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SERB INDIA

SERB Sponsored
4th International Conference on
ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS

09th–13th, July, 2024

PROCEEDINGS ICATCEM - 2024
BOOK OF ABSTRACTS

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Organized by

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PROCEEDINGS ICATCEM-2024

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SERB Sponsored

4th International Conference on

ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS

09th -13th , July, 2024

ORGANIZING SECRETARY

Dr. B. V. APPA RAO

CONVENER

Dr. RENUKA KOLANDASAMY

CO-CONVENERS

Dr. K. RAJYALAKSHMI

Dr. D. RAMESH

Dr. P. BINDU

Dr. A. SREENIVASULU

PREFACE

Koneru Lakshmaiah Education Foundation , Vaddeswaram ,Guntur is organizing SERB Sponsored Five-day International conference on entitled 4th International Conference on **"ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS (ICATCEM-2024)"**, during 09th -13th, July, 2024 has provided a global platform bringing Academia, Researchers, Engineers, Industry experts and Students together to share their knowledge, work and experiences both through the presentations from the conference and dissemination of high quality research publications in the areas of Mathematics and Science. This acts as an international forum for online interactions with eminent speakers and renowned experts about the recent innovations, trends and concerns as well as practical challenges encountered and solutions adopted in the field of Mathematics and Science. We are earnestly thankful to our Management, Vice-Chancellor, Pro-VC's, Dean-R &D, Director-FED, Principal-FED, Chair persons and members of various committees, International and National Advisory Committees for their wholehearted support and encouragement. We are also thankful for all the authors who have contributed their research works to the conference. We truly believe that the participants will find the discussions fruitful and will appreciate the opportunity for setting up future collaborations.

CONVENOR

ABOUT THE KONERU LAKSHMAIAH EDUCATION FOUNDATION

The KL College of Engineering was started in the academic year 1980-81 and achieved autonomous status in 2006. Koneru Lakshmaiah Education Foundation was conferred with Deemed to be University status in the year 2009, under Section 3 of the UGC Act 1956. The University underwent assessment by NAAC and was accredited for a period of five years from 2018 to 2023, with A++ grade and CGPA of 3.57 out of 4.0 scale. The University has been accredited with Category-1 status. KLEF has established an ecosystem to promote innovation, including a centre for Innovation, Incubation and Entrepreneurship Cell (IIEC), leading to start-ups in different disciplines. Through publishing research articles in various national and international refereed journals, particularly in Scopus/WoS/SCI Indexed journals, research has taken a quantum leap towards improving its quality, resulting in good h-index.

ABOUT THE DEPARTMENT OF MATHEMATICS

The Department of Mathematics was established in 1980. It has strong backup of 100% doctorate faculty. All the faculty are highly qualified, motivated and are specialized in various areas of Mathematics. The department focuses on Pure and Applied Mathematics catering to the professional needs of students with varied backgrounds. The department offers M.Sc. Program in Applied Mathematics, Computational Mathematics, and research programs in Ph.D. The department is also offering courses for students majoring in Science, Engineering, Commerce, Pharmacy, Law, Arts, Architecture and Business Administration. The curriculum has been designed with emphasis on the concepts and its applications. The faculty members regularly attend seminars, workshops and conferences to keep themselves upgraded with latest research inputs as well as efficient classroom management techniques which meet the challenges of a fast-changing technical world.

LOCATION:

The KL Deemed to be University is located at Green fields, Vaddeswaram, Guntur Dist, Andhra Pradesh in a 100 acre green campus abutting Buckingham Canal about 9 km from Vijayawada railway station and bus stand. Vijayawada is located on the banks of river Krishna in the state of Andhra Pradesh. The city is well connected by National Highway and railways with Chennai (440km), Hyderabad (275km) and Visakhapatnam (385km). The city is the gateway for trains running from North to South India. Vijayawada is well connected by daily flights from the cities Visakhapatnam, Hyderabad, Chennai, Bangalore and Delhi.

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ORGANIZING SECRETARY

Dr. B. V. APPA RAO, Professor & Head, Department of Mathematics

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Dr. P. BINDU, Asst. Professor, Dept. of Mathematics, KLEF

Dr. A. SREENIVASULU, Asst. Professor, Dept. of Mathematics, KLEF

PRESIDENT'S MESSAGE

An engineer needs to use mathematics and apply science for engineering solutions to many types of problems pertaining to different disciplines.

