

International Conference on Mathematics, Statistics and Data Science (ICMSDS 2022)

(As part of National Science Day Celebrations 2022)

on
26-27 February 2022

Souvenir & Abstracts

Organized by



School of Mathematics and Statistics & School of Data Analytics
Mahatma Gandhi University, Kottayam, Kerala, India
Email: sms@mgu.ac.in, sda@mgu.ac.in, mgusmsda@gmail.com

February 2022



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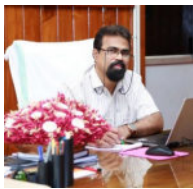
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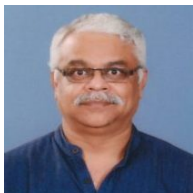


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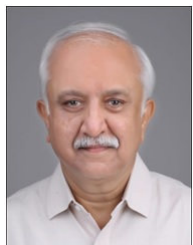
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Academic Ambassador(SMSDA),

Mahatma Gandhi University, Kottayam

About the Conference

Welcome to ICMSDS-2022!

We warmly welcome you to the International Conference on Mathematics, Statistics, and Data Science (ICMSDS-2022), which will be held during 26-27 February 2022 at Mahatma Gandhi University, Kottayam, Kerala, India, organized by the newly established School of Mathematics and Statistics & School of Data Analytics as part of its National Science Day Celebrations.

Mathematics and Statistics along with Computer Science form the pillars of the emerging areas of Data Science and Data Analytics. In this new data driven world, the importance of interdisciplinary studies and research in Mathematics and Statistics has increased more than ever and big data challenges have made it necessary to develop more advanced models and techniques. Academia and Industry has to come together to address these issues. India had a strong tradition of great scholars in Mathematics and Statistics and we have made a mark in the field of Computer Science at global level.

The goal of ICMSDS-2022 is to bring together outstanding scholars, practitioners and students across the world who are interested in further improvement of the state of the art research in Mathematics, Statistics, and Data Science for the purpose of exchanging information across a wide variety of disciplines and communities. Researchers and practitioners are expected to provide new perspectives for cross-disciplinary collaboration and acquire inspiration to help foster creative discoveries. The conference's

themes are therefore “Recent Trends in Mathematical and Statistical Sciences and Data Science.”

The new schools have developed an action plan for various academic programs including Lecture Series, Invited Talks, Workshops and Skill Enhancement Programs, Conferences and Seminars etc. in collaboration with national and international institutes of repute. The inauguration of the Research Promotion Programs for the year 2022-23 will also take place at the conference. This conference is planned to bring together scholars to discuss the most recent approaches, scientific findings, and strategies for resolving challenging issues in mathematics and statistics. In parallel tracks, the conference will feature famous speakers and contributed talks.

Due to the current pandemic situation, conference will take place in online mode.

We solicit your wholehearted support and active involvement for the success of ICMSDS - 2022.

General Chairs ICMSDS-2022

About the University

Mahatma Gandhi University, Kottayam established on 2nd October 1983 is one of the major Universities in Kerala, that strives to fulfill the higher educational needs of the people of Central Kerala. Set on the sprawling Priyadarsini Hills Campus at Athirampuzha, 12 kms off Kottayam, the University also has two satellite campuses in Kottayam. The University was accredited “A by NAAC with a score of 3.24 points in 2017, and was ranked 30th in National Institution Ranking Framework (NIRF) and included among the top 25 educational institutions in the Atal Ranking of Institutions on Innovation Achievements (ARIIA) -2020, conducted by the Ministry of HRD. The Council of Scientific & Industrial Research (CSIR) ranked the University 13th in India in terms of intellectual productivity and National Institute of Science, Technology and Development Studies (NISTADS) rated 19th in terms of h-index of the science faculty. Department of Science and Technology (DST) also ranked the University 8th among the 29 Universities under the Promotion of University Research and Scientific Excellence (PURSE) programme. Recently, Times Higher Education ranked MGU 141 among the worlds emerging universities and 11th in India TodayMDRA Ranking 2018.

