್ಜಾಗಿದೆ. 190 ಸುಪ್ಲೆಕ್ಟ್ ಆಸನಗಳಿರುವ ಈ ಸಭಾಂಗಣ ಹವಾಮಾನೋಪ್ಪವನ್ನು ಹೊಂದಿದೆ. ಬಹಿಷ್ಕಾರದ ಯಜ್ಞದೇ ಛಾಂದೀಂದಿ ವಿಧಿಯೇ ಕಾನ್ಸರ್ಟ್, ನಡವಳಿಯಾದ ಸಾಮರ್ಥ್ಯ ಹಾಗೂ ಧ್ವನಿ ಮಾನ್ಯ ದೃಶ್ಯ ಪ್ರಸಾರ ಮಾಡುವ ವ್ಯವಸ್ಥೆ ಹೊಂದಿದೆ. ಪ್ರತಿ ದಿನ ಸಂಜೆ 6ಕ್ಕೆ ಇದೇ ಸಭಾಂಗಣದಲ್ಲಿ ಯೌತ ವಿಜ್ಞಾನಿಗಳಿಂದ ಉಪನ್ಯಾಸ ನಡೆಯಲಿದೆ. ವಿಜ್ಞಾನಿಗಳೂ ಹಾಗೂ ವಿಜ್ಞಾನಾತ್ಮಕರು ಉಪನ್ಯಾಸಗಳಿಗೆ ಪ್ರವೇಶ ಶುಲ್ಕ ನೀಡದೆ ಪಾಲ್ಗೊಳ್ಳಬಹುದು" ಎಂದು ರಾಮರಾವ್ ತಿಳಿಸಿದ್ದಾರೆ.

■ ಇ.ಎಸ್. ಸುಧೀಂಧ್ರ ಪ್ರಸಾದ್



ಡಾ.ಬಿ.ವೆಂಕಟೇಶ್



ಡಾ.ಎಚ್.ಸೀತಾರಾಮ ಅಯ್ಯಂಗಾರ್



ಡಾ.ಬಲರಾಮ್

# ಯುವಿಸಿಇಯಲ್ಲಿ ಇಂಪೆಟಸ್ ಉತ್ಸವ

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿದ್ಯಾಲಯದ 'ಇಂಪೆಟಸ್ 2011' ಕಾರ್ಯಕ್ರಮ ಇತ್ತೀಚೆಗೆ ನಡೆಯಿತು. ಉದ್ಘಾಟನೆಯನ್ನು ಮೈಂಡ್ ಟ್ರೀ ಸಂಸ್ಥೆಯ ಸಿಬಿ.ಎಸ್.ಎಸ್. ಪಾರ್ಥಸಾರಥಿ ಹಾಗೂ ಲೂಸಿಯಾನಾ ವಿವಿಯ ಪ್ರಾಧ್ಯಾಪಕ ಡಾ. ಎಸ್.ಎಸ್. ಐಯಂಗಾರ್ ನೆರವೇರಿಸಿದರು.

ಈ ಸಂದರ್ಭದಲ್ಲಿ ಎಸ್.ಎಸ್. ಪಾರ್ಥಸಾರಥಿಯವರು ಮಾತನಾಡಿ, ಜಾಗತಿಕ ಮಾರುಕಟ್ಟೆಯಲ್ಲಿ ಐಟಿ ಉದ್ಯಮವು 1.6 ಟ್ರಿಲಿಯನ್ ಡಾಲರ್ಸ್ ಮೌಲ್ಯದ ಪಾಲು ಹೊಂದಿದೆ. ಈ ಬೃಹತ್ ಉದ್ಯಮದಲ್ಲಿ ಭಾರತವು ಶೇ. 60ರಷ್ಟು ಸಿಂಹಪಾಲು ಹೊಂದಿದೆ. ಗ್ರಾಹಕರ ನಿರೀಕ್ಷೆಗಳ ಪೂರೈಕೆ, ಆವಿಷ್ಕಾರಿ ಕೌಶಲಗಳು ಹಾಗೂ ವಿಶಿಷ್ಟ ವೇತನ ಹಂಚಿಕೆಗಳಿಂದಾಗಿ ಭಾರತವು, ಐಟಿ ಉದ್ಯಮದಲ್ಲಿ ಬೆಳವಣಿಗೆಯತ್ತ ದಾಪುಗಾಲು ಹಾಕಿದೆ ಎಂದು ಹೆಸರಿಸಿದರು.



ಡಾ. ಎಸ್.ಎಸ್. ಐಯಂಗಾರ್ ಅವರು ಮಾತನಾಡಿ, ಭಾರತವು ಸಾಫ್ಟ್‌ವೇರ್, ಹಾರ್ಡ್‌ವೇರ್ ಹಾಗೂ ಸೇವಾ ಕ್ಷೇತ್ರದಲ್ಲಿ ಮುಂಚೂಣಿಯಲ್ಲಿದೆ. ಭಾರತೀಯ ವಿದ್ಯಾರ್ಥಿಗಳು ಜಾಗತಿಕ ಮಟ್ಟದಲ್ಲಿ ಸ್ಪರ್ಧಿಸಬೇಕಾದಲ್ಲಿ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದ ಆತ್ಮತೃಪ್ತಿಯ ಶಿಕ್ಷಣ ಆತ್ಮವಶ್ಯಕ. ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉದ್ಯೋಗಕ್ಕೆ ಸಮರ್ಥರಾಗಿಸಬೇಕಾದಲ್ಲಿ ಉತ್ತಮ ಶಿಕ್ಷಕರು, ಜಾಗತಿಕ ಗುಣಮಟ್ಟದ ಶಿಕ್ಷಣ, ತರಬೇತಿ ಹಾಗೂ ಸೌಲಭ್ಯಗಳ ಅವಶ್ಯಕತೆಯಿದೆ ಎಂದು ಹೇಳಿದರು.

ಅಧ್ಯಕ್ಷೀಯ ಭಾಷಣ ಮಾಡಿದ ಯುವಿಸಿಇ ಕಾಲೇಜಿನ ಪ್ರಾಚಾರ್ಯ ಡಾ. ವೇಣುಗೋಪಾಲ್, ನಮ್ಮ ದೇಶವು ವಿಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನ ವಿಭಾಗದ ಮೂಲ ಬೆರಗುಗಳನ್ನು ಹೊಂದಿದೆ. ಪ್ರಸ್ತುತ 30 ಲಕ್ಷ ಪದವೀಧರರನ್ನು ಉತ್ಪಾದಿಸುತ್ತಿದೆ. ಅವರಲ್ಲಿ 7.5 ಲಕ್ಷ ಎಂಜಿನಿಯರುಗಳಿದ್ದಾರೆ. ಈ ಪ್ರಮಾಣವು ಬರುವ 5 ವರ್ಷಗಳಲ್ಲಿ ಶೇ. 30ಕ್ಕೆ ಹೆಚ್ಚುವ ನಿರೀಕ್ಷೆ ಇದೆ ಎಂದರು. ■

## Data mining useful in defence too

It is applied in vehicle, land mine and even voice detection

Anuradha Mani Wadhawan

Data mining, a process of extracting patterns from large databases, has been widely used in concepts like marketing and tracking trends. But now, it is finding crucial application in the defence sector with technological advances. In keeping with these developments, Lalit Patnaik, the vice chancellor of the Defence Institute of Advanced Technology (DIAT), said data mining has the potential to be applied in vehicle detection when visibility is low, land mine detection and even voice detection when certain prominent words in telephonic conversations can be detected to narrow down a search. Experts at DIAT are working on certain projects related to this. "For example, the visibility is poor in a war scenario, at night or during the



SS Iyengar

monsoon. In such a case, if our soldier tracks a vehicle but isn't sure about the strategy an elaborate algorithmic system will help click a photo of the vehicle, compare it with thousands of photos from similar databases and identify exactly which vehicle is approaching in a few seconds," said Patnaik. Similarly real-time phone conversations can also be tracked to search and

single out conversations that use certain words related to strategic issues.

Patnaik was speaking on the sidelines of the National Conference on Modelling and Simulation organised by the Department of Applied Mathematics (DAM), SS Iyengar, the professor of computer science from the Louisiana State University delivered the keynote address on 'Algorithm and Graph Problems in Wireless Sensor Network'.

Meanwhile, a number of foreign military universities are taking a keen interest in collaborating with the DIAT owing to its work in the field of security, cryptography and sensor-network.

DIAT's work on cryptography has attracted interest from the Weizmann Institute of Science in Israel. "We are already exporting teams from the Royal Military College of Science UK and the Naval Postgraduate School at California, as they have shown an interest in a tie-up for security, cryptography and sensor-network related knowledge," said Patnaik.

DNA – December 17, 2009

# సైబర్ భద్రతకు పెద్దపీట

**బెంగళూరు (హైదరాబాద్), న్యూఢిల్లీ :** సామాజిక, రాజకీయ, ఆర్థిక వ్యవస్థలు అతి ఎక్కువగా ఆధారపడే సైబర్ వ్యవస్థ రానున్న పదేళ్లలో తన సొంత మరొక విస్తృతం చేసుకోనుంది. ఈ నేపథ్యంలో కేంద్ర, రాష్ట్ర ప్రభుత్వాలు తమ బడ్జెట్లో సైబర్ భద్రతను అతిక విలువ కలిగి ఉండేలా సమాచార సాంకేతిక- కంప్యూటింగ్ రంగ నిపుణులు సూచించారు. సమాచార విశ్లేషణ, వినియోగదారు సంఘం (సైబెట్) ఆఫ్ ఇన్ఫర్మేషన్ ప్రావెనింగ్ ఎసెబిఐ, ఆల్టా వెంజీసింగ్ రంగ కళాశాలలు సంయుక్తంగా 'రానున్న దశాబ్దికి సైబర్ భద్రత' అనే అంశంపై గురువారం బెంగళూరులో నిర్వహించిన అంతర్జాతీయ సమ్మేళనంలో ఛోరియా విశ్వవిద్యాలయం ఆచార్యులు ఎన్.ఎస్.అయ్యంగార్ మాట్లాడారు. రానున్న రోజుల్లో సైబర్ వ్యవస్థ కోసం ప్రపంచ దేశాల మద్దతులు తలెత్తే ప్రమాదం ఉందన్నారు. ఆర్థిక, రాజకీయ, సామాజిక ప్రగతి సైబర్ వ్యవస్థలపై ఆధారపడే రోజులు ఎంతో దూరంలో లేవన్నారు. ఈ రంగ నిపుణుడు డాక్టర్ కె.ఆర్.



