RAJIV GANDHI NATIONAL INSTITUTE OF YOUTH DEVELOPMENT
MINISTRY OF YOUTH AFFAIRS AND SPORTS, GOVERNMENT OF INIDA
SRIPERUMBUDUR-602105, TAMIL NADU

NCMMAC - 2023

NATIONAL CONFERENCE ON MATHEMATICAL MODELLING, ANALYSIS & COMPUTATION

6 - 7 JUNE, 2023

Book of Abstracts

THEME : "YOUTH THREADS THROUGH MATHEMATICS"

NATIONAL CONFERENCE ON
MATHEMATICAL MODELING, ANALYSIS AND COMPUTATION
Theme: "Youth Threads through Mathematics"
June 6-7, 2023; RGNIYD Campus

BOOK OF ABSTRACTS

Edited By
Dr. Parthasakha Das
Assistant Professor & Head
Department of Mathematics
Rajiv Gandhi National Institute of Youth Development
Sriperumbudur – 602105 , Tamil Nadu

Patron

Prof. Sibnath Deb
Ph.D, D.Sc
Director, RGNIYD

Organizing Committee

Convener

Dr. Parthasakha Das
Assistant Professor & Head(i/c)
Department of Mathematics
RGNIYD

Co-Convener

Dr. K Srikanth
Faculty(On Contract)
Department of Mathematics
RGNIYD

Scientific Committee

Prof. Joydev Chattopadhyay
ISI kolkata

Prof. Tanmoy Som
IIT BHU

Prof. Tirupathi Rao Padi
Pondicherry University

Prof. Nandadulal Bairagi
Jadavpur University

Prof. Sandip Banerjee
IIT Roorkee

Prof. Samarjit Kar
NIT Durgapur

Prof. Mini Ghosh
VIT Chennai

Dr. Samit Bhattacharyya,
Associate Professor
Shiv Nadar University

Dr. Samrat Chatterjee
Associate Professor
THSTI

Student Co-ordinators

Aksa Mathew

Akshaya M

Amjath Milan

Anargh T

Aswini T

Bavishmathy G

Dharani K

Juthisha Jayan

Kavya k

Reshmi V P

Vaishnavi Suresh

Ankit Kumar Yadav

Jenifer J

Kalaiarasi R C

M Sanjeeva Reddy

Mohammed Ansad

Nandhana S

Niraimathi K R

Radhika B R

Rohit Sahu

Roshni Somawar

Sneha Pal

Sumanth S

Vijayasri V

Director's Message

It is an immense pleasure for me to welcome you all to the National Conference on Mathematical Modeling, Analysis and Computation (NCMMAC-2023) on 6th -7th June, 2023 under the theme: "Youth Threads through Mathematics", organized by Department of Mathematics, Rajiv Gandhi National Institute of Youth Developments, Sriperumbudur.

This conference focuses to bring together academicians, researchers and research scholars to exchange and share their knowledge, experiences and research results on different parts of mathematical modeling and its applications in various fields. In addition, NCMMAC-2023 provides a platform for participants to present their research findings and also serves as a stage for exchanging knowledge in Mathematical Modeling, Analysis and its Applications. Moreover, the theme of the conference is "Youth Threads through Mathematics". Mathematics is one of the pillars in STEM Education (Science, Technology, Engineering and Mathematics). With a visionary of new education policy, STEM graduates would have better employability prospects. STEM Players will rule the 'Jobs of tomorrow'. In this connection, Mathematical modeling and its analysis is stepping stone towards sustainable eco-system, bio-diversity, eco-epidemiology, various decision making, engineering fields.

I sincerely offer my earnest gratitude to invited speakers as well as those who have contributed through their research papers at the conference. I am sure that the conference would achieve its objective by providing a suitable platform for learning and experiencing the latest advancement in the field of Applied Mathematics. I thank the convener, co-convener, scientific committee and student co-ordinators, without whom this event would not be possible. Finally, I wish to thank one and all who have come over here with your kind cooperation towards NCMMAC-2023. I wish for the grand success of the conference.

Prof. Sibnath Deb, Ph.D., D.Sc

Contents

Invited Speakers

Recent Advances in Mathematical Modelling of Fear Effects on Prey Populations in Predator-Prey Dynamics

Dr. Joydev Chattopadhyay
Professor, Indian Statistical Institute, Kolkata.

In this talk, tailored for the esteemed audience of master's and PhD students, we will delve into the remarkable progress of mathematical biology within the realm of predator-prey dynamics, with a specific focus on the fear effect on prey populations. Our exploration will be anchored in the foundational Lotka-Volterra (L.V) predator-prey model, providing a robust framework to understand this captivating phenomenon.

To set the stage, we will begin by examining the intriguing Fibonacci sequence, renowned for its pervasive presence in nature's patterns. By showcasing the underlying arithmetic properties of this sequence, we will establish a mathematical foundation that reveals the inherent intricacies of population growth and pattern formation within ecological systems. Building upon this, we will present two thought-provoking arithmetic problems, expertly tailored to establish a direct connection between mathematical reasoning and population dynamics.

From there, we will seamlessly transition to the logistic equation, a cornerstone in population biology. This equation, capturing the interplay between population growth and finite resources, will elucidate the intrinsic limitations that shape ecological systems. By unravelling its fundamental principles, we will witness how the logistic equation serves as a powerful tool for modelling and understanding the dynamics of population growth and stability.

Guided by this mathematical groundwork, we will embark on a captivating journey into the renowned Lotka-Volterra predator-prey model. Rooted in the concept of species interactions, this model embodies the intricate dance between predators and their prey, offering profound insights into their population dynamics. We will delve into the equations, assumptions, and key dynamics of this model, exploring its ability to depict oscillations, stable equilibria, and the delicate balance within ecosystems.

Furthermore, we will augment our discussion with the enlightening findings of prominent experimental studies. The seminal work by Zannet et al. in 2011 will elucidate the fear effect on prey populations, unravelling the profound impact that predator-induced fear can have on the prey's behaviour and survival. Drawing upon the more recent investigation by Wang et al. in 2016, we will explore the experimental approach employed to probe the fear effects on prey populations in greater depth.

Through these studies, we will witness how empirical observations harmonize with the Lotka-Volterra model, advancing our understanding of predator-prey dynamics.

To provide a holistic perspective, we will contextualize the development of this study by considering various ecological phenomena that influence predator-prey interactions. We will examine the effects of spatial heterogeneity, prey refuge, and adaptive behaviour, among other factors, shedding light on their profound implications for the dynamics of fear effects on prey populations. By intertwining these ecological complexities with mathematical models, we will gain a more comprehensive understanding of the intricate web of predator-prey relationships.

In conclusion, this talk strives to highlight the significant strides made in the field of mathematical biology, specifically in the context of fear effects on prey populations due to predators. By commencing with the mesmerizing Fibonacci sequence and delving into arithmetic problems, we established a firm mathematical foundation before progressing to the logistic equation as a powerful modelling tool. Grounded in the Lotka-Volterra predator-prey model, we explored its dynamics and intertwined them with empirical evidence from pioneering studies. Additionally, we examined how ecological phenomena contribute to the intricate tapestry of predator-prey interactions. It is my hope that this journey into the world of mathematical biology will inspire further research and interdisciplinary collaboration, unveiling new insights into the captivating dynamics of our natural world.

An Intuitionistic Fuzzy Rough Set Model for Feature Selection

Dr. T Som

Professor, Department of Mathematical Sciences
Indian Institute of Technology (BHU), Varanasi
E-mail: tsom.apm@iitbhu.ac.in

Feature subset selection is an essential machine learning approach aimed at the process of dimensionality reduction of the input space. By removing irrelevant and/or redundant variables, not only it enhances model performance, but also facilitates its improved interpretability. The fuzzy set and the rough set are two different but complementary theories that apply the fuzzy rough dependency as a criterion for performing feature subset selection. However, this concept can only maintain a maximal dependency function. It cannot illustrate the differences in object classification and does not fit a particular dataset well. This problem was handled by using a fitting model for feature selection with fuzzy rough sets. However, intuitionistic fuzzy set theory can deal with uncertainty in a much better way when compared to fuzzy set theory as it considers positive, negative and hesitancy degree of an object simultaneously to belong to a particular set. Therefore, in the current study, a novel intuitionistic fuzzy rough set model is proposed for handling above mentioned problem. This model fits the data well and prevents misclassification. Firstly, intuitionistic fuzzy decision of a sample is introduced using neighborhood concept. Then, intuitionistic fuzzy lower and upper approximations are constructed using intuitionistic fuzzy decision and parameterized intuitionistic fuzzy granule. Furthermore, a new dependency function is established. Moreover, a greedy forward algorithm is presented using the proposed concept to calculate the reduct set. Finally, this algorithm is applied to the benchmark datasets and a comparative study with the existing algorithm is presented. From the experimental results, it can be observed that the proposed model provides more accurate reduct set than other existing models.

Mathematical Modeling - Essential Mechanism of Machine Learning

Dr. Tirupathi Rao Padi

Professor & Dean
Department of Statistics,
Ramanujan School of Mathematical Sciences,
Pondicherry University

This talk is intended to address some key concepts of mathematical modeling as a constructing mechanism of machine learning. Data science is one of the most vibrant and fast invading disciplines in the domains of research and new knowledge discovery. Needless to say how the data become a vital resource that is essential for any rational decision support systems. Data driven decision making is the order of the day in which the role of data science is indispensable. Mathematical modeling is something like building a structural architecture for the data processing by formulating the scientific tools. The concepts of mathematical models are now having the new trending nomenclature as machine tools by the discipline of computer science. Machine learning is the activity that has been carried out by the data science discipline in which the fuel is mathematical modeling.