The University has won the Chancellors Award for the Best University in Kerala for 33 times in 2020-21, 2017-18 and 2015-16. The present Vice Chancellor Prof. Dr. Sabu Thomas, is a world renowned top ranking scientist and researcher in Nano Science and Technology and Polymer Sciences in the area of Chemical Sciences. There are many other distinguished scholars among our faculty.

The University is well known for wide variety of specializations at the Under graduate, Post graduate and Professional programmes through its 23 University Departments, 1 International and Inter University Centre, 7 Inter University Centres, 10 Inter School Centres, 77 Govt./Aided Affiliated Colleges, 10 Autonomous Colleges (of which 8 are Colleges with a Potential for Excellence), 200 Unaided Affiliated Colleges and 199 Recognized Research Centres. It imparts education in the interdisciplinary as well as conventional disciplines of Science, Social Science and Humanities besides in the professional disciplines like Engineering, Technology, Legal Studies, Pedagogy, Pharmacy and Nursing.

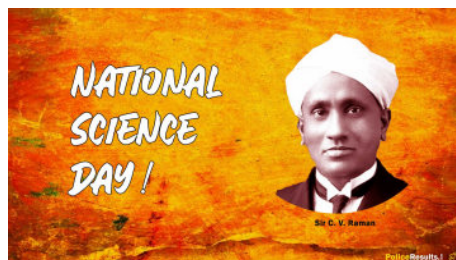
For more details visit www.mgu.ac.in

About the Schools

School of Mathematics & Statistics and School of Data Analytics were established in 2020. In this new era of increasing thrust on Mathematical Modeling and Statistical Data Analytics and Data Science, there is wide scope and potential for offering postgraduate and research level interdisciplinary programs in these disciplines. Mathematics and Statistics are fundamental disciplines of knowledge and constitutes most important tools for all programs of study and research as well as science & technology, social sciences, health and welfare, industry, business and management. At present the schools are led by Prof. Dr. K.K.Jose as Hon. Director and a team of dedicated faculty members.

During 2021-22 we have started three programmes of study namely (i) M.Sc. Mathematics (ii) M.Sc. Statistics (iii) M.Sc. Data Science and Analytics. One full semester Project Work and Internship are part of each program. The curriculum and syllabus for these programs are developed by eminent scholars and industry experts with a view to provide teaching, research and training in emerging areas for meeting the demand from academia and industry. In addition to the program of study, various workshops, seminars, conferences, lecture series etc by experts will be offered to encourage research and skill development to meet the emerging challenges.

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National Science Day is celebrated in India on 28 February each year to mark the discovery of the Raman effect by Indian physicist Sir C. V. Raman on 28 February 1928. National Science Day is celebrated to spread a message about the importance of science used in the daily life of the people. To display all the activities, efforts and achievements in the field of science for human welfare. It is celebrated to discuss all the issues and implement new technologies for the development in the field of science. To give an opportunity to the scientific minded citizens in India. To encourage the people as well as popularize science and technology.

The theme for National Science Day 2022 is “**Integrated Approach in S&T for Sustainable Future**”.

Sir Chandrasekhara Venkata Raman¹



Chandrasekhara Venkata Raman was born at Tiruchirappalli in Southern India on November 7th, 1888. His father was a lecturer in mathematics and physics so that from the first he was immersed in an academic atmosphere. He entered Presidency College, Madras, in 1902, and in 1904 passed his B.A. examination, winning the first place and the gold medal in physics; in 1907 he gained his M.A. degree, obtaining the highest distinctions.

¹This autobiography/biography was written at the time of the award and first published in the book series Les Prix Nobel. It was later edited and republished in Nobel Lectures, Physics 1922-1941, Elsevier Publishing Company, Amsterdam, 1965

His earliest researches in optics and acoustics—the two fields of investigation to which he has dedicated his entire career—were carried out while he was a student.

Since at that time a scientific career did not appear to present the best possibilities, Raman joined the Indian Finance Department in 1907; though the duties of his office took most of his time, Raman found opportunities for carrying on experimental research in the laboratory of the Indian Association for the Cultivation of Science at Calcutta (of which he became Honorary Secretary in 1919).