**జ్యోతి వెరిగిస్తున్న ప్రాఫెసర్ అయ్యంగార్, డాక్టర్ కె.ఆర్.వేణుగోపాల్**

వేణుగోపాల్ మాట్లాడుతూ విజ్ఞానం, సాంకేతిక విశ్వవిద్యాలయం ఆధారిత పరిశోధనలో ప్రాథమిక అంశాల అభివృద్ధి కేంద్రాల స్థాపన అవసరమని విస్తరించారు. సైబర్ పరిరక్షణం అన్ని రంగాల్లో కీలక పాత్ర పోషిస్తుంది. నూరు రోజుల పాటు నిర్వహించే ఈ సమ్మేళనంలో నీటిపానీ విశ్వవిద్యాలయం (అమెరికా) ఆచార్యులు ఎన్.ఆర్.కొల్లా, విశ్వేశ్వరయ్య

సాంకేతిక విశ్వవిద్యాలయం ఆధారిత పరిశోధనలో ప్రాథమిక అంశాల అభివృద్ధి కేంద్రాల స్థాపన అవసరమని విస్తరించారు. సైబర్ పరిరక్షణం అన్ని రంగాల్లో కీలక పాత్ర పోషిస్తుంది. నూరు రోజుల పాటు నిర్వహించే ఈ సమ్మేళనంలో నీటిపానీ విశ్వవిద్యాలయం (అమెరికా) ఆచార్యులు ఎన్.ఆర్.కొల్లా, విశ్వేశ్వరయ్య

సమాచార సాంకేతిక ప్రగతిలో..

# భారత్ దే అగ్రస్థానం



కార్యక్రమాన్ని ప్రారంభిస్తున్న ఎస్.ఎస్. పార్లసారధి, ప్రిన్సిపల్ వేణుగోపాల్ తదితరులు



సదస్సుకి హాజరైన విద్యార్థులతో మాట్లాడుతున్న అతిథులు

బెంగళూరు, ఏప్రిల్ 9 (న్యూస్ టుడే): ప్రపంచ సమాచార సాంకేతిక రంగం ప్రగతిలో భారతదేశం అగ్రస్థానంలో ఉందని ఇంఫోటెక్-2011 లో పాల్గొన్న ప్రముఖులు పేర్కొన్నారు. స్థానిక కాలేజ్ ఆఫ్ విశ్వకర్మయ్యలో శనివారం నిర్వహించిన ఈ కార్యక్రమంలో పాల్గొన్న మైండ్ ట్రీ సంస్థ ప్రధాన కార్యదర్శి ఎస్.ఎస్.పార్లసారధి మాట్లాడుతూ ప్రపంచ మాన్యేట్లో ఐటీ పరిశ్రమ వ్యాపారం 1.9 ట్రిలియన్ డాలర్లయితే అందులో ఒక్క భారత్ దే 60 శాతం ఉందన్నారు. ఈ అంశంలో

వినియోగదారుని అవసరాలకు అనుగుణంగా ఉత్తమ అవిష్కరణలను దేశం విజయవంతంగా నిర్వహిస్తుందన్నారు. ఇదే కార్యక్రమంలో పాల్గొన్న లాయిసన్ స్టేట్ యూనివర్సిటీ కంప్యూటర్ సైన్స్ విభాగం చైర్మన్ డా.ఎస్.ఎస్.అయ్యంగార్ మాట్లాడుతూ సాఫ్ట్వేర్, హార్డ్వేర్లలో కాక ఇతర సేవా రంగంలో భారత ఉజ్జ్వల భవిష్యత్తును కల్గివుందన్నారు. సమాచార సాంకేతిక రంగంలో ఉత్తమ విద్యను పొందితే ప్రపంచ వ్యాప్తంగా ఉపాధికి కొరవలేదన్నారు. మన దేశం విజ్ఞాన సాంకే

తిక రంగానికి మూలం కాగా, ప్రస్తుతం ఏటా వస్తున్న 30 లక్షల పట్టభద్రుల్లో 7.5 లక్షలు ఒక్క ఇంజనీరింగ్ కోర్సుల నుండే వస్తున్నారని యూపీసీఈ ప్రెస్సిపల్ డా.వేణుగోపాల్ పేర్కొన్నారు. ఇందులో 75 శాతం మందికి ఉపాధి కల్పించేందుకు ఉత్తమ శిక్షణ ఇవ్వాలని అవసరాన్ని ఆయన గుర్తుచేశారు. ప్రస్తుతం 24 శాతం ఇంజనీరింగ్ విద్యార్థులు మాత్రమే ఉద్యోగాలకు అర్హులవుతుండగా, రానున్న 5 ఏళ్లలో ఈ ప్రమాణం 30 శాతానికి పెరుగుతుందన్నారు.



ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯದ ವಿಶ್ವಕನ್ನಡ ಸಂಘದ ಅಧ್ಯಕ್ಷರಾದ ಎಂ.ಎಂ.ಎಸ್. ಶರಣ್ ಕುಮಾರ್ ಅವರು ಲಂಚನಾ ಸಮಾರಂಭದಲ್ಲಿ (ಎಡದಿಂದ) ಕಾಲೇಜು ಪ್ರಾಚಾರ್ಯ ಹಾಗೂ ಎಂಜಿನಿಯರಿಂಗ್ ವಿಭಾಗದ ಡೀನ್ ಪ್ರೊ. ಕೆ.ಆರ್. ವೇಣುಗೋಪಾಲ್, ಎಂಟಿಟಿಎಸ್ ಮಾಜಿ ಅಧ್ಯಕ್ಷ ಡಾ. ಎಸ್. ರಾಮೇಗೌಡ, ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯದ ಕುಲಪತಿ ಪ್ರೊ. ಎಸ್.ಎ.ರಂಗನಾಥ್, ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಸಚಿವ ರಾಮಚಂದ್ರಗೌಡ, ಅಮೆರಿಕದ ಲೂಸಿಯಾನಾ ರಾಜ್ಯ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಕಂಪ್ಯೂಟರ್ ಸೈನ್ಸ್ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥ ಪ್ರೊ. ಎಸ್.ಎಸ್. ಅಯ್ಯಂಗಾರ್, ಭಾರತೀಯ ವಿಜ್ಞಾನ ಸಂಸ್ಥೆಯ ಕಂಪ್ಯೂಟರ್ ವಿಭಾಗದ ಪ್ರಾಧ್ಯಾಪಕ ಪ್ರೊ. ಎಲ್.ಎಂ. ಪಟ್ಟಾಯರ್ ಕಾಲೇಜ್ ಅಧ್ಯಕ್ಷರು.

## ‘ಅಂತರ್ಜಾಲದಲ್ಲಿ ಅತ್ಮೀಲತೆ ದೃಶ್ಯ ಕೊನೆಯಾಗಲಿ’

ಪ್ರಜಾವಾಣಿ ವಾರ್ತೆ

ಬೆಂಗಳೂರು: ‘ಅಂತರ್ಜಾಲದಲ್ಲಿ ಅತ್ಮೀಲತೆಯನ್ನು ಪ್ರಚೋದಿಸುವ ದೃಶ್ಯ ಗಳ ಪಾವತೆ ಹೆಚ್ಚಾಗಿದೆ. ಇವುಗಳ ನಿಯಂತ್ರಣಕ್ಕೆ ಜಾಗೃತ ಮಟ್ಟದಲ್ಲಿ ಬೃಹತ್ ಚರ್ಚೆ ಆಗಬೇಕಿದೆ’ ಎಂದು ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಸಚಿವ ರಾಮಚಂದ್ರಗೌಡ ಇಲ್ಲಿ ಪ್ರತಿಪಾದಿಸಿದರು. ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯದ ಅಧ್ಯಕ್ಷರಾದ ಎಂಜಿನಿಯರಿಂಗ್ ಕಾಲೇಜು ಮಾಹಿತಿ ಸಂಸ್ಥೆ ಕುರಿತು ಏರ್ಪಡಿಸಿರುವ ಅಂತರರಾಷ್ಟ್ರೀಯ ಸಮಾವೇಶವನ್ನು ಉದ್ಘಾಟಿಸಿ ಮಾತನಾಡಿದರು. ‘ಅತ್ಮೀಲತೆ ಹಾಗೂ ಬೈನಿಕತೆಯನ್ನು ಪ್ರಚೋದಿಸುವ ಅಂತರ್ಜಾಲಗಳನ್ನು ಹದುವುಗೊಳಿಸುವ ವಿಶ್ವದ ಎಲ್ಲ ದೇಶ

ಗಳು ಒಂದಾಗಿ ಪ್ರಯತ್ನಿಸಬೇಕೆ. ಇಂಥ ಕೆಟ್ಟ ಜಾಲಗಳಿಗೆ ಪೂರ್ಣ ವಿರಾಮ ಹಾಕಬೇಕೆಂದು ಎಂಬ ಹೇಳಿದರು. ಕಂಪ್ಯೂಟರ್ ಬೆಲೆ ಕೆಲವು ಸಲಿಯುವ ಯುವ ಜನತೆ ‘ಕಾನ್ಸೂಟರ್’ ಗಳಲ್ಲಿ ಉದ್ಯೋಗಕ್ಕೆ ಸೇರಿ ನೈಜ ಜೀವನ ಶೈಲಿಯನ್ನೇ ಮರೆಯುತ್ತಿದ್ದಾರೆ. ಇಲ್ಲಿ ಕೆಲವು ಮಾತನು ಕೆಲವರು ಸೈಬರ್‌ಪಾಡರಲ್ಲಿ ತೊಡಗಿದ್ದಾರೆ ಎಂಬ ಆರೋಪಗಳು ಇವೆ. ಇದಕ್ಕೆ ಪೂರ್ಣಕ ವರ್ಗದ ಆತಂಕಕ್ಕೆ ಕಾರಣವಾಗಿದೆ ಎಂದು ಅವರು ಇದೇ ಸಂದರ್ಭದಲ್ಲಿ ಈವರೆಗೆ ವ್ಯಕ್ತಪಡಿಸಿದರು. ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದ ಬೆಳವಣಿಗೆಯಿಂದ ಇಂದು ವೋಲ್ಟೆಜ್‌ನಲ್ಲಿಯೂ ಕಂಪ್ಯೂಟರ್ ಸೌಲಭ್ಯಗಳು ಲಭ್ಯವಾಗಿವೆ. ಇದರಿಂದ ಕೆಲವೇ ಕ್ಷಣಗಳಲ್ಲಿ ಮಾಹಿತಿ ರವಾನೆಯಾಗುವಂತಾಗಿದೆ ಎಂದರು. ಈ ತಂತ್ರಜ್ಞಾನದ ಉಪಯೋಗ

ದೇಶದ ಪ್ರತಿ ಹಳ್ಳಿಗಳಿಗೆ ತಲುಪಬೇಕು. ಒಬ್ಬ ಸಾಮಾನ್ಯರು ಇದನ್ನು ಬಳಸುವಂತಾಗಬೇಕೆಂದು ಎಂದ ಅವರು. ಈ ನಿಟ್ಟಿನಲ್ಲಿ ರಾಜ್ಯ ಸರ್ಕಾರ ಕಾರ್ಯ ಪ್ರವೃತ್ತವಾಗಿದೆ ಎಂದು ಹೇಳಿದರು. ಎಂಟಿಟಿಎಸ್ ಮಾಜಿ ಅಧ್ಯಕ್ಷ ಡಾ. ಎಸ್. ರಾಮೇಗೌಡ ಮಾತನಾಡಿ. ‘ಕಂಪ್ಯೂಟರ್ ನೆಟ್‌ವರ್ಕ್ ಹಾಗೂ ಅದರ ಭದ್ರತೆಗೆ ಹೆಚ್ಚಿನ ಆಸಕ್ತಿ ತೋರಿ ಸೇರಿಕೆ ಎಂದು ಕಿವಿಮಾತು ಹೇಳಿದರು. ‘ಡಿಜಿಟಲ್ ಸಿಗ್ನೇಚರ್’ ವಿಧಾನದಿಂದ ಎಂತಹವರ ಸಹಿಯನ್ನಾದರೂ ಮಾಡಬಹುದು. ಇದು ಭವಿಷ್ಯದಲ್ಲಿ ಅವಶ್ಯಕತೆಗಳನ್ನು ಸೃಷ್ಟಿಸಬಹುದು. ಆದ್ದರಿಂದ ಪ್ರತಿ ಹಂತದಲ್ಲೂ ಎಚ್ಚರವಿರಬೇಕು ಎಂದು ಅವರು ಮಾರ್ಗದರ್ಶನ ನೀಡಿದರು.