Proper knowledge of mathematics is the prime requisite requirement for engineering various kinds of applications. An engineer must know general purpose mathematics and mathematics related to a specific discipline. An engineer having clear knowledge of the mathematics will be able to engineer solutions to the problems that are to be solved with least cost and time.

I am happy that the Department of Mathematics, KLEF is organizing SERB Sponsored Five-day International conference on entitled 4th International Conference on **"ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS (ICATCEM-2024)"**, during 09th -13th, July, 2024. Which is quite apt for every engineering and also non engineering student. Various discussions and presentations on this topic should bring out various present-day usages of mathematics using which one will be able to find solutions to complex problems.

I wish the organizers good luck for successfully conducting the International Conference and come out with the proceedings and recommendations which can be circulated to all the engineers for their knowledge and usage of the findings.

Er. KONERU SATYANARAYANA

PRESIDENT

PRO CHANCELLOR'S MESSAGE

I am happy to know that the Department of Mathematics is organizing SERB Sponsored Five-day International conference on entitled 4th International Conference on **"ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS (ICATCEM-2024)"**, during 09th -13th, July, 2024.

Several specialists from IITs and International Professors are participating and contributing on Various challenging Industrial problems and solutions in the conference. The Five-Day Conference is sure to provide a rich experience to the young researchers who can exchange ideas and learn from the expert participants and work towards greater achievements useful to the research community.

I wish all the delegates to interact and participate in all sessions to accomplish scientific breakthroughs.

I wish the conference a great success.

Dr. K. S. JAGANNATHA RAO,
PRO CHANCELLOR

VICE-CHANCELLOR'S MESSAGE

I extend my warm welcome to all the participants and appreciate the Department of Mathematics, KLEF Deemed to be University for their commitment and superb drive in organizing SERB Sponsored Five-day International conference on entitled 4th International Conference on **"ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS (ICATCEM-2024)"**, during 09th -13th, July, 2024. Conferences are the platforms for academic discourse. I am certain that this platform proves to be a great opportunity for the researchers, postgraduate students and industrial people for strengthening their academic and research aspirations. I believe in the virtual discussions and findings which can be generated only through these kinds of Research and Development (R&D) activities.

Mathematics is a rapidly growing interdisciplinary branch that incorporates many new advances in computer science and has applications in other sciences and industry. The deliberations of the delegates will undoubtedly generate lots of interesting and innovative concepts which pave the way to industrial commercialization. I extend my best wishes to the students and faculty who are a part of our University and to those who seek to join us in this conference for sharing and creating knowledge. I am sure that you will feel proud of sharing academic excellence in our vibrant campus and wish you all a grand success.

Dr. G. P. SARADHI VARMA
VICE CHANCELLOR

PRO VICE-CHANCELLOR'S MESSAGE

It is with great enthusiasm and anticipation that I welcome you to the 4th International Conference on Advanced Trends in Computational Engineering Mathematics (ICATCEM-2024), sponsored by the Science and Engineering Research Board (SERB). This prestigious event, taking place from July 9-13, 2024, in the Department of Mathematics, is a testament to our commitment to fostering cutting-edge research and facilitating the exchange of innovative ideas in the field of computational engineering mathematics. ICATCEM-2024 brings together a diverse and distinguished group of scholars, researchers, and practitioners from around the globe.

I extend my deepest gratitude to the organizing committee, whose tireless efforts and dedication have made this conference possible. Their commitment to academic excellence and meticulous planning ensure that ICATCEM-2024 will be a resounding success. I would also like to thank our sponsors, especially SERB, for their generous support and recognition of the importance of this conference. To all the participants, I encourage you to take full advantage of the opportunities this conference offers. Engage in stimulating discussions, explore new ideas, and forge connections that will drive future research and innovation. Your contributions and active participation are what make this conference truly exceptional.

In closing, I wish everyone a productive and inspiring conference. May ICATCEM-2024 be a catalyst for new discoveries, collaborations, and advancements that will shape the future of computational engineering mathematics.