In 1917 he was offered the newly endowed Palit Chair of Physics at Calcutta University, and decided to accept it. After 15 years at Calcutta he became Professor at the Indian Institute of Science at Bangalore (1933-1948), and since 1948 he is Director of the Raman Institute of Research at Bangalore, established and endowed by himself. He also founded the Indian Journal of Physics in 1926, of which he is the Editor. Raman sponsored the establishment of the Indian Academy of Sciences and has served as President since its inception. He also initiated the Proceedings of that academy, in which much of his work has been published, and is President of the Current Science Association, Bangalore, which publishes *Current Science (India)*.

Some of Raman's early memoirs appeared as *Bulletins of the Indian Association for the Cultivation of Science* (Bull. 6 and 11, dealing with the Maintenance of Vibrations; Bull. 15, 1918, dealing with the theory of the musical instruments of the violin family). He contributed an article on the theory of musical instruments to the 8th Volume of the *Handbuch der Physik*, 1928. In 1922 he published his work on the Molecular Diffraction of Light, the first of a series of investigations with his collaborators which ultimately led to his discovery, on the 28th of February, 1928, of the radiation effect which bears his name (*A new radiation*, *Indian J. Phys.*, 2 (1928) 387), and which gained him the 1930 Nobel Prize in Physics.

Other investigations carried out by Raman were: his experimental and theoretical studies on the diffraction of light by acoustic waves of ultrasonic and hypersonic frequencies (published 1934-1942), and those on the effects produced by X-rays on infrared vibrations in crystals exposed to ordinary light. In 1948 Raman, through studying the spectroscopic behaviour of crystals, approached in a new manner fundamental problems of crystal dynamics. His laboratory has been dealing with the structure and properties of diamond, the structure and optical behaviour of numerous iridescent substances (labradorite, pearly felspar, agate, opal, and pearls).

Among his other interests have been the optics of colloids, electrical and magnetic anisotropy, and the physiology of human vision.

Raman has been honoured with a large number of honorary doctorates and memberships of scientific societies. He was elected a Fellow of the Royal Society early in his career (1924), and was knighted in 1929.

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**International Conference on
Mathematics, Statistics and Data Science
(ICMSDS 2022)**




INAUGURAL CEREMONY

26, February 2022 — 9:15 AM (IST) - 10:30 AM (IST)





PROGRAMME SCHEDULE

SILENT PRAYER	:	
WELCOME SPEECH	:	Prof. K. K. Jose, Hon. Director, SMS & SDA
PRESIDENTIAL ADDRESS	:	Prof. Sabu Thomas, Vice Chancellor, MGU
INAUGURATION	:	Prof. V. K. Ramachandran Vice Chairman, Kerala State Planning Board, Thiruvananthapuram
FELICITATIONS	:	Prof. Ambat Vijayakumar Emeritus Professor of Mathematics, CUSAT
	:	Prof. Kalyan Chakraborty Director, KSCSTE-KSoM, Kozhikode
	:	Mr. Sayooj Aby Jose IMU Breakout Graduate Fellow and Academic Ambassador, SMS & SDA
VOTE OF THANKS	:	Prof. S. Satheesh, SDA


Schedule of Invited Talks

DAY 1: Saturday - 26 February, 2022	
Session I 9.15-10.30	INAUGURAL SESSION
Session II 10:40-11:25	<p>Chair : Dr. Ambat Vijayakumar</p> <p>Keynote Address</p> <p>Prof. C. E. Veni Madhavan</p> <p>C. R. Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSCS), Hyderabad, India.</p>  <p>Topic: Impact of Quantum Computing on Cryptography</p>
Session III 11:30-13:00	<p>Chair : Dr. K. K. Jose</p> <p>Invited Talk 1</p> <p>Dr. Xiao-Jun Yang</p> <p>Professor, School of Mathematics and State Key Laboratory for Geo-mechanics and Deep Underground Engineering, China University of Mining and Technology, China</p>  <p>Topic: A New Conjecture on the Scaling-Law Chaos</p> <p>Invited Talk 2</p> <p>Dr. G. Suresh Singh</p> <p>Professor, Department of Mathematics, Kerala University, Kerala, India.</p>  <p>Topic: Mathematical Modelling Through Graphs</p>
13.00-14.00	LUNCH BREAK