ಅಧ್ಯಕ್ಷತೆ ವಹಿಸಿದ್ದ ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯದ ಕುಲಪತಿ ಪ್ರೊ. ಎಚ್.ಎ.ರಂಗನಾಥ್ ಅವರು ಮಾತನಾಡಿದರು. ಶೈಕ್ಷಣಿಕ ಪ್ರಗತಿಯ ಉದ್ದೇಶದಿಂದ ಕಾಲೇಜು ಕೈಗೊಳ್ಳುವ ಕಾರ್ಯಕ್ರಮಗಳಿಗೆ ವಿಶ್ವವಿದ್ಯಾಲಯ ಎಲ್ಲ ರೀತಿಯ ನೆರವು ನೀಡುವುದಾಗಿ ಭರವಸೆ ನೀಡಿದರು. ಅಮೆರಿಕದ ಲೂಸಿಯಾನಾ ರಾಜ್ಯ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಕಂಪ್ಯೂಟರ್ ಸೈನ್ಸ್ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥ ಪ್ರೊ. ಎಸ್.ಎಸ್. ಅಯ್ಯಂಗಾರ್, ಭಾರತೀಯ ವಿಜ್ಞಾನ ಸಂಸ್ಥೆಯ ಕಂಪ್ಯೂಟರ್ ವಿಭಾಗದ ಪ್ರಾಧ್ಯಾಪಕ ಪ್ರೊ. ಎಲ್.ಎಂ. ಪಟ್ಟಾಯರ್, ಕಾಲೇಜಿನ ಪ್ರಾಚಾರ್ಯ ಹಾಗೂ ಎಂಜಿನಿಯರಿಂಗ್ ವಿಭಾಗದ ಡೀನ್ ಪ್ರೊ. ಕೆ.ಆರ್. ವೇಣುಗೋಪಾಲ್ ಕಾರ್ಯಕ್ರಮದಲ್ಲಿ ಉಪಸ್ಥಿತರಿದ್ದರು.

# ಇಂಪೆಟಸ್ 2011 ಉದ್ಘಾಟನೆ



ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿದ್ಯಾಲಯವು ಆರೋಜಿಸಿದ್ದ, "ಇಂಪೆಟಸ್ 2011" ಎಂಬ ಕಾರ್ಯಕ್ರಮವನ್ನು ಉದ್ಘಾಟಿಸಿದ ಮೈದಂ ಪ್ರೀ ಸಂಸ್ಥೆಯ ಸಿ.ಎ.ಪಿ.ಎಸ್. ಪಾರ್ಥಸಾರಥಿ ಹಾಗೂ ಲೂಸಿಯಾನಾ ರಾಜ್ಯ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಪ್ರೊ. ಎಸ್.ಎಸ್. ವಿಯ್ಯಂಗಾರ್ ಮತ್ತಿತರರು. ಡಾ. ವೇಣುಗೋಪಾಲ್ ಕೆ.ಆರ್. ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ವಿವರ ವಿಷಯ ಮಾತುಕತೆ ನಡೆಸುತ್ತಿರುವುದು.

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿದ್ಯಾಲಯದ "ಇಂಪೆಟಸ್ 2011"ರ ಉದ್ಘಾಟನೆಯನ್ನು ಮೈ.ಎಸ್. ಪಾರ್ಥಸಾರಥಿ, ಸಿ.ಎ.ಪಿ. ಮೈಂಟ್ ಪ್ರೀ ಸಂಸ್ಥೆ ಹಾಗೂ ಡಾ. ಎಸ್.ಎಸ್. ವಿಯ್ಯಂಗಾರ್, ಮುಖ್ಯಸ್ಥರು, ಗಣಕ ವಿಜ್ಞಾನ ವಿಭಾಗ, ಲೂಸಿಯಾನಾ ರಾಜ್ಯ ವಿಶ್ವವಿದ್ಯಾಲಯ ಇವರು ನೆರವೇರಿಸಿದರು.

ಈ ಸಂದರ್ಭದಲ್ಲಿ ಮಾತನಾಡಿದ, ಮೈ.ಎಸ್. ಪಾರ್ಥಸಾರಥಿಯವರು ಜಾಗತಿಕ ಮಾರುಕಟ್ಟೆಯಲ್ಲಿ ಏಕೆ ಉದ್ಯಮವು 1.6 ಟ್ರಿಲಿಯನ್ ಡಾಲರ್ ಮೌಲ್ಯದ ಪಾಲು ಹೊಂದಿದೆ. ಈ ಬೃಹತ್ ಉದ್ಯಮದಲ್ಲಿ ಭಾರತವು ಶೇ 60 ರಷ್ಟು ಸಂಪನ್ಮೂಲ ಹೊಂದಿದೆ. ಗ್ರಾಹಕರ ನಿರೀಕ್ಷೆಗಳ ಪೂರೈಕೆ, ಅವಿಷ್ಕಾರಿ ಕೌಶಲ್ಯಗಳು ಹಾಗೂ ವಿಶಿಷ್ಟ ವೇತನ ಹಂಚಿಕೆಗಳಿಂದಾಗಿ ಭಾರತವು, ಏಕೆ ಉದ್ಯಮದಲ್ಲಿ ಬೆಳವಣಿಗೆಯತ್ತ ದಾಖಲಾಗಲು

ಜಾಗತಿಕ ಗುಣಮಟ್ಟದ ಶಿಕ್ಷಣ, ತರಬೇತಿ ಹಾಗೂ ಸೌಲಭ್ಯಗಳ ಅವಶ್ಯಕತೆಯಿದೆ ಎಂದರು.

ಅಧ್ಯಕ್ಷೀಯ ಭಾಷಣ ಮಾಡುತ್ತಾ, ಡಾ. ವೇಣುಗೋಪಾಲ್ ಕೆ.ಆರ್. ಪ್ರಾಂಶುಪಾಲರು, ಯು.ಪಿ.ಸಿ.ಒ. ಒಳಗೆ ಹೇಳಿದರು. ನಮ್ಮ ದೇಶವು ವಿಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನ ವಿಭಾಗದ ಮೂಲ ಬೆಲೆಗಳನ್ನು ಹೊಂದಿದೆ. ಪ್ರಸ್ತುತ 30 ಲಕ್ಷ ಪದವೀಧರರನ್ನು ಉತ್ಪಾದಿಸುತ್ತಿದ್ದು ಅವರಲ್ಲಿ 7.5 ಲಕ್ಷ ಇಂಜಿನಿಯರಾಗಿದ್ದಾರೆ. ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ ವಿಭಾಗವು 1/3 ರಷ್ಟು ಇಂಜಿನಿಯರಿಂಗ್ ಪದವೀಧರರಿಗೆ ಉದ್ಯೋಗ ಕಲ್ಪಿಸುತ್ತಿದೆ ಮತ್ತು ಒಂದು ಬಿಲಿಯನ್ ಡಾಲರ್‌ನಷ್ಟು ಹಣ ಹೊಸ ಉದ್ಯೋಗಗಳನ್ನು ತರಬೇತುಗೊಳಿಸುವಲ್ಲಿ ವ್ಯಯಿಸಲ್ಪಡುತ್ತಿದೆ.

ಹಾಕಿದೆ. ಹಣಕಾಸು ವಿಭಾಗವು ತನ್ನ ಸೇವೆಯನ್ನು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ ವಿಭಾಗದ ಅವಶ್ಯಕತೆಗಳಿಗೆ ಅನುಗುಣವಾಗಿ ಅಳವಡಿಸಿಕೊಂಡಿದೆ. ಭಾರತ ದೇಶವು ಈ ನಿಟ್ಟಿನಲ್ಲಿ ಉತ್ತಮ ಭವಿಷ್ಯವನ್ನು ಹೊಂದಿದ್ದು, ವಿಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನದ ಬೆಳವಣಿಗೆಯಲ್ಲಿ ಒಂದು ಮುಖ್ಯ ಪಾತ್ರವನ್ನು ಹೊಂದಿದೆ ಎಂದರು.

ಡಾ. ಎಸ್.ಎಸ್. ವಿಯ್ಯಂಗಾರ್ ಅವರು ಭಾರತವು ಸಾಫ್ಟ್ ವೇರ್, ಹಾರ್ಡ್‌ವೇರ್ ಹಾಗೂ ಸೇವಾ ಕ್ಷೇತ್ರದಲ್ಲಿ ಮುಂಚೂಣಿಯಲ್ಲಿ ಏನು ಅಂಶವನ್ನು ಒತ್ತಿ ಹೇಳಿದರು. ಭಾರತೀಯ ವಿದ್ಯಾರ್ಥಿಗಳು ಜಾಗತಿಕ ಮಟ್ಟದಲ್ಲಿ ಸ್ಪರ್ಧಿಸಬೇಕಾದಲ್ಲಿ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದ ಅತ್ಯುತ್ತಮ ಶಿಕ್ಷಣ ಅತ್ಯಾವಶ್ಯಕ ಎಂದು ನುಡಿದರು. ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉದ್ಯೋಗಕ್ಕೆ ಸಮರ್ಥರಾಗಿಸಬೇಕಾದಲ್ಲಿ, ಉತ್ತಮ ಶಿಕ್ಷಕರು, ಸಮರ್ಥರಾಗಿಸಬೇಕಾದಲ್ಲಿ, ಉತ್ತಮ ಶಿಕ್ಷಕರು, ತಯಾರಿಸಬೇಕು ಎಂದು ನುಡಿದರು.