Dr. KURRA RAJASEKHARA RAO

PRO-VC (ACADEMICS)

DIRECTOR'S MESSAGE

I congratulate the Department of Mathematics of KLEF Deemed to be University in organizing SERB Sponsored Five-day International conference on entitled 4th International Conference on **"ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS (ICATCEM-2024)"**, during 09th -13th, July, 2024. I am sure that this conference becomes a right platform for the students, researches and industrial delegates to come up with innovative deliberations. Mathematics has become more and more international, and solidarity across countries which has been increasing at a fast pace. It is not just a language of science, but it is also a science of formulating theories for other sciences. Besides fundamental research, the importance of the interaction of mathematics with other areas of science, computers and industry is now largely in demand.

I whole heartedly appreciate the efforts of the organizers of the Department of Mathematics for coming forward with such a challenging theme of contemporary relevance. I hope that this conference will definitely become a landmark event in facilitating knowledge exchange and research discourse. I wish all the participants of the conference to come up with useful research deliberations.

Dr. A. JAGADEESH
CCO & DIRECTOR FED

PRINCIPAL'S MESSAGE

It is quite gratifying to note and with great pleasure, I would like to state that the Department of Mathematics of our college is hosting SERB Sponsored Five-day International conference on entitled 4th International Conference on **"ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS (ICATCEM-2024)"**, during 09th -13th, July, 2024.

Organizing such an event at this point of time reinforces our objective of developing an environment for the exchange of ideas towards technological developments. I wish the conference would be able to deliberate on current issues of national and international relevance, particularly in the field of Mathematics-Modelling in Ecology, Rough Set Theory and its Application, Game Theory Models and Application WSNs, Life with Mathematics and Integration of Technology in Education. There have been unprecedented numbers of quality papers that are to be presented in the conference.

I am sure that this occasion will provide an affable environment for the researchers and academicians to freely exchange the views and ideas with others. I convey my warm greetings and felicitations to the organizing committee and the participants and extend my best wishes for the success of the conference.

Dr. K. SUBRAMANYAM

PRINCIPAL COLLEGE OF SCIENCES

PRINCIPAL'S MESSAGE

As Principal-FED, it brings me immense pleasure to extends a warm welcome to each one of you at our SERB Sponsored Five-day International conference on entitled 4th International Conference on **"ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS (ICATCEM-2024)"**, during 09th -13th, July, 2024. It is an honour to have such a distinguished group of participants gathered for this significant occasion.

The field of Applied and Computational Mathematics has witnessed remarkable advancements and this event serves as a testament to the dedication and passion that each one of you bring to the table. Th exchange of knowledge and ideas in the next few days promises to be both enlightening and transformative.

Our aim with this event is to create an environment that foster collaboration, sparks innovation, and contributes to the growth of our collective expertise. I encourage you to actively engage in the various sessions, presentation and networking opportunities that have been curated to enhance your experience. This is an invaluable chance to learn, share, and establish connections that could potentially shape the future of our field.

I would like to express my gratitude to the organizing committee, speakers, sponsors, and every individual who has plays a role in making this event possible. Your collective efforts have undoubtedly contributed to the success of our endeavors.

DR. V. KRISHNA REDDY

PRINCIPAL -FED

HOD'S MESSAGE

It is my pleasure to extend a warm welcome to all of you to the SERB Sponsored Five-day International conference on entitled 4th International Conference on **"ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS (ICATCEM-2024)"**, during 09th -13th, July, 2024.

In this diverse collection, you will find research highlights from esteemed researcher, scholars, and expert who are at the forefront of their respective filed. The breadth and depth of topics covered reflect the richness and variety of perceptively that our conference aims to brigs together.

ICATCEM-2024 serves as platform for intellectual exchange, collaboration, and the exploration of recent trends in various domains. I would like to express my heartfelt appreciation to all the contributors for their dedication to advancing knowledge and for sharing their research with our academic community.

I would also like to acknowledge the hard work and diligence of the organizing committee and everyone involved in bringing this conference to fruition. Their efforts have ensured that this event is a testament to the spirit of inquiry and discovery.

Wishing you a rewarding and enriching experience at the ICATCEM-2024.