<p>Session IV 14:00-15:30</p>	<p>Chair : Dr. Satheesh S.</p>
	<p>Invited Talk 3 Dr. Manoj Chacko Associate Professor, Department of Statistics, University of Kerala, Kerala, India. Topic: Application of Ranked Set Sampling in Parametric Estimation</p> 
	<p>Invited Talk 4 Dr. Wajaree Weera Assistant Professor, Department of Mathematics, Khon Kaen University, Thailand. Topic: New Dissipativity Criteria for Generalized Neural Networks with Time-Varying Delays</p> 
<p>Session V 15:40-18:00</p>	<p>Chair : Mr. Abraham K. Samuel</p>
	<p>Invited Talk 5 Dr. Juan Eduardo Napoles Valdes Professor, Department of Mathematics, National University of the Northeast, Argentina. Topic: Integral Inequalities and Convexity</p> 
	<p>Invited Talk 6 Dr. P. G. Sankaran Pro-Vice Chancellor and Professor of Statistics, CUSAT, Kochi, Kerala, India. Topic: Quantile Modelling</p> 
	<p>Invited Talk 7 Dr. Sebastian George Associate Professor and Head, Department of Statistical Sciences, Kannur University, Kerala, India. Topic: A Review on Symmetric, Log-symmetric and Reciprocal Symmetric Distributions</p> 
<p>18.10</p>	<p style="text-align: center;">CLOSING</p>

DAY 2: Sunday -27 February, 2022	
Session VI 9:00-10:30	<p>Chair : Dr. Ajitha Sasi</p> <hr/> <p>Invited Talk 8 Dr. C. Satheesh Kumar Director, School of Physical and Mathematical Sciences Professor, Department of Statistics, Kerala University, Kerala, India.  Topic: Certain Alternative Classes of Hyper-Poisson Family of Distributions</p> <hr/> <p>Invited Talk 9 Dr. Yun Kang Professor, Department of Applied Mathematics, Arizona State University, USA.  Topic: Mathematical Modeling of Complex Adaptive System</p>
Session VII 10:40-13:00	<p>Chair : Dr. C. Satheesh Kumar</p> <hr/> <p>Invited Talk 10 Dr. Joby K. Jose Registrar and Professor, Department of Statistics, Kannur University, Kerala, India.  Topic: Finite Mixtures of Power Transformed Half-Logistic Distribution: Estimation and Application</p> <hr/> <p>Invited Talk 11 Dr. K. Jayakumar Professor and Head, Department of Statistical Sciences, Calicut University, Kerala, India.  Topic: Recent Developments on Some Discrete Distributions</p>

	<p>Invited Talk 12</p> <p>Dr. Normah Maan</p> <p>Associate Professor, Assistant Dean, Quality and Strategy, Department of Mathematical Sciences, Faculty of Science, Universiti Teknologi Malaysia, Malaysia.</p>  <p>Topic: Tumour-Immune System Interaction with Distribution: Hyperthermia Treatment</p>
13.00-13.45	LUNCH BREAK
Session VIII	Chair : Dr. Vivek S
13:45-15:20	<p>Invited Talk 13</p> <p>Dr. R. Raja</p> <p>Assistant Professor and Head (i/c), Ramanujan Centre for Higher Mathematics, Alagappa University, Tamil Nadu, India.</p>  <p>Topic: Mathematical Modeling and Its Applications to Neural Networks</p>
	<p>Invited Talk 14</p> <p>Dr. Jayrold Arcede</p> <p>Professor, Department of Mathematics, Caraga State University, Philippines.</p>  <p>Topic: Modeling COVID-19: Learnings and Realities</p>
Session IX	Chair : Dr. Ambat Vijayakumar
15:30-17:00	<p>Invited Talk 15</p> <p>Dr. S. Sumitra</p> <p>Associate Professor, Department of Mathematics, Indian Institute of Space Science and Technology, Thiruvananthapuram, Kerala, India.</p>  <p>Topic: Machine Learning and its Applications</p>

	<p>Invited Talk 16</p> <p>Dr. P. B. Vinod Kumar</p> <p>Professor, Department of Mathematics, Rajagiri School of Engineering & Technology, Kochi, India.</p> <p>Topic: Self Similar Fractals, Partial Self Similarity and Some Recent Applications</p> 
<p>Session X</p> <p>17:00-17.30</p>	<p>VALEDICTORY FUNCTION</p> <p>Chief Guest: Prof. C. T. Aravindakumar</p> <p>Pro-Vice Chancellor, Mahatma Gandhi University, Kottayam</p>

N.B. Invited Talk for 40 minutes followed by questions and discussion for 5 minutes.