## ಐಟಿಯಿಂದ ಅಭಿವೃದ್ಧಿ ಸಾಧ್ಯ

### ಜಾಗತಿಕ ವಹಿವಾಟಿನಲ್ಲಿ ಭಾರತದ ಪಾಲು ಶೇ.60ರಷ್ಟು

ಬೆಂಗಳೂರು, ಏ.10-ಜಾಗತಿಕ ಮಾರುಕಟ್ಟೆಯಲ್ಲಿ ಐಟಿ ಉದ್ಯಮ 1.6 ಟ್ರಿಲಿಯನ್ ಡಾಲರ್ ಮೌಲ್ಯದ ಪಾಲು ಹೊಂದಿದ್ದು, ಈ ಉದ್ಯಮದಲ್ಲಿ ಭಾರತವು ಶೇ.60ರಷ್ಟು ಸಂಪನ್ಮೂಲ ಹೊಂದಿದೆ ಎಂದು ಮೈಂಟ್ ಪ್ರೀ ಸಂಸ್ಥೆ ಸಿ.ಎ.ಪಿ.ಎಸ್. ಪಾರ್ಥಸಾರಥಿ ತಿಳಿಸಿದರು.

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿದ್ಯಾಲಯದ ಇಂಪೆಟಸ್-2011 ಕಾರ್ಯಕ್ರಮ ಉದ್ಘಾಟನೆ ನೆರವೇರಿಸಿ ಅವರು ಮಾತನಾಡಿದರು.

ಗ್ರಾಹಕರ ನಿರೀಕ್ಷೆಗಳ ಪೂರೈಕೆ, ಅವಿಷ್ಕಾರಿ ಕೌಶಲ್ಯಗಳು ಹಾಗೂ ವಿಶಿಷ್ಟ ವೇತನ ಹಂಚಿಕೆಗಳಿಂದಾಗಿ ಭಾರತವು ಐಟಿ ಉದ್ಯಮದಲ್ಲಿ ಬೆಳವಣಿಗೆಯತ್ತ ದಾಖಲಾಗಲು ಹಾಕಿದೆ. ಹಣಕಾಸು ವಿಭಾಗವು ತನ್ನ ಸೇವೆಯನ್ನು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ ವಿಭಾಗದ ಅವಶ್ಯಕತೆಗಳಿಗೆ ಅನುಗುಣವಾಗಿ ಅಳವಡಿಸಿಕೊಂಡಿದೆ. ದೇಶವು ಈ ನಿಟ್ಟಿನಲ್ಲಿ ಉತ್ತಮ ಭವಿಷ್ಯವನ್ನು ಹೊಂದಿದ್ದು, ವಿಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನದ ಬೆಳವಣಿಗೆಯಲ್ಲಿ ಒಂದು ಮುಖ್ಯ ಪಾತ್ರವನ್ನು ಹೊಂದಿದೆ ಎಂದರು.

ಯುಎಸ್‌ಎನಲ್ಲಿ ಉದ್ಯೋಗ ಕಲ್ಪಿಸುವಲ್ಲಿ ಗಣಕ ವಿಜ್ಞಾನ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥ ಡಾ.ಎಸ್.ವಿಯ್ಯಂಗಾರ್ ಅವರು ಭಾರತವು ಸಾಫ್ಟ್‌ವೇರ್, ಹಾರ್ಡ್‌ವೇರ್ ಹಾಗೂ ಸೇವಾ ಕ್ಷೇತ್ರದಲ್ಲಿ ಮುಂಚೂಣಿಯಲ್ಲಿ ಏನು ಅಂಶವನ್ನು ಒತ್ತಿ ಹೇಳಿದರು. ಭಾರತೀಯ ವಿದ್ಯಾರ್ಥಿಗಳು ಜಾಗತಿಕ ಮಟ್ಟದಲ್ಲಿ ಸ್ಪರ್ಧಿಸಬೇಕಾದಲ್ಲಿ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದ ಅತ್ಯುತ್ತಮ ಶಿಕ್ಷಣ ಅತ್ಯಾವಶ್ಯಕ ಎಂದು ನುಡಿದರು.

ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉದ್ಯೋಗಕ್ಕೆ ಸಮರ್ಥರಾಗಿಸಬೇಕಾದಲ್ಲಿ, ಉತ್ತಮ ಶಿಕ್ಷಕರು, ಸಮರ್ಥರಾಗಿಸಬೇಕಾದಲ್ಲಿ, ಉತ್ತಮ ಶಿಕ್ಷಕರು, ತಯಾರಿಸಬೇಕು ಎಂದು ನುಡಿದರು.



ಮಾತನಾಡಿ, ನಮ್ಮ ದೇಶವು ವಿಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನ ವಿಭಾಗದ ಮೂಲ ಬೆಲೆಗಳನ್ನು ಹೊಂದಿದೆ. ಪ್ರಸ್ತುತ 30 ಲಕ್ಷ ಪದವೀಧರರನ್ನು ಉತ್ಪಾದಿಸುತ್ತಿದ್ದು ಅವರಲ್ಲಿ 7.5 ಲಕ್ಷ ಇಂಜಿನಿಯರಾಗಿದ್ದಾರೆ. ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ ವಿಭಾಗವು 1/3 ರಷ್ಟು ಇಂಜಿನಿಯರಿಂಗ್ ಪದವೀಧರರಿಗೆ ಉದ್ಯೋಗ ಕಲ್ಪಿಸುತ್ತಿದೆ ಮತ್ತು ಒಂದು ಬಿಲಿಯನ್ ಡಾಲರ್‌ನಷ್ಟು ಹಣ ಹೊಸ ಉದ್ಯೋಗಗಳನ್ನು ತರಬೇತುಗೊಳಿಸುವಲ್ಲಿ ವ್ಯಯಿಸಲ್ಪಡುತ್ತಿದೆ ಎಂದರು.

ಪ್ರಸ್ತುತ ಭಾರತ ಇಂಜಿನಿಯರಾಗಳಲ್ಲಿ ಶೇ.25 ರಷ್ಟು ಪ್ರಮಾಣ ಮಾತ್ರ ಉದ್ಯೋಗ ಸಮರ್ಥರಾಗಿದ್ದಾರೆ ಮತ್ತು ಈ ಪ್ರಮಾಣವು ಬರುವ 5 ವರ್ಷಗಳಲ್ಲಿ ಶೇ.30ಕ್ಕೆ ಹೆಚ್ಚುವ ಪ್ರಮಾಣವಾಗಿರಬೇಕು ಎಂದು ನುಡಿದರು.

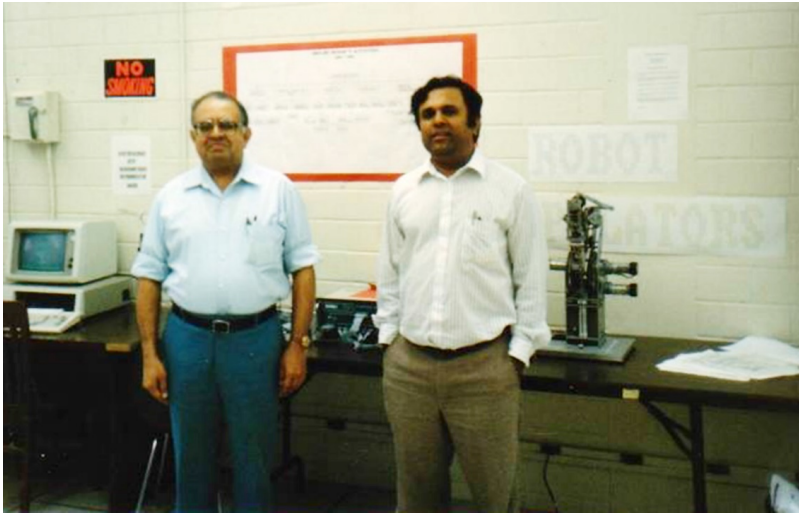
ಬೆಳವಣಿಗೆಯಲ್ಲಿ ಮಾತ್ರ ಜಾಗತಿಕ ಮಟ್ಟದಲ್ಲಿ ಸ್ಪರ್ಧಿಸಲು ಸಾಧ್ಯವಿದೆ ಎಂದು ಅವರು ವಿವರಿಸಿದರು. ಉದ್ಯಮ, ಶಿಕ್ಷಣ ಸಂಸ್ಥೆಗಳ ನಡುವಿನ ಪಾಂಪ್‌ಡವ್‌ನು ಅತ್ಯಂತ ಅಗತ್ಯವಾಗಿದೆ. ಬೆಳವಣಿಗೆಯ ಉದ್ಯಮಗೊಳಿಸುವುದರ ಮೂಲಕ, ಉದ್ಯಮದ ಮೂಲಕ, ಕಲಿಕೆಗೆ ಅವಕಾಶ ಕಲ್ಪಿಸುವುದರ ಮೂಲಕ, ಹಿರಿಯ ತಾಂತ್ರಿಕ ಉದ್ಯೋಗಿಗಳನ್ನು ಆಕರ್ಷಿಸಿ ಶಿಕ್ಷಣದ ಅತ್ಯುತ್ತಮವಾದ ಮೂಲಕ, ಇಂಜಿನಿಯರಿಂಗ್‌ನಲ್ಲಿ ಹೆಚ್ಚಿನವರನ್ನು ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಮರ್ಥರನ್ನಾಗಿಸಬೇಕು ಎಂದು ನುಡಿದರು. ಹಣಕಾಸು ವಿಭಾಗ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥರಾದ ಡಾ. ಸಿ. ದೀಪಾ ಶೆಟ್ಟಿಯವರು ಸಭಾಕಾರ್ಯ ನಿರ್ವಹಿಸಿದರು.