Now the Data Science is a new emerged discipline with the combination of several disciplines such as Mathematics, Statistics, Computer Sciences, Management Studies, Decision Science, etc. Data analytics, data intelligence, data mining, database management, data processing, data procurement, data upgradation, data purification, etc. similar activities are the activities that requires the involvement of mathematicians with embedded knowledge of statistics and computer science. To speak on more common man terminology, the data science is now dealing the data requirements as if Mathematics is the language of data, Statistics is the grammar of the data and Computer Science is the technical medium of the data for exploring the information, knowledge, wisdom and intelligence.

Keywords:
Mathematical Modeling, Machine Learning, Data Science, Decision Support Systems, Knowledge Discovery, Statistics, Computer Science

---

How mathematical model grows with the underlying assumptions – An example from the socio-ecological-economic perspective

Dr. Nandadulal Bairagi

Professor, Centre for Mathematical Biology and Ecology,
Department of Mathematics, Jadavpur University, Kolkata-700032
E-mail: nbairagi.math@jadavpuruniversity.in

Mathematical modelling is the approximate representation of any natural phenomena using a mathematical language. The ordinary differential equation (ODE) is one such language which researchers predominantly use for the mathematical modelling of various physical, biological, and chemical phenomena. Since Thomas Robert Malthus published his book "An Essay on the Principle of Population" in 1798, people have been using ODE to model the population growth of various species. Every mathematical model of population interaction is formulated based on assumptions. In this talk, I'll demonstrate how the mathematical model grows and improves from simple ecological to recent socio-ecological-economic models based on the underlying assumptions.

Modeling the Dynamics of Hepatitis C Virus with combined antiviral drug therapy: Interferon and Ribavirin

Dr. Sandip Banerjee

Professor, Department of Mathematical Sciences
Indian Institute of Technology Roorkee,
E-mail: sandip.banerjee@ma.iitr.ac.in

Mathematical modeling of hepatitis C virus (HCV) dynamics and antiviral therapy has been presented in this paper. The proposed model, which involves four coupled ordinary differential equations, describes the interaction of target cells (hepatocytes), infected cells, infectious virions, and non-infectious virions. The model takes into consideration the addition of ribavirin to interferon therapy and explains the dynamics regarding a biphasic and triphasic decline of viral load in the model. A critical drug efficacy parameter has been defined and it is shown that for an efficacy above this critical value, HCV is eradicated whereas for efficacy lower than this critical value, a new steady state for infectious virions is reached, which is lower than the previous steady-state value.

On Uncertain Multi-objective Combinatorial Problems

Dr. Samarjit Kar

Professor, Department of Mathematics,
National Institute of Technology Durgapur, Durgapur, India

Many real-world problems involve the simultaneous optimization of several competing objectives and constraints that are difficult, if not impossible, to solve without the aid of powerful optimization algorithms. What makes multi-objective optimization so challenging is that, in the presence of conflicting specifications, a single solution cannot be optimal to all objectives. Therefore optimization algorithms must be capable of finding a number of alternative solutions representing the trade-offs. Most optimization problems are also characterized by various forms of uncertainties stemming from factors such as data incompleteness, fluctuating nature of parameter values, noise in data, bad statistical analysis, uncertainty in judgment, etc.

In this presentation, different class of uncertain multi-objective combinatorial problems and different Multi-objective Evolutionay Algorithms, for solving such uncertain combinatorial problems will be covered.

As an example, we have investigated a multi-objective minimum spanning tree problem (MMSTP) with indeterminate problem parameters based on the principles of the uncertainty theory. Here, the objective is to simultaneously minimize uncertain cost and uncertain time associated with every edge of the network. Subsequently, two uncertain programming models of the proposed uncertain multi-objective minimum spanning tree problem (UMMSTP) are developed and their corresponding crisp equivalence models are investigated, and eventually solved using a classical multi-objective solution technique, the epsilon-constraint method. Additionally, two multi-objective evolutionary algorithms (MOEAs), non-dominated sorting genetic algorithm II (NSGAII) (Deb et al. 2002) and duplicate elimination non-dominated sorting evolutionary algorithm (DENSEA) (Greiner et al. 2007) are also employed as solution methodologies. An appropriate numerical example is demonstrated for the proposed UMMSTP.

References

1. Deb, K.; Pratap, A.; Agarwal, S.; Meyarivan, T. A fast and elitist multi-objective genetic algorithm: NSGAII. IEEE Transactions on Evolutionary Computation. 2002, 6, 182- 197.

2. Greiner, D.; Emperador, J.M.; Winter, G.; Galván, B. Improving computational mechanics optimum design using helper objectives: An application in frame bar structures. In: Fourth International Conference on Evolutionary MultiCriterion Optimization, EMO 2007, 2007, vol. 4403 of Lecture Notes in Computer Science, Berlin, 575-589.

3. Liu, B. Uncertainty theory, 2nd edn. Springer-Verlag, Berlin, 2007.

Mathematical models and Mycobacterium tuberculosis

Dr. Samrat Chatterjee
Associate Professor,
Translational Health Science and Technology Institute,
NCR Biotech Science Cluster 3rd Milestone,
Faridabad-Gurgaon Expressway, Faridabad-121001

Infection of humans with Mycobacterium tuberculosis (Mtb) results in diverse outcomes ranging from acute disease to establishment of persistence and even clearance of the pathogen. These different outcomes represent the combined result of host heterogeneity and virulence properties of the infecting strain of the pathogen on the other. We studied high-throughput metabolomics data reflecting the response of human macrophages to infection with different strains of Mtb and at different stages of infection. The success of Mtb as a pathogen derives from its facile adaptation to the intracellular milieu of human macrophages. To explore this process, we asked whether adaptation also required interference with the host cell's metabolic machinery. Temporal profiling of the metabolic flux in cells infected with differently virulent mycobacterial strains confirmed the case. Subsequent analysis using the ordinary differential equation (ODE) model identified the core subset of host reactions that were targeted. For an indepth study, we also explored high throughput proteomics data reflecting the response of the Mf-like THP1 cell line to Mtb infection. Our study revisits this strategy by integrating the temporal proteomics data in the genome-scale metabolic model (GSMM), giving context-specific GSMMs. We have established a method of rewiring using GSMMs to explore potential strategies to change the flux state of virulent Mtb infected macrophages against their avirulent counterparts. Our methodology gives a correlation between different flux states, the extent of which was interpreted as the extent of rewiring. We found that multiple reactions must be rewired simultaneously to alter virulent to an avirulent response. The identified modules showed influence across the investigated strains and time points, suggesting that these reactions could be therapeutically targeted.

The tuberculosis epidemic widely varies among different countries, with the morbidity and mortality of tuberculosis highly dependent on socio-economic structure and demography. These variations challenge formulating a demographic-dependent treatment strategy to reduce the burden and its eradication. We constructed a six-dimensional mathematical model to investigate the effect of demographic variability on TB incidence rate and assess the effectiveness of LTBI treatment in high-incidence scenarios. The present study suggests targeted implementation of LTBI treatment in countries with a high burden of the infected population, like India.

Self-medication, Economy and Drug-resistance – Population Dynamics to Policymaking

Dr. Samit Bhattacharyya

Associate Professor, Dept. of Mathematics,
School of Natural Sciences, Shiv Nadar University, India

The act of self-medication is a prevalent occurrence on a global scale and has the potential to be a significant factor in the development of antimicrobial resistance across the world, particularly in low-income countries (LICs) and lower-middle-income countries (LMICs). Socio-economic factors, such as poverty, inadequate health expenditure, and limited awareness, contribute to the acceleration of certain healthcare practices. The practice of self-medication is widely observed in numerous countries, where antibiotics are available without the prescriptions. The intricate interplay between drug resistance, economic factors, human behavior, and disease epidemiology presents a significant challenge to society. This phenomenon is crucial to consider when developing intervention strategies and formulating public health policies. Comprehending the interplay between human self-medication choices, economic development, and disease transmission, and how they mutually influence each other through feedback mechanisms, can play a crucial role in predicting the impact of antimicrobial resistance and subsequently guiding policy interventions. The utilization of mathematical modeling is a crucial method for examining and measuring the impact of infectious diseases and their management.

This presentation aims to introduce game dynamic models that can be utilized to depict human decision-making in the context of self-medication. Additionally, it will showcase how the strategic interactions of human choices interact with economic factors and the nonlinear nature of disease transmission.

Mathematical Modeling of COVID-19

Dr. Mini Ghosh
Professor, Department of Mathematics
Vellore Institute of Technology, Chennai,
Email: minighosh@vit.ac.in

The proposed talk will briefly introduce the mathematical modeling of infectious diseases, present the important and critical issues in modeling and analysis, report some of our recent research results in the area of mathematical modeling of COVID-19, and finally will focus on the emerging and current trends in modeling the transmission dynamics of COVID-19 in the world.

Contributed Talks

Quantifying the costs and benefits of Transmissible Vaccine in wild population

Dr. Aniruddha Deka

Texas A & M University, USA

Transmissible vaccines, or self-disseminating vaccines, are vaccines capable of transmitting between hosts (like a pathogen). This is a relatively new concept and existing literature have not quantified the costs and benefits of this concept. Transmissible vaccines may be a revolutionary approach for controlling infectious disease (spillover). However, there are potential evolutionary risks associated with a vaccine being transmissible. Before introducing a transmissible vaccine in the wild population, we need to know the additional benefits and challenges that can be attributed to a vaccine being transmissible. The main motivation of the work is to understand and analyze the costs and benefits of transmissible vaccine. Our analysis show that there is always a benefit in terms of reduction of infection for a transmissible vaccine. At the same time there is always an increased cost of vaccine reversion to virulence. We also show that there is a potential risk of recombination that be higher or lower depending upon the model parameters

---

Mathematical Modeling of Oncolytic Virotherapy and its Combination with other Cancer Treatments

Dr. Joseph Malinzi

Faculty of Science and Engineering,
Department of Mathematics,
University of Eswatini, M201, Kwaluseni, Eswatini

In the recent past, oncolytic virotherapy (OV), a new form of cancer treatment has extensively been studied. The major advantage of using OV over other traditional cancer therapies is its ability to selectively kill cancer cells without damaging normal body tissue cells and its ability to invoke immune responses. Nonetheless, several problems to do with OV and combination therapy involving OV still remain to be solved, for example, the choice of virus platforms, determining the best delivery approach and optimal dosage combinations. In this talk I will present a recent study on Oncolytic virotherapy. A reaction-telegraph model for oncolytic virus spread is proposed to explore several scenarios in order to quantify: the effect of viral spread on a tumor and the role of the extra-cellular matrix concentration in facilitating viral spread. Analysis of the model includes proving existence of positive unique solutions for the temporal and spatiotemporal cases and determining steady state solutions and investigating their stability. Under a steady state assumption of tumor cells, exact solutions for the virus and ECM densities are determined. Numerical simulations of both the temporal and spatiotemporal cases are carried out. I will discuss all the obtained results and their biological implications. All the results that were obtained and their biological implications will be explained.