Abstracts
Keynote Address & Invited Talks

Keynote Address

Impact of Quantum Computing on Cryptography

Dr. C. E. Veni Madhavan

C.R.Rao Advanced Institute of Mathematics, Statistics and Computer Science, Hyderabad
Indian Institute of Science, Bangalore

Abstract

Today, the field of quantum engineering, brings an exciting confluence of ideas from physics, mathematics, computation, devices, engineering and applications. There is an overwhelming interest among cryptography researchers to design new invulnerable algorithms and utilize the power of quantum computers to overwhelm conventional cryptosystems.

We discuss the generic ideas behind *quantum computation and quantum simulation*. The perspectives range from (a) quantum race and supremacy, (b) quantum correctness and readiness, and (c) quantum defiance and future. Early theoretical results due to Shor on a polynomial time factoring algorithm, and current technological developments toward realistic quantum computers have led to new, realizable schemes for quantum cryptanalysis and to ideas on quantum-secure systems. Recent research results suggest the augmentation of public key parameters in defiance of potential quantum capabilities. We indicate the *infrastructures for quantum-ready* computations and simulations.

We present an overview of this new new area that draws upon mathematics, combinatorics, computer science and statistical physics.

Invited Talk 1**A New Conjecture on the Scaling-Law Chaos****Dr. Xiao-Jun Yang**

Professor, School of Mathematics and State Key Laboratory for Geo-mechanics and Deep Underground Engineering, China University of Mining and Technology, China

Abstract

In this talk we suggest an anomalous chaotic system of the scaling-law ordinary differential equations involving the Mandelbrot scaling law. We suggest the conjecture for the fixed-point theory for the system. The obtained result may be open a new door in the study of the chaos theory.

Invited Talk 2**Mathematical Modelling Through Graphs****Dr. G. Suresh Singh**

Department of Mathematics, University of Kerala, Kariavattom. Email:
sureshsingh@yahoo.co.in

Abstract

Representation of unknown or unfamiliar, objects/event/problem through a known or familiar, method/technique/system is known as a Model and this process is said to be Modeling. In this lecture, we wish to study the role of Mathematical concepts in such a process and in particular, some models through graphs.

Invited Talk 3**Application of Ranked Set Sampling in Parametric Estimation****Dr. Manoj Chacko**

Department of Statistics, University of Kerala, Trivandrum.

Email: manojchacko02@gmail.com

Abstract

Ranked set sampling (RSS) method is a cost effective sampling method which is of major concern in statistics, especially when the measurement of the characteristic of interest is costly and/or time-consuming. In this talk, we consider ranked set sampling when ranking is imperfect, in which ranking of units are done based on measurements made on an easily and exactly measurable auxiliary variable X which is correlated with the study variable Y . Estimators for the mean of the study variate Y , when (X, Y) follows a Morgenstern type bivariate exponential distribution, are obtained based on both usual ranked set sample and extreme ranked set sample. Estimation procedures developed in this paper are also illustrated using a real data.

Invited Talk 4**New Dissipativity Criteria for Generalized Neural Networks with Time-Varying Delays****Dr. Wajaree Weera**

Assistant Professor, Department of Mathematics, Khon Kaen, University, Thailand.