*Dr. Iyengar with President A. Kalam and  
 President of Rice University (Fall 2010)*



*With Former Vice Chancellors Prof. N R Shetty,  
 Dr. N Prabhu Dev, Prof. L M Patnaik, Prof. R  
 Natarajan, Chairman, AICTE and Prof. K R  
 Venugopal K R, Principal, UVCE*



*Meeting Prof. R L Kashyap during his visit at LSU 1989*



*Prof. S S. Iyengar family*

## Article 01: System that senses

S S Iyengar and Jerry Miller Jul 26 2010, 15:31pm IST

Read more at:

<https://www.deccanherald.com/content/83951/sy-stem-senses-danger.html>

Articles published in Deccan Herald and Indian Express

## Article 02: VTU's pact with US varsity to combat crop disease

S S Iyengar and Jerry Miller Jul 06 2011, 00:42am IST

Read more at:

<https://www.deccanherald.com/content/174027/vtus-pact-us-varsity-combat.html>



## Article 03: Roots of modern 'cyber' terrorism in a divided world

S S Iyengar and Jerry Miller Aug 09 2015, 22:53pm IST

Read more at:

<https://www.deccanherald.com/content/494314/roots-modern-cyber-terrorism-divided.html>

## Article 04: Big Data and Cyber Security: What have you given away?

S S Iyengar and Jerry Miller February 4, 2016 0:08 IST

Read more at:

<https://www.deccanherald.com/content/499490/big-data-cyber-security-have.html>

## Article 05: Biometrics and digital forensics: Cyber security connections

S S Iyengar and Jerry Miller Dec 02 2015, 22:48pm IST

Read more at:

<https://www.deccanherald.com/content/515241/biometrics-digital-forensics-cyber-security.html>

Articles published in Deccan Herald and Indian Express



## Article 06: The Darknet, cyber secrets and concealing identity

S S Iyengar and Jerry Miller Feb 03 2016, 23:18pm IST

Read more at:

<https://www.deccanherald.com/content/526816/darknet-cyber-secrets-concealing-identity.html>



## Article 07: Internet as the new Silk Road for the new decade

S Iyengar and Jerry Miller Mar 06 2016, 23:02pm IST

Read more at:

<https://www.deccanherald.com/content/533037/internet-silk-road-decade.html>

## Article 08: IS CyberCaliphate readying for deadly net attacks

S S Iyengar and Jerry Miller Apr 03 2016, 23:21pm IST

Read more at:

<https://www.deccanherald.com/content/538401/is-cybercaliphate-readying-deadly-net.html>

## Article 09: Future cyber security: smart, safe cities

S S Iyengar and Jerry Miller May 16 2016, 22:39pm IST

Read more at:

<https://www.deccanherald.com/content/546867/future-cyber-security-smart-safe.html>

Articles published in Deccan Herald and Indian Express



## Article 10: Telebot and cyber security concerns of a new future

S S Iyengar and Jerry Miller Jul 03 2016, 21:49pm IST

Read more at:

<https://www.deccanherald.com/content/555806/telebot-cyber-security-concerns-future.html>



## Article 11: Robots to counter terrorism: a brave new world?

S Iyengar and Jerry Miller Aug 05 2016, 23:24pm IST

Read more at:

<https://www.deccanherald.com/content/562497/robots-counter-terrorism-brave-world.html>

## Article 12: Ransomware attacks, a growing threat to gadgets

S S Iyengar and Jerry Miller Oct 25 2016, 22:08pm IST

Read more at:

<https://www.deccanherald.com/content/577748/ransomware-attacks-growing-threat-gadgets.html>

## Article 13: A new generation of hacking affects international affairs

S S Iyengar and Jerry Miller Dec 23 2016, 00:23am IST

Read more at:

<https://www.deccanherald.com/content/587883/a-generation-hacking-affects-international.html>

Articles published in Deccan Herald and Indian Express

## Article 14: Cyber security: past, present and future

S S Iyengar and Jerry Miller Feb 26 2017, 23:44pm IST

Read more at:

<https://www.deccanherald.com/content/598460/cyber-security-past-present-future.html>



## Article 15: Cyber security mega breaches: attacks go personal

S Iyengar and Jerry Miller Apr 04 2017, 00:13am IST

Read more at:

<https://www.deccanherald.com/content/604511/cyber-security-mega-breaches-attacks.html>

## Article 16: Hackathons: stretching engineering talent to the maximum

S S Iyengar and Jerry Miller May 08 2017, 23:30pm IST

Read more at:

<https://www.deccanherald.com/content/610525/hackathons-stretching-engineering-talent-maximum.html>

## Article 17: The blockchain drain: fueling new technology

S S Iyengar and Jerry Miller Dec 04 2017, 09:10am IST

Read more at:

<https://www.deccanherald.com/content/646190/blockchain-drain-fuelling-technology.html>

Articles published in Deccan Herald and Indian Express



## Article 18: Who should we believe on AI, Musk or Murthy?

S S Iyengar and Jerry Miller Jan 05 2018, 23:32pm IST

Read more at:

<https://www.deccanherald.com/content/652125/who-should-we-believe-ai.html>



And 7+ articles till 2019



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# Celebration of Success of Dr. Iyengar's Post Docs, Graduate and Undergraduate Students during the last forty years in USA

Aug. 31<sup>st</sup> – Sep 2<sup>nd</sup> 2017

Florida Polytechnic University, Lakeland, Florida



# PART I:

## DR. IYENGAR'S POSTDOC & PHD STUDENTS



**Dr. N. Parameswaran (PostDoc, 1985 & 2006)** is a Senior Lecturer in the School of Computer Science and Engineering, University of New South Wales, Sydney, Australia. He works in the area of ontology based intelligent agent technology, wireless sensors applications, natural language

processing, and video event annotations. His teaching interest includes artificial intelligence, Internet programming, and multi-agent systems. He is currently building scalable policy based applications on wireless computing platforms in health-care domain. He earned his PhD in Computer Science from I.I.S.C.



**Dr. Gregory Vert (PostDoc, 2007)** is currently working at Texas A&M Central, Texas as Assistant Professor from 2009. He earned his BS in Geography field at University of Washington, US. And MS in Information Systems Management at Seattle Pacific University, US. And pursued PhD in Computer Science at University of Idaho, US. Dr. Gregory Vert worked as Senior Postdoctoral Researcher at Louisiana State University, under supervision of Dr. Iyengar. His research

interests include Information Technology and Intelligent Computing, Computer Science and Network Security, Cybernetics, Transactions on Knowledge and Data Engineering. **Email:** greg.vert@erau.edu



**Dr. Noureddine Boudriga (Post-Doc, 2010)** is an internationally known scientist/academic. He received his Ph.D. in algebraic topology from the University of Paris (France) and his Ph.D. in computer science from the University of Tunis (Tunisia). He is currently a professor of telecommunications at the University of Carthage, Tunisia, and the director of the Commu-

nication Networks and Security Research Laboratory (CNAS). Dr. Boudriga is the recipient of the Tunisian Presidential Award in Science and Research (2004). He has served as the General Director and founder of the Tunisian National Digital Certification Agency. He has been very actively involved in research and has authored or co-authored many

chapters and books, including more than 350 published journal and conference papers. Prof. Boudriga is the President of the Tunisia Scientific Telecommunications Society. **Email:** nab@supcom.rnu.tn



**Dr. Rajnish Kumar (PostDoc at LSU and FIU, 2011 & 2012)** is currently serving as Scientist and Assistant Professor at Council of Scientific and Industrial Research (CSIR)-Indian Institute of Toxicology Research (CSIR-IITR), Lucknow-India. His area of research interests are Biochemical and Molecular Neurotoxicology, Stem Cell Neurobiology, regenerative medicine and Neuro-degenerative

disorders. Recently, he is involved to assess the cellular and molecular mechanism of neuro-degenerative disorders, and how environmental toxicants modulate the disease pathogenesis. He is also trying to identify the molecules which can induce "BRAIN SELF REPAIR" by activating resident NSC population. He earned his PhD in Economics from Rice University. **Email:** rajnish.kumar@qub.ac.uk



**Dr. Yongcai Wang (Visiting Researcher, 2014)** is an assistant researcher at Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, headed by Prof. Andrew Yao. He got his BSc degree from Tsinghua University, China in 2001; PhD degree from Tsinghua University China in 2006 (advisors Dazhong Zheng, Qianchuan Zhao). He worked as an associate researcher in

NEC Labs. China from 2007 to 2009. From 2009 to 2011, he was a post doctor at Institute for Interdisciplinary Information Sciences (IIIS). Since 2011, he is an assistant researcher at IIIS. He was a visiting scholar in Cornell University from Feb. 2014 to August 2014. His major research interests lie in the broad area of sensor information fusion, network measurement, wireless locating algorithms, and systems. He co-authored several papers in major network science conferences and journals. He received the best paper awards at Ubicomm2009 and CWSN2011. He holds several Chinese and international patents on ultrasound locating systems. His research results "ultrasound locating system" were commercialized by NEC and exhibited in World Expo 2014. **Email:** wangyc@tsinghua.edu.cn



**Dr. S. V. N. Rao (1988)** received his B.Tech in Electronics and Communications Engineering from Regional Engineering College, Warangal, India. Then, he got his ME in Computer Science and Automation from Indian Institute of Science in 1984. He finished his PhD under supervision of Dr. Iyengar from Louisiana State University. He served as an Assistant Professor in Department of Computer Science, Old

Dominion University from 1988 to 1993. He was the UT-Battelle Corporate Fellow (2001), Distinguished Staff Member (2001), Senior Staff Member (1997) and Staff Member (1993) in Oak Ridge National Laboratory. His research interests include sensor networks, robotics and algorithms. **Email:** raons@ornl.gov



**Dr. Sudharsan R. Iyengar (1989)** received his PhD in Computer Science under supervision of Dr. S. S. Iyengar from Louisiana State University. His dissertation title was "A Framework for Efficient Execution of Logic Programs". His research interests include Artificial Intelligence and Intelligent Systems, Object Based Systems Development, Distributed Applications and Systems, Embedded Controls, Programming Languages and their Design, Algorithms and Data Structures, and Concurrency. His current research projects include Modeling, and developing, the kernel for a Speech/Chant/Music Generating Artificial System, Developing a Universal Cognitive Platform for Audio, Video, and Analytical Reasoning, and Alliteration and Memory Models. **Email:** siyengar@winona.edu

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**Dr. Tai-Tsung Ho (1989)** was born in Keelung, Taiwan in 1957. He earned his bachelor degree in Industrial Engineering from National Tsing Hua University, Taiwan in 1980. He served as a lieutenant in The Army of Republic of China from 1980 to 1982. He earned his masters in Industrial Engineering from Louisiana State University in 1985. After that he joined the Computer Science PhD. program.

His major research interest is in VLSI design automation. He received the Ph.D. degree in December 1989.

