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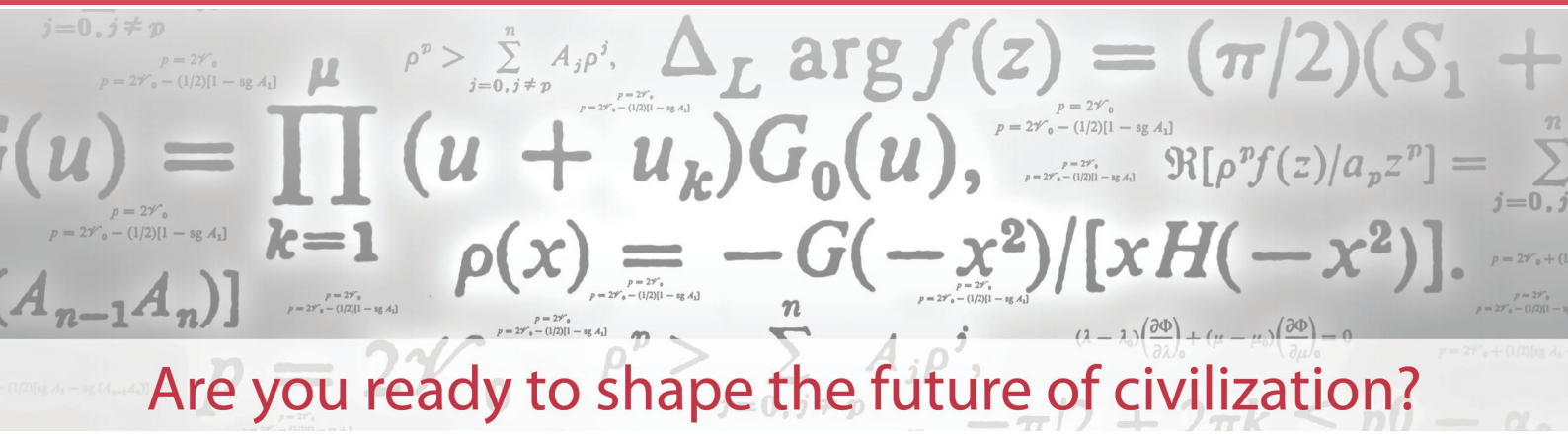
National Winter School in Mathematics

26 -31 DEC 2016 @ PRASANTHI NILAYAM CAMPUS

Department of **MATHEMATICS & COMPUTER SCIENCE**



Are you ready to shape the future of civilization?

The National Winter School in Mathematics brought together dozens of undergraduate students of Indian universities and exposed them to the world of Mathematics and made them experience the joy and fun of Mathematics.

DAY 1 – Mon, 26 Dec 2016

The six day National Winter School in Mathematics from 26 - 31 December 2016, started with invocatory vedam chanting and the Introductory and Welcome Addresses by Dr. Pallav K Baruah, HoD, DMACS, SSSIHL followed by Prof. Radhakrishna Nair, Director, Prasanthi Nilayam Campus. The Inagural Address was given by Prof. K B Naidu.

Prof Adimurthy, TIFR Banagalore
Three methods to tackle non linear problems in PDE, Part -1
Basically there are following three methods to solve a non linear problem.
1. Banach fixed point theorem,
2. Sub and super solution method,
3. Variational method--Rolls theorem - Mountain Pass theorem.
Here I will illustrate all these methods in R and then indicate how they can use to solve real non liner PDE problem.

Prof V Raghavendra, IIT Tirupathi
Phase Portraits for 2 x 2 systems of ODE, Part -1

Prof M Venkatesulu, Kalasalingam University
Introduction to Cryptography

Prof Adimurthy, TIFR Banagalore
Three methods to tackle non linear problems in PDE, Part - 2
Basically there are following three methods to solve a non linear problem.
1. Banach fixed point theorem,
2. Sub and super solution method,
3. Variational method--Rolls theorem - Mountain Pass theorem.
Here I will illustrate all these methods in R and then indicate how they can use to solve real non liner PDE problem.