Abstract

The problem of asymptotic stability and extended dissipativity analysis for the generalized neural networks with interval discrete and distributed time-varying delays

is investigated. Based on a suitable Lyapunov-Krasovskii functional (LKF), an improved Wirtinger single integral inequality, a novel triple integral inequality, and convex combination technique, the new asymptotic stability and extended dissipativity criteria are achieved for the generalized neural networks with interval discrete and distributed time-varying delays. By the above methods, the less conservative asymptotic stability criteria are obtained for a special case of the generalized neural networks. By using the Matlab LMI toolbox, the derived new asymptotic stability and extended dissipativity criteria are expressed in terms of linear matrix inequalities (LMIs) that cover $H_\infty H_\infty$, $L_2 L_2 - L_\infty L_\infty$, passivity, and dissipativity performance by setting parameters in the general performance index. Finally, we show numerical examples which are less conservative than other examples in the literature. Moreover, we present numerical examples for asymptotic stability and extended dissipativity performance of the generalized neural networks, including a special case of the generalized neural networks.

Invited Talk 5

Integral Inequalities and Convexity

Dr. Juan Eduardo Napoles Valdes

Professor, Department of Mathematics, National University of the Northeast, Argentina

Abstract

We take a tour of some integral inequalities, mainly the Hermite-Hadamard Inequality. We present the most current working directions and some open problems.

Invited Talk 6**Quantile Modelling****Dr. P. G. Sankaran**

Professor and Pro Vice Chancellor, Cochin University of Science and Technology, Cochin.

Email: sankaran.p.g@gmail.com

Abstract

A probability distribution can be specified either in terms of the distribution function or by the quantile function. Although both convey the same information about the distribution, with different interpretations, the concepts and methodologies based on distribution functions are traditionally employed in most forms of statistical theory and practice. However, quantile functions have several advantages over distribution functions. First, many data sets can be modelled by quantile functions with simple forms. Second, most quantile functions approximate many of the standard models in reliability analysis quite well. Consequently, if physical conditions do not suggest a plausible model, an arbitrary quantile function will be a good first approximation. The inference procedures for quantile models need less information and are more robust to outliers. Quantile-Based Reliability Analysis presents a novel approach to reliability theory using quantile functions in contrast to the traditional approach based on distribution functions. A thorough review on modelling and analysis of lifetime data analysis using quantile functions is presented.

Invited Talk 7**A Review on Symmetric, Log-symmetric and Reciprocal Symmetric Distributions****Dr. Sebastian George**

Associate Professor and Head, Department of Statistical Sciences,

Kannur University, Kerala, India.

Abstract

This talk will focus on the properties and applications of ordinary symmetric, log-symmetric and R-symmetric distributions. Ordinary symmetry is a familiar concept even in elementary level. However, the properties and applications of log-symmetric and R-symmetric distributions have got considerable attention for modeling complicated data with heavy tail nature. Properties of these type of distributions and their inter-relationships will be discussed. We also introduce two families of R-symmetric distributions for which one has a Pareto tail and the other has an exponential tail. Finally, estimation of parameters and application to some financial data analysis will be considered.

Invited Talk 8

Certain Alternative Classes of Hyper-Poisson Family of Distributions

Dr. C. Satheesh Kumar

Department of Statistics, University of Kerala, Trivandrum, India. E-mail:
drsatheeshkumar@gmail.com

Abstract

The Poisson probability model is based on the assumption that events occur under the principle of complete randomness. But in numerous practical situations this principle does not hold. Consequently, the Poisson distribution has been generalized in several ways. Among them, the hyper-Poisson model is of particular interest. In certain practical situations the hyper-Poisson model also fails to give good fit, but a model near to the hyper-Poisson will be more suitable. So the aim of the present talk is to discuss some recently developed classes of alternative versions of the hyper-Poisson distribution and its generalizations.

Invited Talk 9

Mathematical Modeling of Complex Adaptive System

Dr. Yun Kang

Professor, Department of Applied Mathematics, Arizona State University, USA.

Abstract

A complex adaptive system (CAS) is a system that is complex in that it is a dynamic network of interactions, but the behaviour of the ensemble may not be predictable according to the behaviour of the components. It is adaptive in that the individual and collective behaviour mutate and self-organize corresponding to the change-initiating micro-event or collection of events. Typical examples of complex adaptive systems include: climate; markets; governments; industries; ecosystems; social insect (e.g. ant) colonies; the brain and the immune system. Human social group-based endeavours, such as political parties, communities, war, and terrorist networks are also considered CAS. Mathematical models are powerful tools that can provide us quantitative approaches to elucidate complicated ecological and evolutionary processes on the numerous spatial, temporal and hierarchical scales at which CAS such as social insect colonies operate. Social insects such as ants, bees, wasps and termites, among the most diverse and ecologically important organisms on earth, live in intricately governed societies that rival our own in complexity and internal cohesion. They are excellent examples of CAS. In this talk, I will present some of our recent modeling work with closed collaborations with biologists and psychologists that have been addressing important and interesting questions of CAS such as (1) How are foraging behaviours of social ants dynamically regulated in response to environmental changes? (2) How information spreads in the social insect colonies? (3) How may we define and model trust dynamics in human and robotic teaming?