Dynamics of oxygen-plankton model with variable zooplankton search rate

Dr. Sudeshna Mondal

Department of Mathematics
Indian Institute of Information Technology, Kalyani,
Nadia, Kalyani, India

Ocean dynamics is known to have a strong effect on the global climate change and on the composition of the atmosphere. In particular, scientists estimate that 50-80% of the oxygen production on Earth comes from the oceans due to photosynthetic activity of phytoplankton. Some of this production is consumed by both phytoplankton and zooplankton for cellular respiration. However, the rate of oxygen production depends on water temperature and hence can be affected by the global warming. The main purpose of this article is to investigate the implications on the Holling type II oxygen-plankton model [3] when the assumption that the search rate is constant, is relaxed [1,2]. In this article, I have proposed and analyzed the dynamics of oxygen-plankton model with a modified Holling type II functional response, based on the premise that zooplankton has variable search rate, rather than constant. Our numerical findings show that (i) the system dynamics changes abruptly for low oxygen production rate, resulting in depletion of oxygen and plankton extinction; (ii) the proposed system has oscillatory behaviour in an intermediate range of oxygen production rate; (iii) it has always stable coexistence steady state for large oxygen production rate which is dissimilar from the outcome of the model analyzed by Sekerci and Petrovskii [3]. Because, they have showed that depletion of atmospheric oxygen for large oxygen production rate is another possible catastrophic consequence of the global warming, a global ecological disaster. Therefore, the study of the modified Holling type II functional response (variable zooplankton search rate) is ecologically significant for the sustainability of the dynamics of the proposed system that has been overlooked by Sekerci and Petrovskii[3].

Keywords: Phytolankton; Zooplankton variable search rate; Oxygen depletion; Extinction; Co-existence.

References

1. B. D. Dalziel, E. Thomann, J. Medlock and P. D. Leenheer. Global analysis of a predator-prey model with variable predator search rate. *Journal of Mathematical Biology*, 81:159–183, 2020.

2. M. P Hassell, J. H. Lawton and J. R. Beddington. Sigmoid functional responses by invertebrate predators and parasitoids. *J. Anim. Ecol.*, 46(1):249–262, 1977.

3. Y. Sekerci and S. Petrovskii. Mathematical modelling of plankton-oxygen dynamics under the climate change. *Bull. Math. Biol.*, 77:2325–2353, 2015.

A polynomial collocation method for interval type-2 fuzzy integro-differential equations

Sandip Moi[1] and Suvankar Biswas[*2]

[1]Department of Mathematics,
Indian Institute of Engineering Science and Technology, Shibpur
B. Garden, Howrah - 711103, India
; [2]Discipline of Mathematics, School of Sciences,
Indira Gandhi National Open University, New Delhi - 110068, India

In our literature review, it has been seen that there is no work has been done on the solution of interval type-2 fuzzy integro-differential equation. Also, there is no work has been done on the numerical solution of interval type-2 fuzzy integro-differential equation. So, there is a good opportunity to work on the numerical solution of the type-2 fuzzy integro-differential equation. This article describes a polynomial collocation method for the solution of an interval type-2 fuzzy integro-differential equation. The equation has been written in the operator form. The boundedness of the operators has been shown by different types of theorems and lemmas. The boundedness of the operators ensures that the collocation method is convergent. A flowchart of the numerical method has been given. Numerical examples have been provided to show the validation of our proposed method. Also, different types of error analysis have been performed by considering different types of convergence indicators in the numerical section.

Keywords: Fuzzy differential equation; Type-2 fuzzy differential equation; Type-2 fuzzy integro-differential equation; Jacobi polynomial collocation method.

Dynamical analysis of spread of online misinformation and a delayed optimization technique

Moumita Ghosh and Pritha Das

Indian Institute of Engineering Science and Technology, Shibpur,
Howrah, West Bengal

The Spread of online misinformation has momentous impact on people's daily life. Nowadays with advent of various social media platforms, the twisted news targeting the public opinion have started to disseminate significantly fast and in wide scale. On the basis of the attitudes of netizens toward misinformation, here we have proposed a delayed Susceptible-Exposed-Infected-Recovered (SEIR) model to study the dynamics of propagation of misinformation, considering four categories of netizens, namely, ignorant population(people, who are still uninformed of the misinformation), exposed population (who have encountered misinformation, believed it and pass it to lesser number of people), active spreaders(who create and deliberately spread misinformation on internet among large number of people having some vested personal or group interest), aware (people who are aware about the misinformation, do not spread and ask others not to spread). Here the delay is incorporated to signify that the online misinformation usually lacks credibility and it takes time to persuade netizens to believe it or circulate it to others. Next the critical value of the spread of misinformation (spreading threshold, $\mathcal{R}_0$) is derived, that gives the condition of prevalence of misinformation. Like the basic reproduction number for disease models, here also $\mathcal{R}_0 < 1$ assures the vanishing of misinformation with time, while $\mathcal{R}_0 > 1$ asserts the prevalence of it. With the help of $\mathcal{R}_0$, we analyze the local stability dynamics for the corresponding non-delayed system. For the delayed system, the system bifurcates from its stable condition, when the time delay crosses a certain value. Also the streaming rate of misinformation destabilizes the system when it reaches its threshold value. To counter misinformation and inhibit its spreading process, an optimization technique with the help of mainstream media is formulated and solved by Pontryagin's maximum principle with constant delay. Finally some numerical results are presented to validate our analytical findings.

Keywords: Online misinformation, Spreading threshold, delay, Hopf bifurcation, Optimal control.

Application of a new collocation method on fuzzy fractional integro-differential equations

Sandip Moi[1] and Suvankar Biswas[2] and Smita Pal (Sarkar)[1]

[1]Department of Mathematics,
Indian Institute of Engineering Science and Technology, Shibpur
B. Garden, Howrah - 711103, India
; [2]Discipline of Mathematics, School of Sciences,
Indira Gandhi National Open University, New Delhi - 110068, India

In this article, a fuzzy fractional Volterra integro-differential equation of has been considered in Caputo sense. Also, a new type of collocation method has been used to find the numerical solution of the proposed equation. Collocation method is a very important method which can solve almost any kind of fuzzy integro-differential equations. But we need to prove the existence and uniqueness solution of the proposed equations. In addition, Banach's fixed point principle has been applied in the proof of the existence and uniqueness theorem. In this collocation method, we have chosen some collocation points based on the Chebyshev extreme points of order N. Also, we have been approximated the fractional integral terms of the proposed equation by fractional Gauss-Jacobi quadrature method. The convergent analysis of the proposed method has been demonstrated in terms of some lemmas and theorems. A test example has been taken where different kind of error analysis has been done in terms of tables and figures. In addition, we have shown that the approximate solution converges to the exact solutions as the iterations increases. The numerical results of the proposed technique have been compared with an existing method which is Adomian decomposition method.

Keywords: Fuzzy fractional derivative; Fuzzy fractional integro-differential equation; Collocation method; Volterra integro-differential equation.

Bifurcations and economic trade-off in a two-species fishery model with prey-harvesting and predator-tourism toward the blue economy

Santanu Bhattacharya[1],Biswajit Sarkar[2] and Nandadulal Bairagi[1]

[1]Centre for Mathematical Biology and Ecology, Department of Mathematics,
Jadavpur University, Kolkata, India;
[2] Department of Industrial Engineering,
Yonsei University, Seoul, South Korea;

Fishing and tourism both are globally burgeoning industries. This study considers an integrated two-species predator-prey model where the fishing is applied to the prey species and predators (dolphins) are used for ecotourism purposes. However, four rate equations are considered for the prey fish, predator fish, fishing effort of prey species, and their market price to formulate the bioeconomic model. It is assumed that the tourist association imposes an entry fee to the visitors and the number of tourists depends on the level of entrance fee and the existing predators. The system provides nine equilibrium points of which six are always unstable. In the remaining three, harvesting is possible in only one equilibrium i.e., the coexisting equilibrium point. Our analysis shows that this coexisting equilibrium point is locally as well as globally asymptotically stable. To control overexploitation as well as to sustain the blue economy taxation policy is applied in fishing. The main challenge of the study is to obtain a state where the fisherman, tourist society, and the governing agency face a win-win situation. Applying Pontryagin's maximum principle, this study obtain the circumstances where some trade-offs between the imposed fishing tax and combined earnings exist.

Keywords: Integrated fishery model, Tourist fee, Saturated harvesting rate, Variable demand, Bifurcations.