Dr. B. V. APPA RAO

PROFESSOR & HOD, MATHEMATICS

CONVENOR'S MESSAGE

Mathematics has become essential for solving numerous real-life problems. The ability to translate physical challenges into mathematical terms is crucial. By leveraging existing and new algorithms, we can address these issues and interpret solutions in their real-world context. This capability spans various fields of mathematics, with computational mathematics playing a critical role. Nowadays, computational mathematics ranks among the most prominent areas of research due to its rich applications. In continuation of many successful international conferences organised by the Department of Mathematics every year, this year we are organising SERB Sponsored Five-day International conference on entitled 4th International Conference on **"ADVANCED TRENDS IN COMPUTATIONAL ENGINEERING MATHEMATICS (ICATCEM-2024)"**, during 09th -13th, July, 2024.

The main objective of ICATCEM-2024 is to bring together contemporary researchers, scientists, engineers, and practitioners from all over the world to exchange ideas and share the most recent research findings, developments, and applications in the areas of computational mathematics, discrete mathematics, mathematical modelling, computational sciences, and other related fields. This international conference will provide a valuable opportunity for rural participants to meet eminent speakers from around the globe and interact with them about the latest developments in discrete mathematics and mathematical modelling.

Numerous papers have been received for presentation and publication at ICATCEM-2024, and many eminent speakers have been invited to deliver their talks. This will undoubtedly be an eye-opening event for all young researchers. Based on their presentations and reviewer reports, only selected papers will be considered for publication in reputed Scopus/Web of Science journals.

DR. RENUKA KOLANDASAMY

CONVENOR, ICATCEM-2024

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PROGRAMME SCHEDULE

KONERU LAKSHMAIAH EDUCATION FOUNDATION

(Deemed to be University), Vaddeswaram, Guntur, AP - 522302

DEPARTMENT OF MATHEMATICS

SERB Sponsored International Conference on

Advanced Trends in Computational Engineering Mathematics (ICATCEM - 2024) 9-13 July 2024

Session Details (Day - 1 - 09.07.2024)

TIME	SESSION	NAME OF THE SPEAKER			
9.00 AM to 10:00 AM	REGISTRATION				
10.00 AM to 10:30 AM	**INAGURATION**				
10:30 AM to 12:30 PM	Session -1	**Title :** Similarity Measure on incomplete imprecise information and its Applications	**Speaker : Dr. V. LAKSHMANA GOMATHI NAYAGAM**, Professor, NATIONAL INSTITUTE OF TECHNOLOGY Tiruchirappalli	**Chair** : Dr. G. Mahadevan, Associate Professor, Department of Mathematics, Gandhigram University, Dindigul	**Cochair:** Dr. B.V. Appa Rao, Professor and Head, Department of Mathematics, KLEF
12:30 PM to 1:00 PM	LUNCH BREAK				
1:00 PM to 3:00 PM	Session - 2	**Title :** Solutions of many Madical/Digital related problems via Graph Theoritical Approach	**Speaker : Dr. G. MAHADEVAN**, Associate Professor in Mathematics, The Gandhigram Rural Institute - Deemed to be University, Dindigul, Tamil Nadu	**Chair :** Dr. M. SEENIVASAN, Associate Professor in Mathematics & DY. DIRECTOR- CDOE, Annamalai University, Tamil Nadu	**Cochair:** Dr. Ch. V. Ramana Murthy, Professor, Department of Mathematics, KLEF
3:00 PM to 5:00 PM	Session - 3	**Title :** Markovian Queuing Model with Reneging Customers	**Speaker : Dr. M. SEENIVASAN**, Associate Professor in Mathematics & DY. DIRECTOR- CDOE, Annamalai University, Tamil Nadu	**Chair :** Dr. G. SURESH SINGH, Professor, University of Kerela, Thirvananthapuram, Kerala	**Cochair:** Dr. V.S. Bhagavan, Professor, Department of Mathematics, KLEF
5:00 PM to 5:15 PM	TEA BREAK				

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Session Details (Day - 2 - 10.07.2024)