Invited Talk 10**Finite Mixtures of Power Transformed Half-Logistic Distribution: Estimation and Application****Dr. Joby K Jose**

Professor, Department of Statistical Sciences, Kannur University, Kannur, Kerala-670567,
India. E-mail: jobyk@kannuruniv.ac.in

Abstract

Finite mixture models have been used for many decades, because they provide a flexible tool for modelling data that arise from heterogeneous populations. The main feature of the finite mixture of distributions is the ability to capture more specific properties of the observed data, such as multimodality, heavy tails and/or skewness. Such probability models are very useful in the study of a population which consists of a number of sub-populations mixed in an unknown proportion. In this paper, a new mixture probability model is introduced as the finite mixture of power transformed half-logistic distributions. The basic properties of the survival function, hazard function, moments and stress-strength application of the new finite mixture model are studied. The maximum likelihood (ML) estimates of the model parameters are obtained using Expectation-Maximization algorithm and the Bayes estimators by Markov Chain Monte Carlo (MCMC) method. Using different simulated data sets ML estimates and Bayes estimates of the model parameters are computed and verify the performance of the estimates. Finally, we fit the model to a real data set and compare it with some of the standard probability models.

Invited Talk 11**Recent Developments on Some Discrete Distributions****Dr. K. Jayakumar**

Department of Statistics, University of Calicut, Kerala, India

Abstract

In usual discrete distributions, we assume that the probability of success/failure remains the same from trial to trail. But this may not be the situation always and it necessitated the introduction/study of discrete q distributions. In the present talk we review the literature on discrete distributions, mainly concentrating discrete q distributions and present some new results on discrete q distributions.

Invited Talk 12**Tumour-Immune System Interaction with Hyperthermia Treatment****Dr. Normah Maan**Department of Mathematical Science, Universiti Teknologi Malaysia, Malaysia. Email:
normahmaan@utm.my**Abstract**

Tumour contributes to a real crisis for public health and worldwide health system. Treatments traditionally used to fight against tumors are surgery, radiotherapy, and chemotherapy. Unfortunately, these treatments kill normal cells as well as tumor cells.

Then, immunotherapy is introduced. It is based on the generally-accepted hypothesis that the immune system is the best tool humans have for fighting diseases. Besides that, recent advancements in technology have driven interest in less invasive cancer treatment such as hyperthermia, which will activate the immune system. However, one of the challenges in thermal therapy is delivering the appropriate amount of heat to the affected area. Therefore, the main objective of this research is to develop an optimal tumor-immune interaction model incorporating hyperthermia treatment to suppress tumor proliferation. The expected model is in the form of a differential system with a time delay that describes the time needed by the immune system to react after recognizing the cancer cells. The formulation of the problem will start with identifying the important immune cells and govern the equations that represent the interactions by considering the hyperthermia effect on the immunology treatment. Then, the stability analysis of the model will be investigated, and the parameters involved are estimated by fitting the model to experimental data of tumor cells that developed in the laboratory mice. Optimal control theory is applied through which we determined improved immunotherapy administration schedule. The expected result gives an important role in understanding the dynamics and evolution of the tumor growth. The advancement of knowledge can benefit medical society. A better treatment strategy will be designed to improve the patients quality of life and reduce the economic burden in the financing of health management.

Invited Talk 13

Mathematical Modeling and its Applications to Neural Networks

Dr. R. Raja

Assistant Professor and Head (i/c), Ramanujan Centre for Higher Mathematics, Alagappa
University, Tamil Nadu, India.