Channel replacement model under type-2 fuzzy set

Yogheesha R[1],[2] and Hemalatha S[3]

[1]Department of Mathematics, Agurchand Manmull Jain College, Meenambakkam, Chennai, Tamil Nadu;

[2] Shrimathi Devkunvar Nanalal Bhatt Vaishnav College for women, Chrompet, Chennai, Tamil Nadu;

[3]Department of Mathematics, Shrimathi Devkunvar Nanalal Bhatt Vaishnav College for women, Chrompet, Chennai, Tamil Nadu

Email id: yogheesharajan@gmail.com

Operations research branch of mathematics which involves scientific ideas and scientific methods to solve mathematical problems. Decision theory is a field of Operations Research aids in taking optimum decisions for any problem. But optimum decisions can be taken depending upon the degree of information the decision maker knows. In most if the real-life problems, the degree of information would be uncertain. Replacement theory is a field of Operations Research which is concerned about replacement of any equipment, in particular, this paper deals with replacement of communication channels. In information theory, whenever information/message has to be sent from the sender to the receiver, communication channels are used. But the working efficiency of communication channels are not easy to predict (i.e) the data regarding the working condition if communication channels are uncertain. The communication channels analysed in this research paper use simplex mode to transmit information/message from one place to another and also communication channel uses multicast data transmission method to transmit the information from one place to another. The uncertainty in the data regarding the working efficiency of communication channels can be effectively handled by Fuzzy Set theory. Fuzzy set theory is a research approach that can deal with problems relating to ambiguous, subjective and imprecise data and helps in decision making. Thus, Fuzzy Set theory can be applied to take optimal decisions regarding the replacement of communication channels. In particular, type-2 fuzzy sets are used to obtain the optimal decision regarding replacement of communication channels in a unprecedented model. A model is constructed wherein one (or) few communication channels does not work only for a short duration of time otherwise these communication channels work properly. Type-2 fuzzy sets are used to take optimum decision for this model, which is illustrated with a numerical example.

Keywords: Operations Research, Decision Theory, Replacement Theory, Information Theory, Communication Channels.

Effect of productivity and seasonal variation on phytoplankton intermittency in a microscale ecological study using closure approach

Arpita Mondal

Department of Mathematical Sciences
Indian Institute of Technology Roorkee,
E-mail: amondal@ma.iitr.ac.in

A microscale ecological study using the closure approach to understand the impact of productivity controlled by geographical and seasonal variations on the intermittency of phytoplankton is the highlight of the talk. Using this approach for a nutrient–phytoplankton model with Holling type III functional response, it will be shown how the dynamics of the system can be affected by the environmental fluctuations triggered by the impact of light, temperature, and salinity, which fluctuate with regional and seasonal variations. Reynold's averaging method in space, which results in expressing the original components in terms of their mean (average value) and perturbation (fluctuation) has been used to determine the impact of growth fluctuation in phytoplankton distribution and in the intermittency of phytoplankton spreading (variance). Parameters are estimated from the nature of productivity and spread of phytoplankton density during field observation done at four different locations of Tokyo Bay. The model validation shows that the results are in good agreement with the field observation and succeeded in explaining the intermittent phytoplankton distribution at different locations of Tokyo Bay, Japan, and its neighboring coastal regions.

Role of fear factor in a two-prey one-predator model: comparison between crisp and fuzzy environment.

Soumya Das and Pritha Das

Indian Institute of Engineering Science and Technology, Shibpur, Howrah, West Bengal

Prey-predator interactions are perhaps the most ordinarily noticed phenomena in the environment. In this article, a two-prey one-predator model with the fear effect on two prey species by the predator has been considered. Here we have assumed the predator consumes two prey species by Holling type-II functional response, and there is intraspecific and interspecific competition in both the prey species. Some parameters have been considered to be fuzzy numbers to consider the inherent imperfection of environmental factors. In the fuzzy sense, the system has been studied analytically and numerically. The system's positivity, boundedness, and permanence are examined using model analysis. The system's local stability analysis at each equilibrium point, and global stability analysis at the positive interior equilibrium point has been investigated. Hopf bifurcation analysis around the positive interior equilibrium point has been discussed. Using MATHEMATICA 2011 and MATLAB 2018, all of the system's numerical simulations are presented with appropriate tables and graphical diagrams. In this article, we have mainly focused on our study to examine the effect of fear on the stability of the system in crisp as well as fuzzy environments. Numerically, we have seen that the fear effect can bring the system back to a stable state from chaos. At the positive equilibrium point, the system experiences Hopf bifurcation when the fear parameter k crosses the threshold value in both crisp and fuzzy environments.

Keywords: Prey-predator model; fear effect; fuzzy number; signed distance method; stability analysis; Hopf- bifurcation

---

Video Encoding : A Geo Encryption Algorithm

Dr. B. Rajesh Kanna
Associate Professor, Department of Computer Science(AI& ML),
Rajiv Gandhi National Institute of Youth Development
brajeshkanna@gmail.com

Combining video encoding and encryption stream lines the decryption and decoding processes, simplifying the playback of encrypted videos. This integration enables simul taneous or seamless decryption and decoding, eliminating the need for additional steps, and allowing authorized users to view the video effortlessly. By employing data randomization and generating unique random keys for each point, the proposed algorithm maps video data to various points on a 2D plane. This approach ensures improved speed and enhanced security compared to existing encryption algorithms currently in use. In the context of video file encryption, the presented paper introduces a symmetric block algorithm with a 128-bit key size. This algorithm efficiently encrypts video files, ensuring both security and transmission/storage speed. By treating the video file as a sequence of bytes and mapping them to specific points on a two-dimensional plane, the algorithm enables swift decryption using the shared key from the Code-Book, facilitating efficient decryption for the involved parties. Furthermore, as the algorithm follows a Fully Layered Encryption approach, it does not affect the MPEG format. The combination of video encoding and encryption offers benefits such as reduced file size for easier and faster transmission over networks or storage on devices. This integration saves time and effort by merging encoding and encryption into a single operation, resulting in more efficient video transmission and storage.

A survey of approximation algorithms for capacitated vehicle routing problems

Yongyu Chen

Ural Federal University, Russia

Finding the shortest tour of the traveling path by vehicles with capacity k from the depot to the customers is called the Capacity vehicle routing problems (CVRP). CVRP plays an essence position in logistics systems and it's the most intensively studied problem in combinatorial optimization. In complexity, CVRP with k gt;= 3 is a NP-hard problems, and it's APX-hard as well. We already knew that it cannot be approximated in metric space. What's more, they're the first problem resisting Arora's famous approximation framework. So, whether there is a polynomial-time (1+)-approximation for the Euclidean CVRP for any gt;0 is still an open problem. In this paper, we will summarize the research progress from history to up- to-date developments.

Keywords: Approximation algorithms, Capacity vehicle routing problems, Polynomial-time approximation scheme, Combinatorial optimization.

AI Enabled Emotional Response System: Kanmani For INDIA

Srimathi M,, Aurobind. G, and Avishek Sinha
Department of Computer Science(Data Science)
Rajiv Gandhi National Institute Of Youth Development
srimathi2001cud@gmail.com

Virtual assistants have gained a lot of popularity since they simplify many of our jobs, especially during our hectic hours. It is one of the fantastic outcomes of the development of artificial intelligence. It may be improved by including elements for voice emotion recognition to make it more adaptable. As a result, it reduces the amount of time required to type and allows the user to complete the work according to their mood. As a result of our research, in this paper by using Machine Learning, Deep Leaning and artificial intelligence, we developed a model that enables people to interact through video and voice, enhancing the flexibility of a virtual assistant and recognizing emotions and speech, particularly when people want to interact with someone when there is no one around, as well as how valuable it is on a daily basis. The key goal or the main objective is "To empower the minds and ignite the possibilities, by unleashing the future through personalised technology". I have split KANMANI into three working phrases, the combination of these three phrases will be your virtual companion, which is custom made for your personal world. First is the voice assistant, Artificial intelligence (AI) has made tremendous improvements recently, and its potential grows every day. NLP, often known as natural language processing, is an application field for AI. Voice assistants may converse with people in natural language and include AI, it receives the queries/ commands as speech signals and convert it and give us the output result as speech. Second is the Emotion Identification through speech and facial expression where it identifies the user's emotion and react to it with a quote. Third is the final level the Virtual Assistant, where user can interact through Video with AI that responds to user query with Emotion Detection.

Keywords: Virtual assistant, Machine Learning and Artificial Intelligence, Voice Assistant, Emotion Recognition, Speech Recognition.

Automated Golf Swing Analysis: A Computer Vision Approach

Joyal Jose T.S, Aurobind. G, and Avishek Sinha
Department of Computer Science(Data Science)
Rajiv Gandhi National Institute Of Youth Development
joyaljose118@gmail.com

Automated golf swing analysis has gained significant attention in recent years due to its potential to provide valuable insights into golfers' skill development. This paper presents a computer vision-based strategy on image processing techniques to reliably categorize golf swings using the Golf DB dataset and a Convolutional Neural Network (CNN) model. The goal is to make a clean and efficient swing analysis easier, allowing golfers to improve their performance and polish their technique. The Golf DB dataset consists of 1400 high-quality golf swing videos, each labeled with event frames, bounding box, player name and sex, club type, and view type. So here we will extract the videos into different frames and using the image processing technique we will analyze each frame and classify the golf swings accordingly. Using this information, we can accurately classify golf swings into separate categories using computer vision techniques.

We use the Convolutional Neural Network (CNN) model to train and recognize complex photo patterns and features, allowing it to categorize swings based on their visual qualities. To assure the classification's accuracy, a thorough evaluation method is used, which includes metrics such as precision, recall, and F1-score. These metrics objectively assess the model's ability to distinguish between distinct swing kinds. The evaluation results show that the suggested approach effectively identifies golf swings, demonstrating its potential as a valuable tool for swing analysis. The proposed methodology offers scalability and adaptability, as it can be extended to incorporate new swing types or variations within the Golf DB dataset. This flexibility ensures that the classification system remains robust and applicable to diverse golfing scenarios.

Keywords: Convolutional Neural Network (CNN), Computer Vision, Image Processing.

Enhancing Neural Style Transfer: Artistic Style Fusion for Background and Foreground of the Image

Jerrin Thomas, Aurobind. G, and Avishek Sinha
Department of Computer Science(Data Science)
Rajiv Gandhi National Institute Of Youth Development
Jerryetm007@gmail.com

Artistic style transfer has revolutionized image transformation by seamlessly blending the style of a reference artwork with the content of an input image. However, conventional methods often overlook the potential to enhance compositions by applying distinct styles to the background and foreground regions. In this project, we propose a novel approach to enhance neural style transfer by introducing artistic style fusion for the background and foreground.