**Dr. Wu Wang (1989)** received his B.S. degree in computer science from Zhongshan University, Canton, China in 1984. In August, 1987, he joined the Department of Computer Science at Louisiana State University, Baton Rouge, Louisiana for his Ph.D. program. He performed research on robot planning, speech recognition, natural

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industry, he has worked on development of medical instrument systems and real-time network control systems for some years. His technical papers have appeared in computer science journals and conferences. **Email:** wuwang@yahoo.com



**Dr. Yujean Sheng (1990)** graduated with a Ph.D in computer science from Louisiana State University under Dr. S.S. Iyengar in 1990. Upon graduation, he started as an assistant professor of computer science at Western Illinois University, where he eventually served for 10 years and earned a tenured professorship. He continued his academic career for 5 more years at Northern Illinois University. Later during his professional career,

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**Dr. Mohan B Sharma (1990)** received the bachelor's and master's degree, both in electronics engineering, from Mysore University, India, and the PhD degree under supervision of Dr. S. S. Iyengar from the Department of Computer Science, Louisiana State University, Baton Rouge, in 1990. After his PhD career, he joined the Distributed Processing Group of IBM in Austin, TX. He is currently working for a company in Bangalore, India. **Email:** sharma@dssl.austin.ibm.com

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**Dr. Sridhar Radhakrishnan (1990)** is a professor and the Director of the School of Computer Science at the University of Oklahoma, where he joined in 1990. He received his PhD in Computer Science from Louisiana State University in 1990. Dr. Radhakrishnan's research interests are in algorithm development and Computer Networks. His work has resulted in many protocol development for broadband networks, wireless and mobile networks, and RFID Systems. He is

currently working on the development of protocols at the intersection of Internet-of-things (IOT) and Software Defined Networks. He also actively involved in the development of algorithms for high performance computing, especially on desktop parallel computing systems. He has published over 100 research articles in journals, conference proceedings, and book chapters. **Email:** sridhar@ou.edu



**Dr. Sandeep Gulati (1990)** is a Ph.D, co-founder of ViaLogy LLC in 1999. He serves as its Chief Technical Officer and Vice President of Product Development. Dr. Gulati co-founded Arroyo Sciences, Inc. and has been its founding Chief Technology Officer and founding Chief Financial Officer

since 2002. He was Co-Founder of ViaLogy plc (Formerly, ViaLogy Corp.) and served as its Chief Technical Officer, Chief Scientific Officer and Vice President until June 13, 2014. He was the Founder of Zyomed Corp. He served as Chief Technology Officer at ViaLogy plc until June 13, 2014. He served as Chief Technology Officer and Vice-President of eServices and Exchange Development of ViaChange.com, Inc. ("ViaChange") from March 2000 to December 2001. He served as the Head of the Ultracomputing Technologies Group within the Information Technologies & Software Systems Division at NASA Jet Propulsion Laboratory (JPL) from 1988 to 2000. He also served as NASA Jet Propulsion Laboratory from 1988 to 2000. During his 12 years at JPL, he led computational advances in spacecraft autonomy, autonomous diagnostics and prognostics of complex systems, sensor fusion, neural networks, signal processing, command decision modeling and intelligence analysis and was also a Principal Scientist on a number of programs of national relevance such as the Department of Defence's Joint Strike Fighter, NASA's Reusable Launch Vehicle, the oil industry's DEELOOK Consortium, predictive intelligence capability for Army's AI-Source Analysis System, and subsurface imaging for cleanup of formerly used contaminated defence sites. He collaborated on strategic programs with Lockheed Martin, Boeing, Northrop Grumman, McDonnell Douglas, Rockwell, Pratt & Whitney, and NASA Center. Dr. Gulati has over 13 issued patents, over 30 patents pending and over 100 publications in archival journals and conferencing proceedings. Dr. Gulati holds a B.Tech. in Computer Science from the Indian Institute of Technology, New Delhi, India; a PhD in Computer Science from Louisiana State University and an MBA from Pepperdine University. **Email:** sandeep.gulati@zyomed.com



**Dr. Rajendra Srivastava (1990)** received his PhD in Computer Science under supervision of Dr. Iyengar from Department of Computer Science, Southern University, Baton Rouge in May 1990. His PhD dissertation title was "Parallelization of Goal Driven Production Systems on Hypercube machines in 'C' Environment Place of Employment. He was among the first students who were advised by Dr. Iyengar during their PhD

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**Dr. Krishna Kumar Narayanan (1991)** joined the Ecrio company in 1999 and now directs the Ecrio engineering team. He also manages off-shore teams responsible for development, product engineering and technical support. Mr. Narayanan has over 22 years of industrial experience in software development and product delivery in the areas of mobile communications, systems programming, computer graphics and image processing. Prior to joining Ecrio, he developed software and firmware for an intelligent server monitoring device at Mirapoint, Inc. At Silicon Graphics, he led a team of engineers in the mid-range graphics workstations group. Mr. Narayanan started his career as a principal engineer at Digital Equipment Corporation, designing advanced graphics and image processing algorithms for hardware based graphics accelerators. He holds a B.S degree in Electrical and Electronics Engineering from Indian Institute of Science, Bangalore, India, and a Ph.D in Computer Science from Louisiana State University. **Email:** knarsylvaner@gmail.com

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**Dr. Maung Htay (1992)** was born in Kyaiklat, Union of Myanmar (formerly Burma). He received his B.S. and M.S. degrees in Mathematics from the University of Rangoon in 1971 and 1979, respectively. He also obtained his M.S. degree in Computer Science from the University of London in 1976. He joined the Ph.D. program in the Department of Computer Science at Louisiana State University, Baton Rouge, Louisiana in August, 1988

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**Dr. Gili Mendel (1993)** is an IBM Master Inventor and a Senior Technical Staff Member. He has been working for IBM since 1993 leading the development of various software products. These products span highly parallel device drivers for AIX clusters, to Eclipse based and now Cloud-based tools. He received his PhD degree in

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1988. He joined the Ph.D. program in the Department of Computer Science in January, 1989 and received his degree under supervision of Dr. Iyengar in 1993. His research interests are in the area of graphics algorithms, in particular raster algorithms, ray tracing, the design and animation of objects, and the application of antialiasing techniques in computer graphics. **Email:** philagra@yahoo.com



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ment: Consultant to State Agencies".

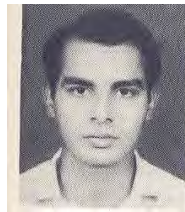


**Dr. Weian Deng (1993)** is an experienced and result-driven software engineering leader with over 16 years of experience in architecting, designing, and building scalable distributed computing systems. He led eBay's SOA and middleware platform development; co-authored multiple patents; and drove the effort to open source eBay's SOA solution. He is the key contributor to Hipbone (now Kana)'s chat and collaboration product. Dr. Deng architected and led the development of VoyagerTrack, a Real-time Container Terminal Operation System. **Email:** dengweian@yahoo.com

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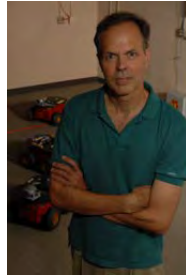
**Dr. Lakshman Prasad (1995)** Lakshman Prasad received a master's degree in Mathematics from the Indian Institute of Technology, Kanpur, India in June 1986. He is currently a graduate research assistant in the Theoretical Division of the Los Alamos National Laboratory. His research interests include wavelet based image analysis & numerical analysis, computational geometry, chaos & dynamical systems.

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for combat command and control (ONR), detection of protocol tunneling through encrypted channels (AFOSR), security of intelligent building technologies (NIST), experimental analysis of Denial of Service vulnerabilities (NSF), mobile code security (ONR), and security analysis of cellular networks used for vehicle remote diagnostics (BMW). Dr. Brooks' current research interests include game theory, strategic reasoning, and information assurance. He was PI of the Mobile Ubiquitous Security Environment (MUSE) Project sponsored by ONR as a Critical Infrastructure Protection University Research Initiative (CIP/URI). It concentrated on creating distributed countermeasures to overcome large-scale network attacks like distributed denial of service and worms. Dr. Brooks was co-PI of a NIST project defining the security standards and protection profiles for the ISO BACNET networked building control systems standard. Dr. Brooks was co-PI of a DARPA ISO program coordinating air campaign command and control and PI of the Reactive Sensor Networks (RSN) Project sponsored by DARPA IXO. RSN explored collaborative signal processing to aggregate information moving through the network, and the use of mobile code for coordination among intelligent sensor nodes. He has received DURIP awards from ONR and ARO that support the study of networked systems interacting with the real world. Current projects include authentication and authorization of exascale computing systems and establishing Internet freedom in West Africa. His Ph. D. dissertation received an exemplary achievement certificate from the Louisiana State University graduate school. **Email:** rrb@clemson.edu



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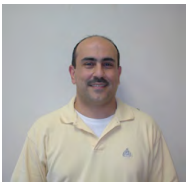
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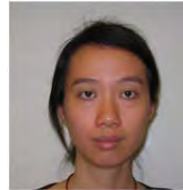
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the innovative principles on which Florida Poly has been built. Dr. Ding ascribes to the Florida Poly philosophy that STEM education should be seamlessly integrated with industrial collaboration and application-oriented research to yield effective solutions to challenges in current STEM education, particularly with low retention rates. He believes that Florida Poly, as a brand-new institution, offers opportunities for faculty members to establish their careers in teaching, research and professional development. Dr. Ding's recent research has covered wireless networks and cyber security in general, and cyber-physical systems, future Internet architecture, soft defined networks, the Internet of things, and security and energy issues in sensor networks, in particular. Dr. Ding takes an independent approach in research, which has resulted in two books, five book chapters, and many peer-reviewed journal and conference papers. Dr. Ding has a total of nine years of full-time teaching experience at four-year U.S. universities. He can teach most undergraduate courses in the areas of computer science, information systems, and information technology, as well as many graduate courses in and beyond his specialty areas. His most experienced areas in teaching include programming, computer networks, cyber security, databases, operating systems, computation theory, artificial intelligence, and information retrieval. He has served as technical program committee member for many IEEE/ACM conferences. In addition to research and teaching experience, Dr. Ding has 10 years of industrial experience in IT-related businesses in China that involved several successful applications of IT theories in the real world. He is proficient in 10+ programming languages as well as multiple web languages, parallel/high-performance computing languages and various operating systems and network technologies. He is a registered engineer in China, where he patented his design for an electronic ear. One of his recent research projects is entitled Simultaneous Limited Two Way Flooding Applying Gossiping in NDN (Named Data Network) Based Wireless Ad-Hoc Networks. NDN is the most popular architecture for future Internet. This project tests and quantifies how much gain in data transmission could result from the gossip style two-way limited flooding. Traditional ad-hoc networks use only data (producer) initiated one-way flooding while NDN-based networks normally only use interest (consumer) initiated one-way flooding. He plans to submit a proposal based on this project to NSF Networking Technology and Systems (NeTS) program in 2015. In his PhD dissertation, Effective Bootstrapping of Peer-to-Peer Networks over Mobile Ad-Hoc Networks, a new protocol RAN (Ring Ad-hoc Network) was designed to build a ring in node ID space. RAN initializes ring-based P2P systems over mobile ad hoc networks (MANETs). Upon this ring, the entire P2P system could start normal operations without lengthy stabi-

lization. He deepened this research after graduation. As a result, he published a book entitled "Synergy of Peer-To-Peer Systems and Mobile Ad-Hoc Networks: Bootstrapping and Routing" in 2009, a book chapter, along with three peer-reviewed conference papers. **Email:** wding@flpoly.org



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matrix, and efficient computation techniques using linear kernels. His academic experience includes Visiting Assistant Professor (2015) at Oklahoma State University, Postdoctoral Research Scientist (Air Force Research lab, 2014). Prior to defending his thesis at FIU, he was a Ph.D. candidate at International Institute of Information (IIIT) and published over

17 research papers. He completed his MSCIS from UNH (1987), CT, and was embedded kernel intern between 1988-1990 working on Genesis Control Series. He joined UC Berkeley (extension) in 1992 and also worked as Software Design Engineer for 11 years (1991-2002) in the San Francisco Bay Area. Prior to becoming a graduate student, he completed B.Eng. in ECE (1985) followed by a Pre-PhD (2004) including the best paper in CSI-2005 both from Osmania University, India. **Email:** iyer@ucmo.edu



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**Dr. A S M Hasan Mahmud (2016)** has 5 years of research and 4 years of solid software development experiences in the industry. He has implemented several data center resource management software systems in Java, Matlab, C/C++, etc. As a researcher, he has published 10 papers in prestigious venues (e.g., IFIP Performance 2013,

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## DR. IYENGAR WITH COLLABORATORS



Fig. 1: Dr. Iyengar doing programming in 1970's.