Abstract

A mathematical model usually describes a system by a set of variables and a set of equations that establish relationships between the variables. Especially the modeling of Artificial Intelligence arises from the behaviour of a human brain which is often termed as artificial neural network. The term neural network had been used to refer to a network or circuit of biological neurons. The modern usage of the term often refers to artificial neural networks, which are composed of artificial neurons or nodes. Thus, the term has two distinct usages. Biological neural networks are made up of real biological neurons that are connected or functionally-related in the peripheral nervous system or the central nervous system. Whereas, artificial neural networks are made up of interconnecting artificial neurons (programming constructs that mimic the properties of biological neurons). The real biological nervous system is highly complex including some features which may seem superfluous to the understanding of the working of artificial networks. Such limitations led to the decline of the field of neural networks.

Neural networks also have broad applicability to real world problems. In fact, they have already been successfully applied in many industries. Since neural networks are best at identifying patterns or trends in data, they are well suited for prediction or forecasting needs including: sales forecasting, industrial process control, customer research, data validation, risk management and target marketing. Also, ANN are used in the following specific paradigms: recognition of speakers in communications; diagnosis of hepatitis; recovery of telecommunications from faulty software; undersea mine detection; texture analysis; three-dimensional object recognition; hand-written word recognition and facial recognition. The prospects for neural networks seem excellent, provided the increasing sophistication of the underlying theory, the increasing range of applicability of the techniques, and the growing scale of the applications that are being undertaken. The interdisciplinary nature of research in this field seems certain to endure and to bring new vigor into allied fields. Finally, future progress in theoretical neuroscience will provide a continuing impetus for the development and understanding of network models of intelligence.

Invited Talk 14**Modeling COVID-19: Learnings and Realities****Dr. Jayrold P. Arcede**

Professor, Department of Mathematics, Caraga State University, Philippines.

Abstract

Since the beginning of the COVID-19 outbreak last 2020, mathematical modeling has been at the forefront of shaping the decisions among policymakers around the world. In this talk, we will discuss some tools employed by my group in understanding COVID-19 spread and highlights results in light of policies and realities on the ground. Specifically, we will touch on the delay or speed on the COVID-19 waves, clarifying issues on infection rates and reproduction number and the effectiveness of community mitigation strategies like border control. Finally, we will discuss some advice and suggestions from one own experience to be an effective math modeler.

Invited Talk 15**Machine Learning and its Applications****Dr. S. Sumitra**

Associate Professor, Department of Mathematics, Indian Institute of Space Science and Technology, Thiruvananthapuram, Kerala, India.

Abstract

The computers can solve problems for which the relationship between the inputs and outputs are known, which is the concept of the traditional programming approach.

However, for extracting information from data sets such a method fails and there lies the importance of machine learning algorithms. *Machine Learning is the study of computer algorithms that improve automatically through experience.* The underlying principle of these algorithms is that by modeling the given problem, the computer can be made to learn the input/output functionality from examples. They can learn image data, relational data, spatial data, text data, time series and sequence data, transaction data and heterogenous data using different techniques such as classification, regression, time series and sequence prediction, clustering, pattern discovery and deviation or anomaly detection. The talk covers the basis concepts of machine learning and its real world applications.

Invited Talk 16

Self Similar Fractals, Partial Self Similarity and Some Recent Applications

Dr. Vinod Kumar P B

Professor, Department of Mathematics, Rajagiri School of Engineering & Technology, Kochi
(RSET, Kochi), India.

Abstract

In this talk, we discuss construction of Self similar fractals, their geometric and topological properties. Partial self-similarity can be thought of as a variant of self-similarity. Graph theoretic method to represent partial self-similar sets is introduced. Some applications of fractals available in recent literature are also presented.



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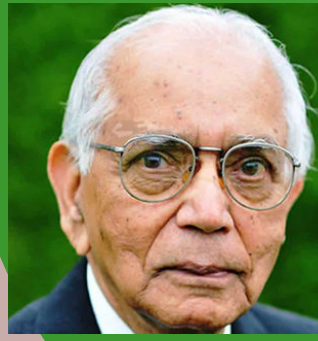
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P.C. Mahalanobis



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S. R. Srinivasa Varadhan



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