Prof V Raghavendra, IIT Tirupathi
Phase Portraits for 2 x 2 systems of ODE, Part - 2

Prof Sanjay Sahani, COE, SSSIHL
Evening Satsang
The learned speaker urged the audience to ask the question "What it means to be successful in life ?" and ponder over the true meaning of success. He then went on narrating some anecdotes and experiences wherein Bhagawan inspired His devotees to lead a life that is full of purpose. He also narrated some experiences of some students who followed Swamy's message to demonstrate their integrity and there by rewarded unexpectedly. The speaker concluded with the powerful teaching of Bhagawan, " Faith in oneself and faith in God leads to success in life".

DAY 2 – Tue, 27 Dec 2016

Prof B C Sutradhar, Memorial University, Canada
Statistics by Example

Prof M Venkatesulu, Kalasalingam University
Applications of Cryptography

Prof Narasimha Sastry, ISI Bangalore
Mathematics in human thought

Prof Mohan Joshi, IIT Gandhinagar
Eigenvalues and Eigenvectors in Action

Prof Narasimha Sastry, ISI Bangalore
Opportunities and challenges in Mathematical education in contemporary India

Prof K B Chandran, University of Iowa
Mathematics in Human Circulation

Sri Aravind Balasubramanian, Alumni
Evening Satsang
In the 'virtual world', if there is only ONE url that one has to

remember, it is 'google.com' or 'yahoo.com' or the like. This alone is enough to help us find anything we want. Shouldn't our education too be like that ?- empowering us to find whatever we seek? That is 'HIGHER EDUCATION' - one which makes us capable of achieving whatever we choose.
The next question is of choice. What is the ultimate thing we can choose in life? The answer, it turns out, is God (or Energy, Atma, Spirit, Consciousness, Chi, Tao - whatever we choose to call it/him/her). Atma Vidya Vidyanaam - that Atma Vidya is the ultimate education which the Sri Sathya Sai Institute of HIGHER LEARNING aspires to give its students along with the secular education.

This knowledge helps us in all spheres - including relationships. Loving God in our hearts sanctifies and makes fulfilling every relationship we have in life - be it with parents, children, friends or spouses. Several experiences of students in the SSSIHL shows how strengthening the one relationship with God strengthens and beautifies all other relationships.

DAY 3 – Wed, 28 Dec 2016

Prof Mohan Joshi, IIT Gandhinagar
Dynamics of Orbiting Satellite

Prof R Prabhakar, Head Dept of Economics, SSSIHL
Statistical Modeling for Real Life Aplications

Prof S Sundar, IIT Madras
Thinking with Mathematical Model Part-I
Focuesd on problem solving, interactive session.
Problems that needs different mathematical concepts highlighted

Prof S Sundar, IIT Madras
Thinking with Mathematical Model Part-II
Focuesd on problem solving, interactive session.
Problems that needs different mathematical concepts highlighted

Visit to Chaitanya Jyothi Museum

Sri Hari Shankar, Alumni
Evening Satsang
The speaker spoke on the topic, "Designing our Life by Swami's Teachings".
People from various walks of life encounter in Bhagawan, the culmination and fulfillment of all human endeavours - be it music, sciences, spirituality etc. If we view the various human endeavours as the infinitely many lines on a plane, God is like the "point at infinity" which makes that plane complete.
God has given us skills and talents - in what way are we to employ these gifts during our sojourn on Earth? Swami says that to lead our lives in a fulfilling and wholesome manner, certain principles are very helpful such as (i) Unity of Thought, Word, and Deed, (ii) Paying honour to our parents, (iii) utilise the talents God has invested in us, in service of society.

DAY 4 – Thu, 29 Dec 2016

Dr N Uday Kiran, DMACS SSSIHL
Exact Differential Equations and their Applications
In this talk, I will discuss the nature of exact differential equations covering the interplay between the analytic and geometric aspects of these equations. An intuitive link between theses aspects will be dealt with using the Green's theorem. This intuition will provide a channel for students to apply these concepts. I will provide one application at the end of the presentation.