Fig. 2: Dr. Puneeth Iyengar, BS (MIT), MD PhD (Albert Einstein College of Medicine). He is assistant professor at University of Texas Southwestern Medical Center, Dallas. He is Dr. Iyengar's first son who has collaborated with him in some research projects.



Fig. 5: Mr. Veneeth Iyengar, BS (Purdue), MS (John Hopkins University). He is the Vice President of Sage and Dr. Iyengar's second son.



Fig. 3: Dr. Vijeth Iyengar, BS (Tulane), MA, PhD (Duke University). He is awarded the Presidential Assistantship Fellowship from NIH, Washington. He is Dr. Iyengar's youngest son.



Fig. 6: Dr. Iyengar (left) in 1970's with his major professor Dr. Brown (center).



Fig. 4: Dr. Iyengar with a number of collaborators and Dr. Ramamoorthy in Berkeley, 2000.



Fig. 7: Professor Bastani (right), Professor Ramamoorthy (middle), and Mrs. Iyengar (left).



Fig. 8: With Associated Director of Oak Ridge National Lab, Dr. Zachariah (middle) in 1995.



Fig. 11: Dr. Iyengar awarding an undergraduate student, at LSU, 2004.



Fig. 9: Faculty Development University Research and Training Information Assurance and Computer Security Workshop funded by NSF in 2007.



Fig. 12: Dr. Iyengar's undergraduate students, LSU, 2004.



Fig. 10: From left to right: Dr. Rao, Professor Iyengar, Dr. Oscar Garcia, and Professor Ramamoorthy.



Fig. 13: Faculty Student Workshop, 2009.



Fig. 14: Dr. Iyengar's former graduate student.



Fig. 17: Student faculty retreat. With Dr. Vir Phoha and Dr. Greg Vert.



Fig. 15: Discussion session with Faculty and Students in LSU, 2005.



Fig. 18: Dr. Iyengar's graduate student in Robotics lab in LSU, 2009.



Fig. 16: Dr. Iyengar's students and collaborators in 2009.



Fig. 19: Collaborators and Graduate Students.



Fig. 20: Mr. and Mrs. Iyengar with the Infosys Founder, Dr. Narayana Murthy.



Fig. 23: Distinguished Computer Scientists meeting in 2000.

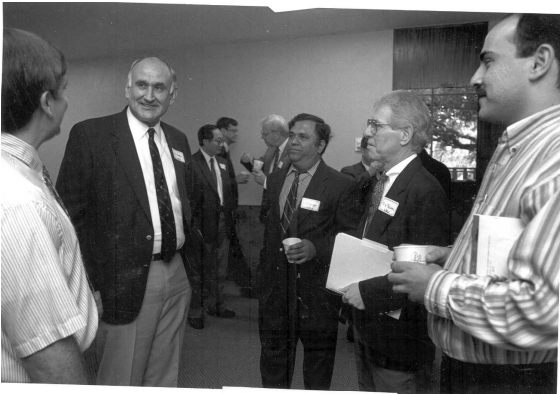


Fig. 21: Faculty meeting with the President of LSU William Jenkins and Dean Rabideau, 1994. From left to right: President Jenkins, Professor Iyengar, Dean Rabideau, and Dr. Khalaf.



Fig. 24: Professor Mani Chandy of Cal tech (left), Dr. Srinivas (middle) and Dr. Supratik (right).



Fig. 22: Dean Carman and Chancellor Martin of LSU in 2009 during the distinguished award ceremony.

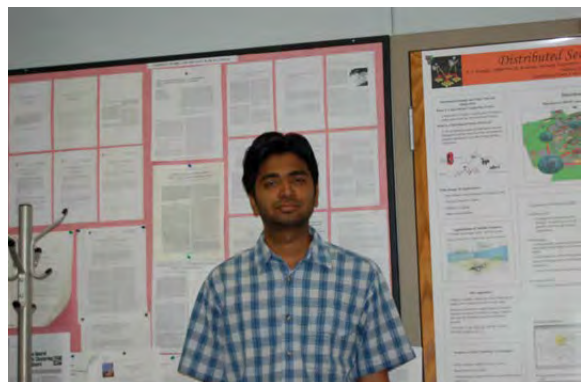


Fig. 25: Dr. Iyengar's former graduate student in a conference.



Fig. 26: With his family, Dr. Vert, Dr. Srinivas and other graduate students, 2009.



Fig. 29: Roy Paul Daniels Professors Award to Dr. Iyengar by Junior Roy Paul Daniels in 2002.



Fig. 27: From right to left: Professor Ramamoorthy, Professor Garcia , Professor Iyengar and Mrs. Iyengar.



Fig. 30: Robotics Lab Showcase in LSU.



Fig. 28: Former PhD Student and Raj Reddy (CMU).



Fig. 31: From left to right: Professor Iyengar, Professor Vint Cerf, Professor Ed Seidel of UIUC, Dr. Iyengar, and Professor Don Kraft (LSU).



## PART II:

# DR. IYENGAR'S Masters Students 1985-2017



Atul Batra



Balaji Narayan



Bharath



Bollapragada Satya Ravi



Brian Pangburn



Cariappa Mallanda



Deepak Nadig



J.R. Mahexh



Amit Nanavati



Anantha Prasad



Ankur Suri



Jong Hoon Kim





## PART II:

# DR. IYENGAR'S Masters Students 1985-2017



Nitin Naik



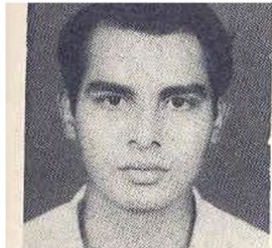
Salil Menon



Sandeep Gulati



Sanjoy Bardharan



Sankar KrishnaMurthy



Sathish T Gopalrao



Shankar Ram



Shyam Cukkemane



Karthik Nagabandi



Kianoosh Borojoni



KrishnaKumar Narayan



Mengxia Zhu





## PART II:

# DR. IYENGAR'S Masters Students 1985-2017



Sumanth Yyenduri



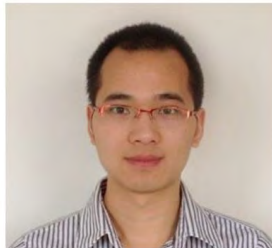
Sumeet Dua



Viyay Veeranna



Ying Chen



Zhi Li May



Sudharshan Iyengar

A.S. Rau	Anand Ganeshan	Ashish G. Tilwe
Ashok Chidige	Ayyappa Chowdhary Veerapaneni	John Fuller
Ashok Chidige	Ayyappa Chowdhary Veerapaneni	John Fuller
G. Pardhy	Gautham Udeshi	Hsi Chang
Mahesh Dandapani	Neelay Shah	R.P. Singh
Raghuram Yedatore	Ratika Natarajan	S. Bose
S. Chauhan	Sandeep Bandi	Sarath C Peddi
Shivarama krishnan Subramanian	Sona Mrinal	Sridhar Karra
Sumathi Nagaraj	Suresh R. Tammana	Swati Dubbaka
Weisung Chen	Yan Xia	Z. Ying
Venkatesh Nadamuni	V. Sridhar	V.B. Srinivasa





### PART III:

## DR. IYENGAR'S UG Students 1985-2017



Daniela



Fernando de



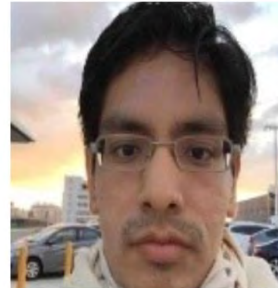
Francisco



Irvin Cardenas



Leo Shao



Uwe Cerron



Eduardo Dennis



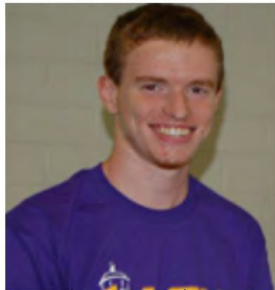
Lazaro Herrera



Seth Robertson



Ankith Tandon



Andrew Hughes



Martin S.





## PART III: DR. IYENGAR'S UG Students 1985-2017

Brian McMahon	Dimmetric Houston	Eric Roberts
Jeff Dereus	John Deries Banef	V. Raman
Williams Rummler		