TIME	SESSION	NAME OF THE SPEAKER			
9:00 AM to 11:00 AM	Session - 4	**Title :** Heat transfer optimization using machine learning	**Speaker : Dr. R. SIVARAJ**, Associate Professor, Department of Mathematics, NIT Jalandhar, Punjab	**Chair :** Dr. R. SIVARAJ, Associate Professor, Department of Mathematics, NIT Jalandhar, Punjab	**Cochair:** Dr. K. V. Chandra Sekar, Associate Professor, Department of Mathematics, KLEF
11:00 AM to 11:15 AM	TEA BREAK				
11:15 AM to 1:15 PM	Session -5	**Title :** Information Theory	**Speaker : Dr. G. SURESH SINGH**, Professor, University of Kerela, Thirvananthapuram, Kerala	**Chair :** Dr. G. MAHADEVAN, Associate Professor in Mathematics, The Gandhigram Rural Institute - Deemed to be University, Dindigul, Tamil Nadu	**Cochair:** Dr. Charan Kumar, Associate Professor, Department of Mathematics, KLEF
1:15 PM to 2:00 PM	LUNCH BREAK				
2:00 PM to 4:00 PM	**Paper Presentation Schedule - I**			**Chair** : Dr. W. Sridhar, Associate Professor, Department of Mathematics, KLEF	**Cochair:** Dr. N. Srimannarayana, Associate Professor, Department of Mathematics, KLEF
4:00 PM to 4:15 PM	TEA BREAK				
4:15 PM to 5:15 PM	**Paper Presentation Schedule - I**			**Chair** : Dr. M. Radha Madhavi, Associate Professor, Department of Mathematics, KLEF	**Cochair:** Dr S Sunitha Devi, Professor, Department of Mathematics, KLEF

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Session Details (Day - 3 - 11.07.2024)

TIME	SESSION	NAME OF THE SPEAKER			
9:00 AM to 11:00 AM	Session - 6	**Title :** Data Analytical using python Programming language	**Speaker : Dr. K. KRISHNA KUMAR,** Associate Professor, Saveetha University, Chennai	**Chair :** Dr. Suresh Kumar, Associate Professor, Deputy HOD, Department of DTI, KLEF	**Cochair:** Dr. Vallimail, Associate Professor, Department of CSA, KLEF
11:00 AM to 11:15 AM	TEA BREAK				
11:15 AM to 1:15 PM	Session - 6	**Title :** Data Analytical using python Programming language	**Speaker : Dr. K. KRISHNA KUMAR**, Associate Professor, Saveetha University, Chennai	**Chair** : Dr. Suresh Kumar, Associate Professor, Deputy HOD, Department of DTI, KLEF	**Cochair:** Dr. Ch. V. Ramana Murthy, Professor, Department of Mathematics, KLEF
1:15 PM to 2:15 PM	LUNCH BREAK				
2:15 PM to 3:15 PM	Session - 6	**Title :** PYTHON - Hands-On Training	**Speaker : Dr. K. KRISHNA KUMAR**, Associate Professor, Saveetha University, Chennai	**Chair :** Dr. Suresh Kumar, Associate Professor, Deputy HOD, Department of DTI, KLEF	**Cochair:** Dr. V.S. Bhagavan, Professor, Department of Mathematics, KLEF
3:15 PM to 3:30 PM	TEA BREAK				
3:30 PM to 4:30 PM	**Paper Presentation Schedule - II**			**Chair** : Dr. N. Vijaya, Associate Professor, Department of Mathematics, KLEF	**Cochair:** Dr. R. Leelavathi, Assistant Professor, Department of Mathematics, KLEF

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Session Details (Day - 4 - 12.07.2024)