Prof Vittal Rao, IISc
Rating, Ranking and Mathematics

Dr S Balasubramanian, DMACS SSSIHL
Singular Value Decomposition and applications
In this talk Singular Value Decomposition (SVD), a universal decomposition of an arbitrary matrix will be elucidated upon. Geometric meaning of a matrix will be brought out through its SVD. Emphasis on how SVD encapsulates all the properties of a matrix will be highlighted. Fundamental subspaces of linear algebra will be derived through SVD. Relation of SVD with eigen value decomposition (EVD) will be discussed. Low rank approximation of a matrix will be accomplished using its SVD. And finally a practical application of SVD in the field of computer vision will be illustrated.

Prof Vittal Rao, IISc
Discrete logarithm and its application in Cryptography

Sri Sai Shyam Sharma, DMACS SSSIHL
Introduction to Game theory - Nash's equilibrium and applications

Dr Amey Deshpande, Alumni
Evening Satsang
How do we define success? Why do we want success? These are questions that we have to find answers for to find proper perspectives to our lives. How does modern psychology and ancient scriptures reconcile? And having found what we want, how do we get it? The speaker made an illustrious presentation to

bring home the theme of the talk. He gave practical tips as to how one should allocate his time in life to achieve higher goals in life. The importance of Goal setting and goal getting was brought out.

DAY 5 – Fri, 30 Dec 2016

Sri Srikanth Khanna, DMACS SSSIHL
Optimization
From the ancient times to the most modern, search for excellence has defined all the human endeavors. Whether it is a simple minimization of the distances or the logistics planning for a grandscale project, this search for the optimal solution is best done using the tools of mathematics. In this talk, we will take a glimpse into this world of optimization through the lens of mathematics.

Prof S Ponnusamy, ISI Chennai
Sequences, Series, Power Series: Part-I

Prof C S Yogananda, SJCE Mysore
Mathematics as a language of Science and Technology

Dr M C Prakash, Amazon.
Introduction to Classification Techniques
In this talk I will introduce few real world problems that are solved using regression and classification techniques. I will introduce popular loss functions namely squared loss, hinge loss, exponential loss, logistic loss, cross entropy loss etc.that are used in the classification and regression techniques and present some compare/contrast analysis of these loss functions. Finally i will present gradient descent based solution for minimizing the loss function. Basic calculus is the only prerequisite for the talk and is primarily aimed at UG students with minimal or zero exposure to machine learning/data mining courses.

Prof C S Yogananda, SJCE Mysore
Linear Algebra to the fore: Modern Applications of Linear Algebra

Sri Prem Anush, Alumni
Evening Satsang
What is the importance of Sanga Neeti or morality in society and how our adherence to it perfects us from within and also helps the society at large? Why does Swami say that it is better that Sanga Neethi should be based on fear of sin (Papa Bheeti) and is best if based on Love for God (Deiva Preethi)? The speaker built up the case systematically through several real world examples to zero in on this theme to impress upon the audience, the importance of following Bhagawan's message in life sojourn.

DAY 6 – Sat, 31 Dec 2016

Prof Ponnusamy, ISI chennai
Sequences, Series, Power Series: Part-II
Sri Sathya Sai M, Visitng Faculty SSSIHL
Mathematics for Actuarial Science

Dr Easwar Nagasubramanina, TCS Hyderabad
Mathematical Finance

Dr T Kumar Rajamani, BOSCH Bangalore
Computer Aided Diagnosis using Multiple Instance Learning

This talk would present the motivation for Multiple Instance Learning/Weak Supervision. The applications of Weak Supervision in computer aided diagnosis and in medical applications would be highlighted. The algorithm steps for Multiple Instance Learning would then be presented. miGraph algorithm which is currently the best performing MIL algorithm for medical application would be the focus of the presentation. Finally the performance of miGraph on couple of medical applications would be shared

Dr Abhinanda Sarkar, OMIX Lab
Mathematics of Big Data – Statistics and Analytics

Dr P K Baruah, HoD, DMACS, SSSIHL
Concluding Remarks & Vote of Thanks