To achieve this, we leverage the state-of-the-art U2net deep learning model for precise image segmentation. By accurately separating the background and foreground regions, we establish a foundation for applying tailored artistic styles to each region independently. This segmentation serves as the basis for our subsequent fusion of artistic styles, resulting in visually striking compositions.

Experimental results demonstrate the effectiveness of our approach in producing captivating and immersive images. By introducing distinct artistic styles for the background and foreground, we unlock new possibilities for artistic expression and creativity. The fusion of styles adds depth and dynamism to the composition, creating visually captivating images that evoke a sense of wonder and allure.

Our work expands the capabilities of neural style transfer by incorporating region-specific styles, offering a unique approach to artistic expression. By enabling the fusion of different artistic styles for background and foreground elements, we create visually striking compositions that showcase the power of combining diverse artistic influences.

Keywords: Artistic style transfer, Neural Style Transfer, Image segmentation, Background, Foreground.

Integrated Initial Screening Assessment for Dementia

Midhun Lal . V.S, B. Rajesh Kanna and Shilpa Bisen
Rajiv Gandhi National Institute Of Youth Development
brajeshkanna@gmail.com, shilpabisen777@gmail.com,
midhunsunil.rgnyd@gmail.com

Dementia, a prevalent neurodegenerative condition characterized by memory loss, impaired communication, and cognitive decline, is the focus of this work. The aim is to propose an integrated initial screening assessment for dementia utilizing multimedia and digital technology. The objective is to develop an integrated platform that automates and improves the assessment of cognitive function, enhancing accessibility and accuracy. The methodology involves collecting and pre-processing data, as well as virtualizing cognitive tests such as the Mini-Mental State Examination (MMSE), Montreal Cognitive Assessment (MoCA), and Mini-Cog in multiple languages. AI algorithms will analyze user responses to extract biomarkers of cognitive impairment, supported by natural language processing techniques for verbal responses. Additionally, machine learning models will integrate test results, demographic information, and medical history to conduct personalized risk assessments. The effectiveness of the platform will be validated through collaboration with healthcare professionals and researchers, comparing results with traditional screening tests and clinical outcomes. These outcomes have the potential to significantly advance dementia screening by providing an accessible, accurate, and efficient mobile app-based assessment for early detection. The development of this mobile application empowers individuals, healthcare professionals, and healthcare systems to effectively address the challenges associated with dementia. By leveraging AI and machine learning, the proposed integrated screening assessment has the potential to revolutionize dementia screening, enabling early detection and timely interventions. This research contributes to ongoing efforts to improve the quality of life for individuals affected by dementia.

Keywords: Dementia, Integrated screening assessment, Artificial intelligence (AI), Cognitive screening.

Bee Bot - Information Hunter

Santhosh Kumar S
Department of Computer Science (AI & ML)
Rajiv Gandhi National Institute Of Youth Development
santhoshsk2k01@gmail.com

As an AI language model, the main purpose is to assist users in generating human-like responses to their queries and provide useful information on a wide range of topics. Whether answering questions, providing suggestions, or helping with problem-solving, the ultimate aim is to provide a seamless conversational experience that feels natural and intuitive for the user. Bee-Bot strives to be a versatile and reliable tool that users can turn to for assistance with any task that requires language processing and analysis.

The main objective is, we are trying to get into the interface of the whole operating system to reflect the hyperblow which is a pop-up that will show the information in the bee bot, that saves much time as we are not going and searching in any web search to get the best possible solution.

The problem statement for this paper is, If we are searching or learning something in the web search or pdf or whatever the format may be, if we need to learn more about some concept, or if we need to know some meaning of the particular corpus, we have to go to a web search so that we can find the answer, that is a time-consuming, also we are not sure whether that is giving you the exact answer also will that providing the answer at the expected time is also an issue, the one-stop solution for all these is BEE BOT – Information Hunter.

The basic interface of BEE BOT has 3 levels, the first level is the old data, where all the existing data will be available, the second level is the Front screen, i.e., a pop-up box, and the third one is the AI component that thinks and produce us the best possible response using several Machine Learning Mechanisms such as content filtering and knowledge engineering.

Keywords: AI Language Model, Information Hunter, Machine Learning, Content Filtering, Knowledge Engineering.

KG-SVM: Knowledge Graph – Based Machine Learning for Accurate COVID-19 Detection from Symptoms

Shahabas KM, Aurobind. G, and Avishek Sinha
Department of Computer Science(Data Science)
Rajiv Gandhi National Institute Of Youth Development
Shahabassha12@gmail.com

The quot;KG-SVM: Knowledge Graph – Based Machine Learning for Accurate COVID-19 Detection from Symptomsquot; project aims to develop a precise model for predicting COVID- 19 infection using knowledge graph (KG) techniques and Support Vector Machine (SVM) algorithm. This study explores the integration of KG data with SVM to enhance the predictive capabilities and precision of the model, addressing challenges posed by diverse symptoms and the need for rapid and accurate diagnosis. COVID-19 is a global health crisis, and early detection is crucial in controlling its spread. However, diagnosing COVID-19 based on symptoms alone is challenging due to overlap with other respiratory illnesses. By leveraging KGs containing interconnected information about COVID-19 symptoms, risk factors, and related entities, we tap into a vast pool of knowledge to improve accuracy and understanding. The methodology involves training an SVM model using a dataset of patient records with symptom information. KG data is incorporated into the feature space of the SVM to capture complex relationships and patterns. Hyperparameters are carefully considered and optimized to achieve high precision and develop a robust model. Performance evaluation uses multiple metrics, focusing on precision, recall, accuracy, and F1 score. The study demonstrates the efficacy of integrating KG data with SVM for COVID-19 detection, achieving a high precision rate in identifying COVID-19 positive cases based on symptoms. This highlights the importance of incorporating domain knowledge from KGs in healthcare applications. In conclusion, the project showcases the potential of graph data science and SVM for accurate COVID-19 detection, offering valuable insights for healthcare professionals and decision-makers in combating the pandemic.

Keywords: Knowledge Graph, SVM, Confusion matrix.

Intelligent Character Recognition For Sign Language

Joshik V, Aurobind. G, and Avishek Sinha
Department of Computer Science(Data Science)
Rajiv Gandhi National Institute Of Youth Development
joshiksaisriram@gmail.com

The recognition of Indian Sign Language (ISL) plays a vital role in joining the communication gap between the deaf-and-dumb person and the general population. This project aims to develop a system for recognizing the characters of the ISL alphabet by leveraging the capabilities of the MediaPipe Hand Landmarks and machine learning algorithms. The project follows a two-step method to achieve its objectives. Firstly, the MediaPipe Hand Landmarks are utilized to extract hand landmarks from input video frames. These landmarks serve as valuable features for character recognition as they represent the spatial positions of the hands in different gestures. The extracted landmarks undergo preprocessing steps to enhance their quality and prepare them for subsequent analysis. The machine learning algorithm is gainfully employed to predict the characters of the ISL alphabet based on the preprocessed hand landmarks. The project aims to achieve high accuracy in recognizing the ISL alphabet characters, enabling effective communication between the hearing-impaired and others. The proposed system has the potential to assist in educational settings, accessibility in public spaces, and facilitate inclusive communication. The results of this project will be evaluated using appropriate evaluation metrics, such as accuracy, precision, recall, and F1 score. Furthermore, the system39;s performance will be compared with existing approaches and benchmarks to assess its effectiveness and efficiency. Suggest, the project presents an innovative approach to Indian Sign Language recognition, utilizing the capabilities of the MediaPipe Hand Landmarks and machine learning algorithms. By successfully recognizing the characters of the ISL alphabet, this system has the potential to enhance communication and inclusivity for the hearing-impaired population.

Keywords: Indian Sign Language, MediaPipe Hand Landmarks, Machine Learning Algorithms, Character Recognition, Hearing-impaired Communication.

OXY-FET: To measure the oxygen level to the foetus using a smart watch.

S Suvetha, Aurobind. G, and Avishek Sinha
Department of Computer Science(Data Science)
Rajiv Gandhi National Institute Of Youth Development
suvethasenguttuvan5@gmail.com

The use of wearable Devices has grown in popularity in the recent decades, with smart watches being among the most popular kinds of gadgets. The proposed research idea is to observe the oxygen level in the placenta to ensure that enough amount of oxygen is supplied to the foetus using smart watch.

The placenta is a important organ that plays a vital role in ensuring the health development of the foetus during pregnancy. It facilitates the transfer of oxygen and nutrients from the mother to the foetus, and thus, an adequate oxygen supply is essential for the overall well- being of the foetus. To ensure a healthy pregnancy, it is critical to monitor and maintain proper oxygenation of the placenta. So for the development of healthy baby and wellbeing, it is essential to monitor the amount of oxygen being delivered through the placenta to the baby. In this ground work, were going to monitoring the oxygen level and give real-time feedback on foetal oxygenation using a device called near-infrared spectroscopy (NIRS).NIRs is non- invasive method and measure the rate of change and the change in oxygenate haemoglobin concentration. The idea is to use a wireless miniature NIRS integrated in a smart watch, which when placed on the abdominal of the mother measure the level of oxygen supply to the foetus.

Using smart watches integrated with NIRS technology to measure placental oxygen saturation is a promising strategy for enhancing prenatal care. This technology opens a gateway opportunity to give parents up-to-the-minute updates on the condition of their unborn child and could be used to spot any potential problems before they worsen. Having this technology built into smart watches would also make it easier for parents to use in more convenient.

Keywords: smart watch, oxygen level, Near infrared spectroscopy , computation.