Congratulations and Happy 70<sup>th</sup> Birthday  
 to  
**Prof. S. S. Iyengar**  
 in Celebration of Years of Dedicated  
 Service  
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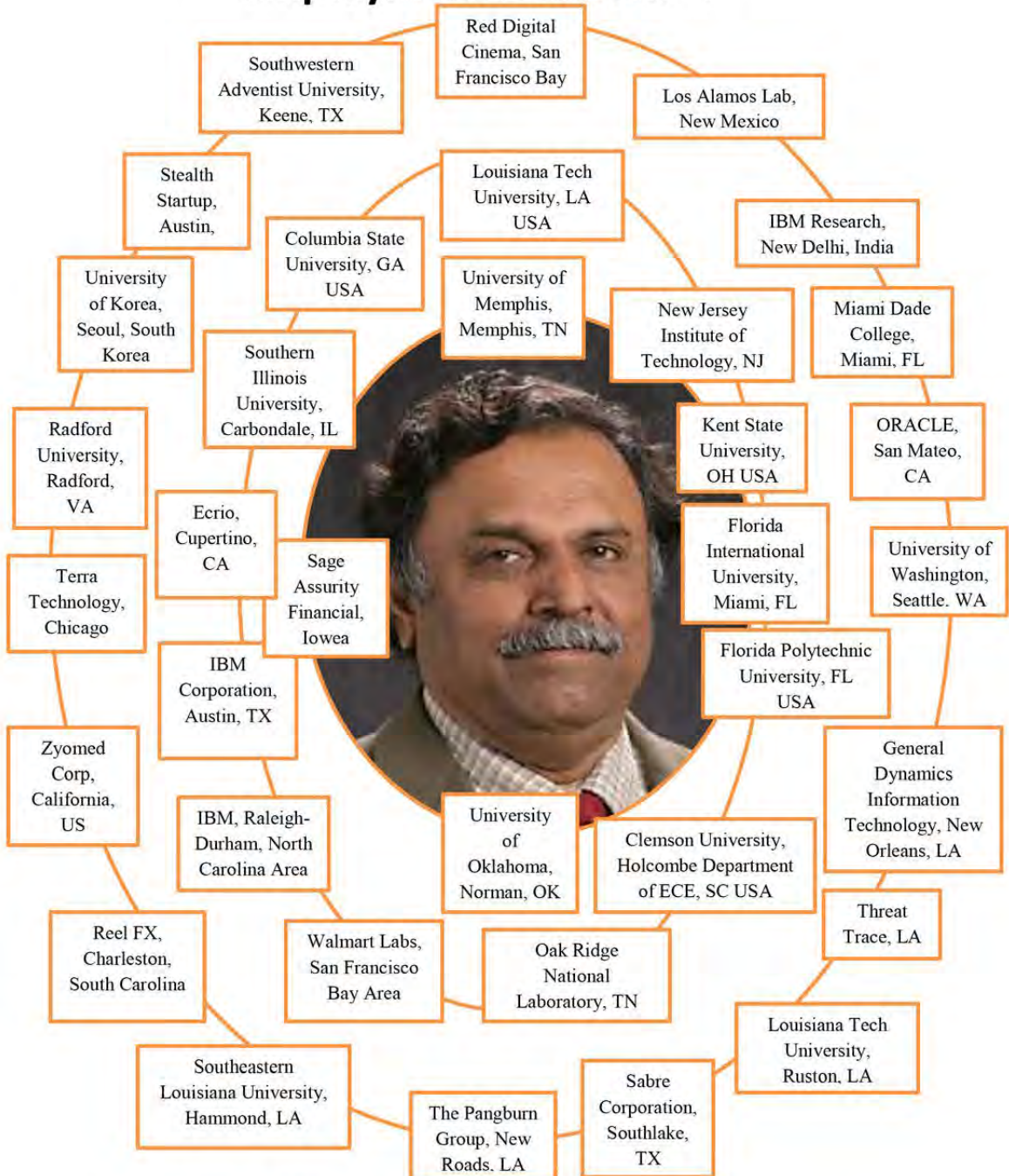
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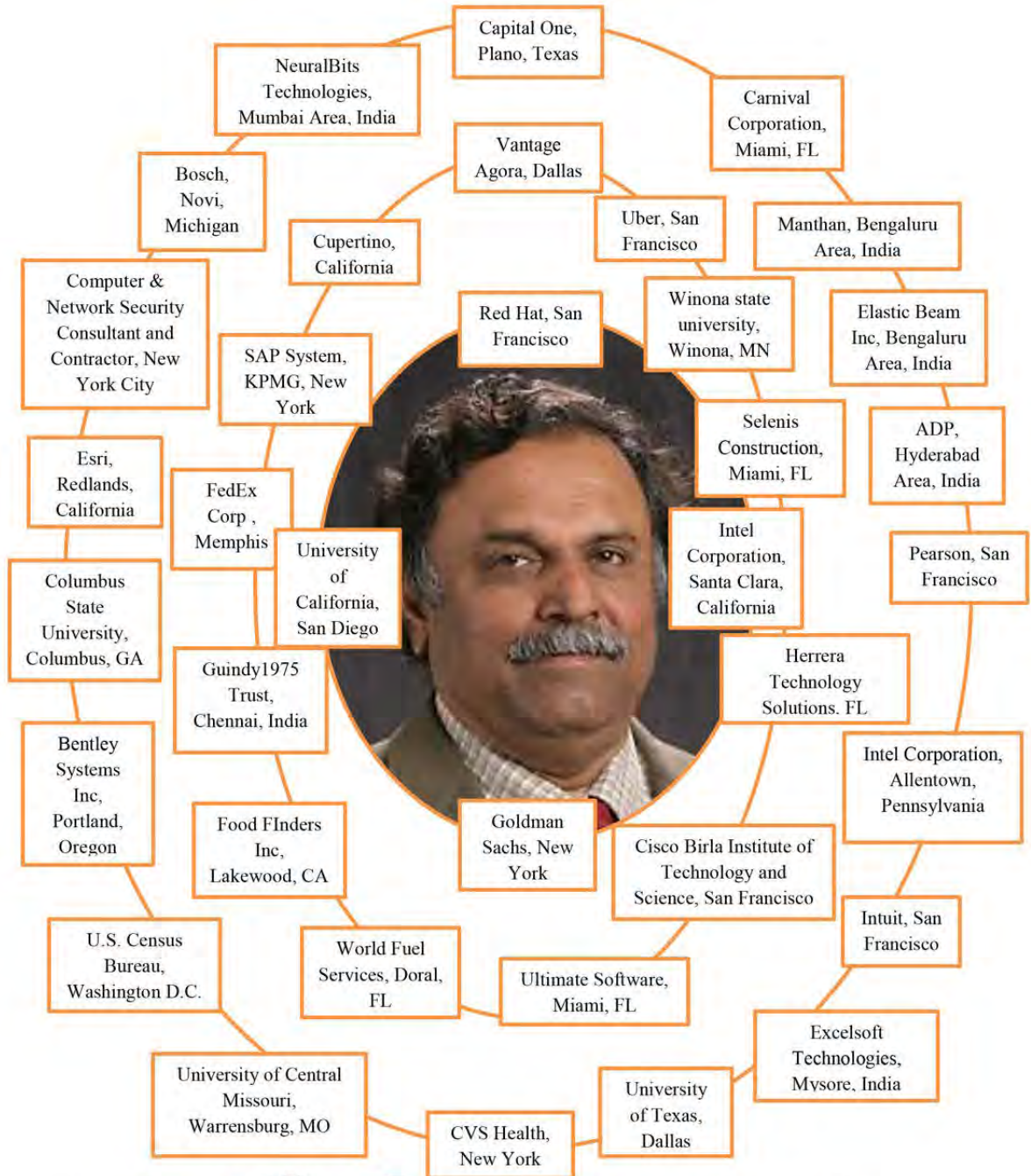


# Dr.S.S.Iyengar's Former Students Employment Network - I



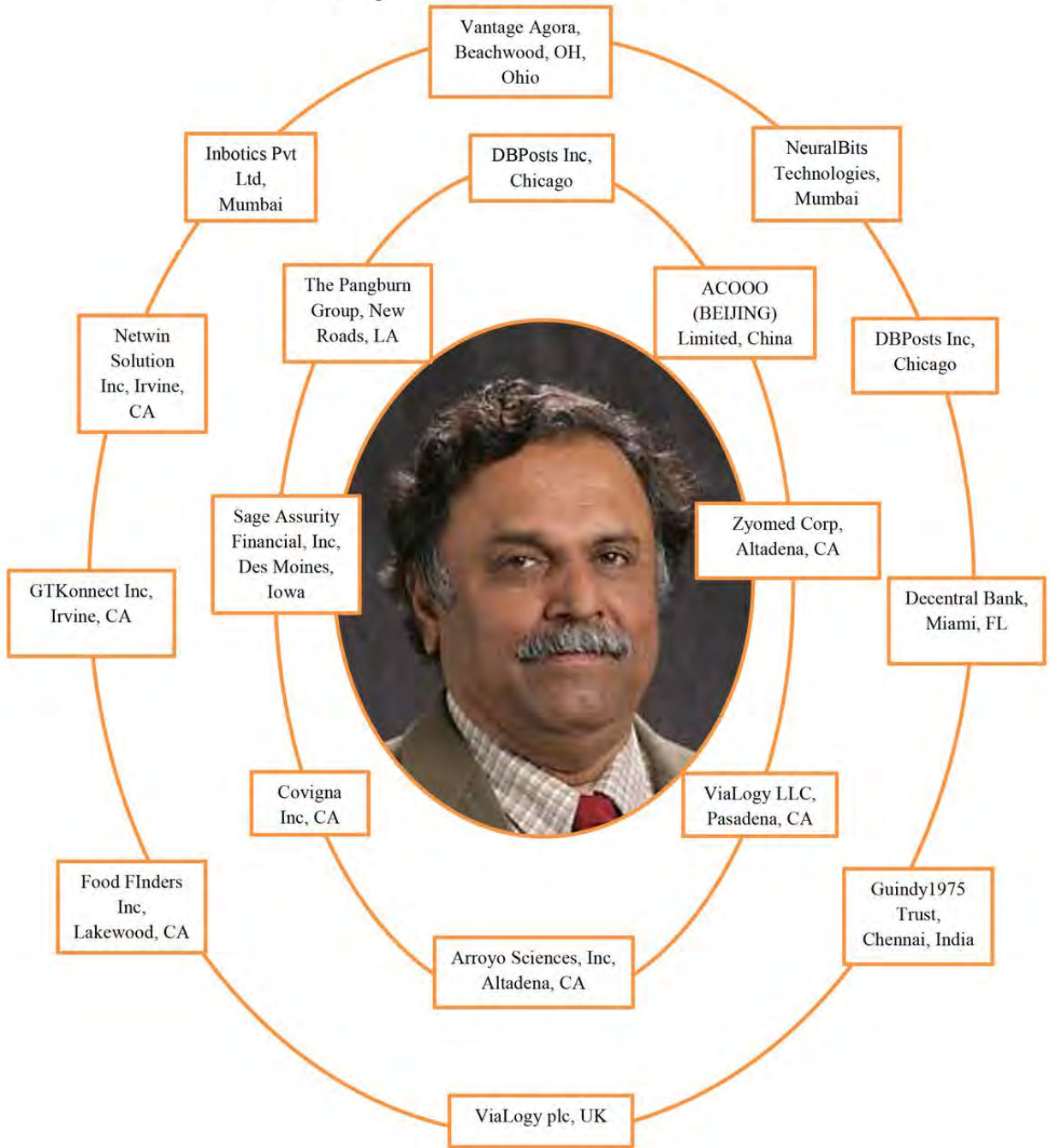


# Dr.S.S.Iyengar's Former Students Employment Network - II





# Dr.S.S.Iyengar's Former Students Entrepreneurs Network



Congratulations and Happy 70th Birthday  
to  
Director and Ryder Professor S.S. Iyengar



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**Dr. S.S. Iyengar** is a Ryder Distinguished Professor and Director of the School of Computing and Information Sciences at Florida International University, USA. He is an ACM Fellow, IEEE Fellow, AAAS Fellow, and NAI Fellow.

**Thejas Gubbi Sadashiva** is a Ph.D. candidate at the School of Computing and Information Sciences (SCIS), Florida International University (FIU) under the supervision of Dr. S.S. Iyengar and external guidance of Dr. N. R. Sunitha. He received his Bachelor's degree in Computer Science and Engineering from Sri Siddhartha Institute of Technology (SSIT) in 2009. He completed his Master's degree in Computer Science and Engineering (M.Tech) from Sri Siddhartha Institute of Technology (SSIT) in 2011. He worked as a trainee for one year at Defence Research and Development Organization/Electronic and RADAR Development Establishment (DRDO/LRDE). His areas of research include Machine Learning, Deep Learning, Cybersecurity, Human Computer Interaction (HCI), and Performance Optimization using parallel computing. Thejas worked as an Assistant Professor for five years at Siddaganga Institute of Technology (SIT) before commencing his PhD at FIU