Personalized Song Recommendation System Using Chatbot

Madhiarasan M, Aurobind. G, and Avishek Sinha
Department of Computer Science(Data Science)
Rajiv Gandhi National Institute Of Youth Development
darkchanspidey@gmail.com

Utilizing the Spotify API, this paper work seeks to create a customized music recommendation system. Based on user preferences and mood, the system provides three alternatives for music suggestions, facilitating the discovery of new music suited to individual interests.

Machine learning techniques are used to enhance the recommendation process. ML algorithms discover patterns and connections between songs, genres, and user preferences by examining a massive quantity of data, including user interactions and music information received through the Spotify API. As a result, the system can deliver precise forecasts and suggestions that are tailored to the preferences and mood of each user. The recommendation algorithms are further improved by optimisation approaches, resulting in extremely relevant and pleasant playlists.

The system offers three different ways to find music. Users may search and listen to songs from Spotify39;s enormous song catalog, discover recommended music based on certain narratives, or take advantage of personalized playlists made up of the songs they listen to the most. Users may retrieve their own playlists made using the Spotify API after a 30-day window.

This paper work provides a fresh way to personalize music suggestion, responding to different moods, musical preferences, and exploratory needs by utilizing the sizable music collection and data made available through the Spotify API. The technology addresses plagiarism issues while providing a fun and interesting music discovery experience. It combines a user-centric design, smooth Spotify API connection, and the effectiveness of machine learning algorithms to offer a novel approach to personalisation. The system offers three different ways to find music. Users may search and listen to songs from Spotify39;s enormous song catalog, discover recommended

music based on certain narratives, or take advantage of personalized playlists made up of the songs they listen to the most. Users may retrieve their own playlists made using the Spotify API after a 30-day window.

This paper work provides a fresh way to personalize music suggestion, responding to different moods, musical preferences, and exploratory needs by utilizing the sizable music collection and data made available through the Spotify API. The technology addresses plagiarism issues while providing a fun and interesting music discovery experience. It combines a user-centric design, smooth Spotify API connection, and the effectiveness of machine learning algorithms to offer a novel approach to personalized music exploration and enjoyment.

Keywords: Machine learning, recommender system, mood detection, Chabot, Spotify API.

An Insights on different plants in Himanchal Pradesh for their Therapeutic Usage (Antibacterial Activity)

Mayuri Jain, Anuj Kumar Poonia
UIS, Chandigarh University Gharuan, Mohali India
mayurijai26@gmail.com

Medicinal herbs have been used for their therapeutic uses since time immemorial. It is amazing to know that weeds growing on the side of the road can have so many medicinal uses. This project reports digs deeper into the plants spotted in the state of Himachal Pradesh for their antibacterial and other therapeutic properties. Around 40 plants have been collected through text mining approach along with the altitude on which they are found. In the first part of the methodology, it summarises the phytochemical constituents of these plants that may be responsible for these properties. In the second part, it reports the use of the extracted components by different people in various fields. In the review of literature section, various bioassays that lead to the detection of the antibacterial and antifungal properties have been reviewed. The results have been displayed in a tabular form for easy follow though and future use.

Since nient times, mediinl lnts hve been used in lmst ll ultures t ure lt f helth issues. The extensive use of plants as medicines can be seen described in the Vedas and Bible. These traditional medicines are still used in a lot of parts of the world and are still an essential part of Indian healthcare as a result of its wide availability and low cost.The medicinal herbs or traditional plants synthesise a lot of chemical compounds, also known as phyto-chemicals; these account for numerous functions like antagonism towards the bacteria, fungi and viruses, and even some insects. A common example of it being the intake of turmeric powder extracted from turmeric plant that consists of the compound Curcumin, acting as an antimicrobial and also an antihypertensive agent.The pharmacological activity has been reported from almost all the plant parts. **Keywords:** Antimicrobial, Medicinal, Pharmaceutical.

References

1. Kulshreshtha, Shweta, et al. "Pre-and Post-treatment Characterization of Petrol Contaminated Soil." Advances in Materials Science and Engineering: Select Proceedings of ICFMMP 2019. Springer Singapore, 2020

2. A, Kyungseop., "The worldwide trend of using botanical drugs and strategies for developing global drugs." BMB reports 50(3), 111, 2017.

Numerical investigation on Maxwell Fluid on vertical Plate with the influence of radiation and Heat Mass Transfer

K. Sudarmozhi[1] and D. Iranian[2]

[1]Department of Mathematics,
Saveetha School of Engineering, SIMATS, Chennai, Tamil Nadu,
; [2]Department of Mathematics, Saveetha School of Engineering, SIMATS, Chennai,
Tamil Nadu, India
sudarmozhik1033.sse@saveetha.com, iraniand.sse@saveetha.com

This simulation shows how mass, heat transfer is analyzed, when Maxwell fluid flows across a vertical plate, In the conservative energy transport equation and relaxation effect is considered. Using appropriate similarity transformations, the governing equations such as continuity, conservation of momentum, energy transport, and mass transport were transformed into ODE ordinary differential equations. Runge – Kutta method uses these differential equations with shooting technique and the corresponding boundary conditions later. The numerical method has compared to previously published work and found to be accurate. As an example, buoyancy ratio (Nr), Grashof number (Gr), Prandtl (Pr), Rayleigh (Ra) and Lewis number (Le) are all essential parameters that are commonly studied through graphs.

Keywords: Vertical plate, Thermal Radiation, Maxwell fluid, Steady state.

Numerical Analysis of Heat Transfer Enhancement of SiO_2 and ZnO Nanofluid in uniformly distributed parallel channel PEMFC Cooling Plate.

Mohit Kumar Singh, Gaurav Kumar and Raj Kumar Singh

Department of Mechanical Engineering,
Delhi Technological University, Delhi-42, India

PEM fuel cells are a promising alternative to fossil fuels in automotive applications and sustainable power-generating technology. One of the major obstacles to the commercialization of these cells is their thermal management. A thermal management system's main task is to keep the required temperature constant, ensuring that the stack and each of its component membranes gets heated uniformly. This work presents a numerical analysis of thermal enhancement for a single cooling plate for a proton exchange membrane fuel cell (PEMFC). A uniformly distributed parallel channel cooling plate measuring 210 x 220 mm and equipped with 19 parallel microchannels of 1 x 4 x 112 mm was utilized to cool PEMFC. The cooling plate was made of carbon graphite material. The SiO_2 and ZnO were used as a cooling agent. The 0.5% volume concentration of SiO_2 and ZnO based on water is the study's main topic. The heating pad was chosen as the source term, which has a single energy source with the value of 1298701 W/m^3 and is taken to be constant. Regarding the boundary conditions, the input velocity of water was adjusted between a 400–2000 Reynold Number range. The result showed that when compared to another nanofluid (SiO_2), the ZnO nanofluid's thermal performance was found to be better at 2000 Reynold Number. The favourable thermal outcomes suggested that ZnO nanofluid could be a better choice for upcoming uses in PEM fuel cell as coolant

---

Novelty On Right(left) Bi- Quasi Ideals In B-semirings

M. Suguna[1] M. Palanikumar[2] and Aiyared Iampan[3]

[12]Department of Mathematics,
Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences,
Chennai-602105, India [3] Fuzzy Algebras and Decision-Making Problems Research Unit,
Department of Mathematics School of Science,
University of Phayao 19 Moo 2, Tambon Mae Ka, Amphur Mueang, Phayao 56000,
Thailand
msugunamaths95@gmail.com[1] and palanimaths86@gmail.com[2] and
aj.iampan@gmail.com[2]

We introduce two types of bi-quasi ideals in b-semirings. Each bi-quasi ideals generated by single element and set are established. We characterize various 1-regular (2-regular) by using generalized-1-bi quasi ideal, 1-bi quasi ideal, weak-1-right ideal, weak-1-left ideal, right ideal, left ideal, bi-ideal, quasi-ideal (generalized 2-bi quasi ideal, 2-bi quasi ideal, weak-2-right ideal, weak-2-left ideal, right ideal, left ideal, bi-ideal, quasi-ideal). Every quasi-ideal is a bi-quasi-ideal and reverse implication does not hold. Examples are provided to strengthen our results.

Posters

Harmonizing Tradition and Technology: Mathematics and Computation in the Analysis of Folk Music

Juthisha Jayan[1] and Midhun Lal . V.S[2]

[1]Department of Mathematics, [2] Department of Computer Science(AI & ML)
Rajiv Gandhi National Institute Of Youth Development
juthishajayan@gmail.com[1] and midhunsunil.rgniyd@gmail.com[2]

The intersection of tradition and technology in the analysis of folk music presents a compelling and innovative approach to understanding the rich cultural heritage and historical evolution of this art form. This study explores the role of mathematics and computation in deepening our knowledge and appreciation of folk music, showcasing various methods and techniques employed in this interdisciplinary field. Mathematics provides a powerful lens for analyzing the intricate components of folk music, including rhythm, melody, and harmony. Computation plays a pivotal role in handling and processing vast amounts of musical data, facilitating comparative studies and cross-cultural examinations. The study highlights the use of algorithmic models and machine learning techniques in analyzing melodic patterns and predicting stylistic attributes in folk music. These computational approaches provide a deeper understanding of the underlying principles and aesthetics of folk music, enhancing our ability to preserve and appreciate this cultural heritage.

Furthermore, the harmonization of tradition and technology offers exciting opportunities for artistic creation and cultural exchange. By identifying recurring patterns and motifs, musicians and composers can draw inspiration from traditional folk music and incorporate these elements into contemporary compositions. The development of computational tools and digital archives also ensures the preservation and accessibility of folk music for future generations. This study aims to demonstrate the potential of mathematics and computation in unraveling the hidden treasures of folk music.

Keywords: Folk Music, Tradition, Mathematics, Computation, Technology.

Investigating the Relationship between Global Warming and Cryptosporidiosis Disease: A Hypothesis Testing Approach

Ankit Kumar Yadav

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
kumarankityadav100@gmail.com

Climate change issues are significant and grave. It is critical to comprehend how it affects the environment and general health. The introduction of new illnesses or the re-emergence of old ones is one of the outcomes of global warming. Cryptosporidiosis is one such disease that has been linked to global warming. It is a waterborne disease caused by the protozoan parasite Cryptosporidium that causes watery diarrhea, nausea, cancer, HIV and AIDS. Researchers can predict and reduce the effects of global warming on the environment and public health by understanding the connection between it and the prevalence of cryptosporidiosis. This paper aims to investigate the potential relationship between global warming and the incidence of cryptosporidiosis through Hypothesis Testing.

The hypothesis of this study is that there is a positive correlation between global warming and the incidence of cryptosporidiosis. The null hypothesis (H0) states that there is no correlation between global warming and cryptosporidiosis incidence. The alternative hypothesis (H1) states that global warming is correlated to increase in cryptosporidiosis incidence.

This study collects climate historical temperature data as well as epidemiological data on cryptosporidiosis for hypothetical analysis. This paper uses regression analysis to model the relationship between global warming indicators and cryptosporidiosis features. To evaluate the significant association, use hypothesis tests such as the z-test, t-tests, or chi-square tests. To examine statistical significance, set up significance level (alpha) and calculate p-values. To decide whether to accept or reject the hypothesis, consider the confidence interval and error.

This paper relates global warming issues and cryptosporidiosis incidences using a hypothesis-testing approach and contributes to our society's understanding of the health impacts and consequences of climate change.

Keywords: Global Warming, Cryptosporidiosis, Hypothesis Testing, Regression analysis.

Application Of Linear Programming For Profit Maximization

M.Sanjeeva Reddy

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
sanjusanjeevareddy007@gmail.com

The main Objective of this project is to maximize the Profit of Pharma Company SP Accure Labs Private limited in the area of manufacturing of Imatinib Film Coated Tablets and to transport from different Plants of company situated at different locations to different markets (customers) situated at different locations.We apply linear programming technique to maximize profit.

Linear programming is the branch of applied mathematics that deals in particular class of business related problems for optimization. It contain a linear objective function which is to be optimize (maximize or minimize) subject to a certain number of constraints. The constraints are also linear inequalities or linear equalities in the variables used in objective function. An application of linear programming technique in business is to maximize the total profit, to minimize the total cost, to arrange the best times to start and finish project etc. It is a Mathematical technique used for finding the best optimal solution to a company.

Keywords: Linear Programming Model, Objective function, Constraints, Decision variables, Simplex method, Maximization, Minimization.

A Study On The Dynamics Of Spread Of Dengue Using SEIR Model In Fuzzy Environment

Aswini T

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
aswinit21@gmail.com

Dengue fever, caused by the dengue virus (DENV) and transmitted by mosquitoes, poses a global health risk, with an estimated annual incidence of 100-400 million infections impacting nearly half of the world's population. This study goes beyond traditional models assuming homogeneous transmission and explores the uncertainty and heterogeneity of dengue transmission by introducing fuzzy numbers. The study presents a system of non-linear ordinary differential equations that model the interaction between the Susceptible, Exposed, Infectious, and Recovered human population and the Susceptible, Exposed, and Infectious mosquito population. Fuzzy numbers are utilized to represent the transmission rate and recovery rate of the disease, capturing the inherent uncertainty. Through computational simulations and sensitivity analysis, the impact of fuzzy parameters on the spread of the dengue virus is investigated. The findings demonstrate that the fuzzy SEIR model offers valuable insights into the potential range of disease spread and enhances the understanding of associated uncertainties. The stability and equilibrium points of the model are assessed, and it can be concluded that the model is stable. Furthermore, the study utilizes data from virus infections in different countries to illustrate and validate the mathematical results.

By incorporating fuzzy modeling techniques, this research contributes to the existing knowledge on dengue transmission dynamics and provides a framework for future research in other infectious diseases within uncertain environments. The study's implications extend to public health interventions and strategies for controlling dengue and other similar diseases.

Keywords: Dengue virus, SEIR model, fuzzy numbers, equilibrium, stability.

Dynamical Behaviour Of COVID-19 Model

Reshmi V P
Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
resmikiranam@gmail.com

The COVID 19 also known as the novel corona virus, is a highly contagious respiratory illness caused by the severe acute respiratory syndrome coronavirus 2(SARS CoV-2).It was first identified in December 2019 in Wuhan, China and rapidly spread across the globe, leading to a pandemic declaration by World Health Organisation (WHO) in March 2020.

Mathematical models are created in order to meet the abstract, precise, and significant needs of a complex problem. The goal of mathematical modelling is to deduce the structural and functional properties related to understanding the issues of handling difficult real life situations. The objectives for construction of a mathematical model must be defined clearly and a complete understanding of the system to be modelled is a prerequisite for the creation of the framework describing the model. The framework of the model is a system of equations which govern the system. These equations are solved to obtain meaningful inferences in terms of providing a solution to the real-life problem. The four important phases of mathematical models are construction, studying, validating, and implementation of the models.

SEIR (Susceptible,Exposed,Infected,Recovered) mathematical model is used here for the study. It helps us understand and analyse the dynamics of disease transmission within a population over time. By manipulating model parameters such as the basic reproduction number (R0) ,the potential impact of population behaviour changes can be assessed.

Keywords: COVID -19,Mathematical model, SEIR model.

Numerical Solutions and Stability Analysis of Partial Differential Equations using the Crank-Nicholson Scheme and Energy Method

Amjath Milan

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
amjathmilan@gmail.com

This study focuses on the development and analysis of numerical methods for solving partial differential equations (PDEs) using the Crank-Nicholson scheme and the energy method to ensure accurate and stable solutions. Time-dependent PDEs are fundamental in modeling diverse physical phenomena, including heat transfer, fluid dynamics, and wave propagation. The Crank-Nicholson scheme, known for its accuracy and stability, is employed to obtain reliable numerical solutions for these PDEs. To achieve this, the PDEs are discretized using a spatial grid, resulting in a system of equations. The Crank-Nicholson scheme is then applied iteratively to solve this system, considering both the current and future time steps. This approach provides improved accuracy and stability, enabling the capture of intricate dynamics with high precision. To assess the stability of the computed solutions, the energy method is utilized. This method allows us to analyze the behaviour of the solution over time by evaluating its energy or other appropriate quantities. By ensuring that the computed solutions remain bounded and physically meaningful throughout the simulation, the reliability of the numerical results is guaranteed. This project contributes to enhancing our understanding of the Crank-Nicholson scheme, its implementation, and the stability analysis using the energy method. By conducting extensive numerical experiments and comparative studies, valuable insights into the limitations, advantages, and practical considerations associated with this numerical approach are gained. Ultimately, this research improves our ability to accurately model and predict various physical phenomena described by PDEs. The combination of the accurate and stable Crank-Nicholson scheme with the stability analysis using the energy method provides a robust framework for numerical simulations, facilitating the precise characterization and prediction of complex physical systems.

Keywords: Time-dependent PDEs, Crank-Nicholson scheme, Energy method, Stability.

Predicting Loan Performance: Machine Learning Models for Bank Loan Modeling

Anargh T
Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
anarght@gmail.com

The financial industry is undergoing a digital transformation, leading to a rise in online loan applications and an abundance of data for analysis. To address the challenges faced by banks in loan approval processes, this project aims to utilize machine learning techniques for automation and improvement. By leveraging artificial intelligence (AI), the project focuses on predicting loan applicant eligibility and safety, enhancing decision-making speed and accuracy.

The loan application process begins with customers submitting their requests, followed by bank validation of applicant eligibility. This project aims to automate the loan eligibility assessment in real-time, leveraging customer details provided during the application stage, including gender, marital status, education, income, loan amount, credit history, and other relevant variables. To ensure accurate loan predictions, the project gathers data from previous customers who were approved for loans based on predetermined parameters. This dataset serves as the foundation for training the machine learning model, ensuring reliable results.

The project primarily focuses on predicting the safety of a loan and assessing the associated risk. It employs machine learning algorithms such as Logistic Regression and Support Vector Machine (SVM), known for their effectiveness in similar applications. Prior to analysis, the dataset undergoes thorough cleaning to eliminate missing values and inconsistencies, ensuring the reliability of subsequent loan predictions.

The implementation of this project aims to revolutionize the loan approval process in banks, enhancing efficiency, accuracy, and speed. By integrating machine learning techniques, decision-making is expedited, allowing banks to strike a balance between risk management and providing financial support to deserving applicants. Ultimately, this project serves as a critical step towards improving the loan approval process and achieving favorable financial outcomes for both banks and loan applicants.

Keywords: Machine learning, Logistic Regression, SVM.

Addressing the Global Water Crisis: Challenges and Solutions

Bavishmathy G

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
bavishmathy012000@gmail.com

The global water crisis has emerged as one of the most pressing challenges of the 21st century, posing significant threats to human well-being, environmental sustainability, and economic development. This abstract provides an overview of the complex nature of the water crisis, highlighting its causes, consequences, and potential solutions.

The water crisis is primarily characterized by the scarcity, unequal distribution, and declining quality of freshwater resources worldwide. Rapid population growth, urbanization, and industrialization have intensified the demand for water, straining existing supplies and exacerbating the crisis. Climate change further aggravates the situation by altering precipitation patterns, increasing the frequency and severity of droughts, and disrupting ecosystems.

To combat the water crisis, raising awareness and fostering behavior change among individuals, communities, and industries is crucial for long-term water conservation. To identify the water scarcity area by using Data Science with Statistics data. Education and capacity building initiatives can empower stakeholders to adopt water-efficient practices, prioritize water conservation in agricultural practices, and embrace sustainable lifestyles.

In conclusion, the global water crisis demands urgent action to safeguard this precious resource for present and future generations. By adopting a holistic and collaborative approach, governments, organizations, and individuals can effectively address the challenges associated with the water crisis and work towards a sustainable and resilient water future.

Keywords: Global water crisis, Scarcity, Rapid population growth, Urbanization, Industrialization, Climate change, Water conservation, Sustainable future.

Exploring Rotational Motion Euler, Johannes Keppler, Pythagoras

Rohit Sahu

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
rsahu0437@gmail.com

Rotational motion is a fundamental concept in physics that encompasses the movement of objects around an axis. This abstract provides a concise overview of rotational motion, its characteristics, and its applications in various fields. Describing it as the movement of an object around a fixed point or axis. It highlights the key difference between translational motion (linear motion) and rotational motion, emphasizing that rotational motion involves the rotation of an object rather than its linear displacement. The fundamental principles of rotational motion, including angular displacement, angular velocity, and angular acceleration. It discusses how these parameters describe the rotational behavior of an object and how they relate to their linear counterparts. The concept of torque, or the rotational equivalent of force, is also introduced, highlighting its role in causing rotational motion and changing an object's angular momentum. Furthermore, such as moment of inertia and rotational kinetic energy. It explains how moment of inertia quantifies an object's resistance to changes in its rotational motion, while rotational kinetic energy relates to the energy associated with the rotational movement. The motion of the wheel, gears, motors is rotational motion. The motion of the blades of the helicopter is also rotatory motion, A door swiveling on its hinges as you open or close it.

Keywords: rotational motion, angular displacement, angular velocity, angular acceleration, torque.

Application Of Non-Linear Programming Problem In Real Life

Akshaya M

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
makshaya868@gmail.com

The study investigates the Application of Non-linear optimization problem. it is the sub- field of mathematical optimization that deals with problems that are not linear. Non-linear programming problems are those where either the objective function, the constraints with equality and inequality, or both are nonlinear. There are different types of non-linear problems are considered to obtain local and global optimums. Some of the algorithms and methods are used to solve non-linear, convex, and non-convex programming problems such as the Kuhn- Tucker condition, Wolfe's Algorithm, and Beale's Algorithm. Non-linear Optimization problems arise in a wide variety of fields, considering some of the selected applications such as weapon assignment, Bid Evaluation, Alkylation process optimization, chemical equilibrium, structural optimization, Launch vehicle Design and costing, and parameter estimation in curve fitting. Discussed the fundamental theory for understanding the problem as well as analyzed the methodologies, and algorithms to solve the problems. Complex optimisation issues can be solved efficiently with NLP, and its application can lead to significant improvements in various fields.

Keywords: Optimization, Non-Linear, Methodology, Applications.

Delay Prediction Model in Railway

Vaishnavi Suresh
Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
vaishnavisureshalr@gmail.com

Railways are always be one of the most important means of transport. Today the transport demand is very high and thus they face a competition from the other means of transport. Now a days world facing the climate change and global warming. Every where government promoting and investing more in the railways. As the competition in every transport modes increases, there are several problems facing by the railway industry.

Here we using the concept of the railway traffic and the incidents occurrence. The traffic operators mainly try to estimate the Total Delay and the incident Duration and this is the one-time prediction. Railway traffic operations and systems are so complex and that humans decision making is not so possible. For the traffic operators data analytics is being used to bring out the informations. In this thesis we use the data analytics techniques on the data we collected and predicting total delay. Delays can be caused by different traits that can be considered to the prediction. These traits are considered on the basis of from which the data base has been collected and the basic informations from that field. Here we are only using the passenger traffic problems are considered for the analysis.

Keywords: Total Delay, Global warming, Railway traffic, Prediction, Decision making.

Application of Graph Theory on Google map Application

Roshni Somawar

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
roshniraosomawar20@gmail.com, elinktosneha@gmail.com

This study aims to investigate the Google map application combined with Graph Theory. By introducing the application of Dijkstra's algorithm and prim's algorithm , it helps to measure the minimum distance between any points. Google Arterial Traffic Information (GATI) system, gives the knowledge about connectivity between road maps through graph. Traffic is the one of the massive threats faced today.

This study determines the density of the traffic which reflects the problems and consequence relatively, identify vertices, edges and loops of graph. Allocate the degree of vertex. Identify and construct path and circuit to determine the graph is connected or disconnected. Evaluate the shortest path through graph using Dijkstra's algorithm and Prim's algorithm. This study contributes the society to travel traffic free to save time.

Keywords: Dijkstra's algorithm, Prim's algorithm, Google Arterial Traffic Information (GATI), Geo-Positioning System (GPS).

Study Of the Homotopy Perturbation Method and Comparison of The Solution With Analytical and Numeric Techniques

Aksa Mathew

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
aksamathew2018@gmail.com

In this research paper, our aim is to solve non-linear Partial Differential Equations using Homotopy Perturbation Method (HPM). The Homotopy Perturbation Method is used to get the solutions of parabolic(heat), hyperbolic (wave), elliptic(laplace) and non-linear equations. The solution to the laplace equation is demonstrated to be same as solving the corresponding Cauchy Reimann equations via homotopy perturbation method. Results obtained by HPM for one dimensional wave equation is compared with those obtained by d'Alembert's solution and numerical technique explicit central difference method. Additionally, the solution obtained from HPM for the one-dimensional Heat equation is compared to that obtained by the variable separable method and numerical technique (explicit, implicit Crank Nicholson). The HPM is also used to solve some non-linear equations and shown that the result is identical to those obtained analytically. We also solved some partial differential equations with variable coefficients. The graphical interpretation for displacement with respect to length with fixed time for various techniques is used to solve the problem. The application of Homotopy perturbation method such as derivation of Blasius equation is discussed in this paper.

Keywords: Homotopy perturbation method, d'Alemberts's solution, Crank-Nicholson method, Blasius equation.

Dynamic analysis of rumor propagation model with reporting effect

Kavya k

Department of Mathematics
Rajiv Gandhi National Institute Of Youth Development
Kavyamanoharan27@gmail.com

Rumor is defined as "the voice which runs between the public" or it is an untrue or unconfirmed social speech that can spread quickly on a large scale. In recent years, online social media has grown rapidly and it provides a convenient communication scheme for people. Meanwhile, the scheme enables unreliable sources to spread large amounts of unverified information among people. Thus rumors spread more quickly and widely through social media when compared to traditional offline communication. The widespread misinformation may bring disorder to people especially when facing religious or political crises. Hence it is crucial for social media to identify misinformation in time so as to limit the spread of rumors.

A mathematical model is a system of differential equations that describes the spreading of rumor when it is propagated by different subgroups of spreaders. Here we comprehensively considered the influence of media reporting effect on the rumor process, regarded media as a separate subclass, and established a rumor propagation model. In this study, we are considering the number of rumors in mass media as a variable that changes over time and discuss individual-to-individual and media-to-individual transmission mechanisms. So it is clear that the effect of media coverage has an important impact on the propagation of rumors.

Detection and prevention

Anupriya kumari
Department of computer science (AI & ML)
Rajiv Gandhi National Institute Of Youth Development
anupriyam282000@gmail.com

Every day we see so many news of road accidents during to overspeeding vehicles or reckless driving .Among which most sadest statistics is that minor teenagers of age group 12-18 are found to be most affected due to their reckless driving habit for fun .Reckless driving among adolescents poses a significant risk to their safety and the well-being of others on the road.

To address this issue we propose an age detection system aimed at preventing youngsters from engaging in reckless driving behaviors.This system aims to accurately detect the age or age range of the driver and classify them to be minor or mature driver.The age detection system combines image recognition algorithms, artificial intelligence, and deep learning techniques to analyze real-time video footage or images captured by roadside cameras .

Through facial recognition, the system will try to accurately estimate the age group of the driver by comparing facial features and patterns with a comprehensive age database.Upon detecting any reckless driving behavior, the system sends an immediate notification to the registered mobile number of the driver's parents or guardians.

The notification includes information about the specific violation, such as speed limit exceeded or dangerous maneuver attempted,along with the time, date, and location of the incident. This real-time feedback empowers parents to address the situation promptly and take appropriate action to counsel and educate their children about safe driving practices.

For this model we have used open CV to detect the face and DeepFace model to get the age of driver (DeepFace having the huge dentity labeled dataset of four million facial images belonging to more than 4,000 identities.) which using the different facial feature for different age group maps the pattern,wrinkles,and tries to predict the age group to which particular person belongs to and send the notification to registered parent.

Keywords: Overspeeding vehicles,Facial recognition, Age detection system, DeepFace model.

Author Index

About the Conference

The Department of Mathematics, Rajiv Gandhi National Institute of Youth Development (RGNIYD), is an Institute of National Importance under the Ministry of Youth Affairs and Sports, Government of India, and is organising a "National Conference on Mathematical Modelling, Analysis, and Computation (NCMMAC-2023)" on June 6 and 7, 2023, at the RGNIYD campus, Sriperumbudur. The main objective of this conference is to bring together academicians, researchers, and research scholars to exchange and share their knowledge, experience, and research results on different parts of mathematical modelling and its applications in various fields. In addition, NCMMAC-2023 will provide a platform for participants to present their research findings and also serve as a stage for exchanging knowledge in mathematical modelling, analysis, and its applications.

About the Department

The department offers a two-year M.Sc. programme in Mathematics, established in 2021. The Department explores ways to combine excellence in education with service to industry. The curriculum comprises Pure, Applied, and Computational Mathematics along with Statistics, Machine Learning and Deep Learning, which have sufficient exposure to hands-on skills leading to higher employability. It is also well suited for the upward mobility of post graduates in mathematics towards industry.

Vision

Department of Mathematics aspires to contribute to the nation through quality education and research in Mathematics to involve in real-world problem, project work that enable them to serve a variety of roles in various situations in employment and research to meet societal needs.

Mission

To impart quality education in postgraduate level in Mathematics.

To mentor students by providing them an environment that is supportive in fostering intellectual skills.

To produce graduates with right attitude who are ready to face the societal and professional challenges.

To train the graduates with skillsets required for interdisciplinary research with world standards.

To utilize the diverse mathematical and statistical skills for providing consultancy services that solves the societal and industrial problems.