TIME	SESSION	NAME OF THE SPEAKER			
9:00 AM to 11:00 AM	Session - 7	**Title :** Leveraging Linear Algebra for Advanced Image Processing with AI: A MATLAB Demonstration	**Speaker : Dr. SURESH RASSAPPAN,** Assistant Professor, UTAS – Ibri, Sultanate of OMAN	**Chair :** Dr. W. Sridhar, Associate Professor, Department of Mathematics, KLEF	**Cochair:** Dr. Md. Ibrahim, Assoiate Professor, Department of Mathematics, KLEF
11:00 AM to 11:15 AM	TEA BREAK				
11:15 AM to 1:15 PM	Session -8	**Title :** Exploring Frontiers: Advanced Computing and Research with R	**Speaker: Dr. V. MURALI MOHAN**, Department of CSE(H), Associate Professor, KLEF	**Chair :** Dr. Sathish Kumar, Associate Professor, Department of Mathematics, KLEF	**Cochair:** Dr. Charan Kumar, Associate Professor, Department of Mathematics, KLEF
1:15 PM to 2:15 PM	LUNCH BREAK				
2:15 PM to 3:15 PM	Session-9	**Title :** Dynamical systems and its applications in control system	**Speaker : Dr. SATHIYARAJ THAMBIAYYA**, Assistant Professor, UCSI University, Malaysia	**Chair** : Dr. S.V. Chandra Sekar, Associate Professor, Department of Mathematics, KLEF	**Cochair:** Dr. S. V. Subramaiyam, Associate Professor, Department of Mathematics, KLEF
3:15 PM to 3:30 PM	TEA BREAK				
3:30 PM to 4:30 PM	**Paper Presentation Schedule - III**			**Chair :** Dr. V.B.V.N. Prasad, Associate Professor, Department of Mathemtics, KLEF	**Cochair:** Dr Nirakara Pradhan, Assistant Professor, Department of Mathematics, KLEF

KONERU LAKSHMAIAH EDUCATION FOUNDATION

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DEPARTMENT OF MATHEMATICS

SERB Sponsored International Conference on

Advanced Trends in Computational Engineering Mathematics (ICATCEM - 2024) 9-13 July 2024

Session Details (Day - 5 - 13.07.2024)

TIME	SESSION	NAME OF THE SPEAKER			
9:00 AM to 11:00 AM	Session - 10	**Title :** Exploring Data with Topology	**Dr. RAMESH KASILINGAM**, Assistant Professor, IIT Madras, Tamil Nadu	**Chair :** Dr.T. ASIR, Associate Professor, Ramanujan School of Mathematical science, Pondicherry University	**Cochair:** Dr. T. Nageswara Rao, Associate Professor, Department of Mathematics, KLEF
11:00 AM to 11:15 AM	TEA BREAK				
11:15 AM to 1:15 PM	Session -11	**Title :** Graph Constructed from Ring Structure	**Dr. T. ASIR**, Associate Professor, Ramanujan School of Mathematical science, Pondicherry University	**Chair :** Dr.RAMESH KASILINGAM, Assistant Professor, IIT Madras, Tamil Nadu	**Cochair:** Dr. Charan Kumar, Associate Professor, Department of Mathematics, KLEF
1:15 PM to 2:15 PM	LUNCH BREAK				
2:15 PM to 3:15 PM	**Paper Presentation Schedule - IV**			**Chair** : Dr. T. Nageswara Rao, Associate Professor, Department of mathematics, KLEF	**Cochair:** Dr Nirakara Pradhan, Assistant Professor, Department of Mathematics, KLEF
3:15 PM to 3:30 PM	TEA BREAK				
3:30 PM to 4:30 PM	**VALEDICTORY**				

RESOURCE PERSONS (ICATCEM - 2024)

Dr. V. Lakshmana Gomathi Nayagam	Professor, Department Of Mathematics National Institute Of Technology Tiruchirappalli, India. Email: velulakshmanan@nitt.edu
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INVITED TALK-1

SIMILARITY MEASURE ON INCOMPLETE IMPRECISE INFORMATION AND ITS APPLICATIONS

Dr. V. LAKSHMANA GOMATHI NAYAGAM

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Abstract: Any decision problem involves information which is not only crisp but also imprecise and incomplete in nature due to the continuous transition and lackof knowledge of experts. The concept of fuzzy sets introduced by Zadeh (1965) paved a way to model imprecise information which is very useful in real time applications. In decision making analysis, interval data is an important class of data which could model imprecise qualitative information. By extending intervalnumbers to fuzzy numbers, we are provided with the ability to handle vague and imprecise information more effectively. Fuzzy numbers are further extended to intuitionistic fuzzy numbers to handle with imprecise and incomplete informationdue to the hesitancy of the expert while giving data to the problem. Similarity measure in the information domain is the base for clustering and pattern recognition involving information and data. Since incomplete and imprecise information is modeled by fuzzy number and intuitionistic fuzzy numbers, the similarity measure on domain of fuzzy numbers and intuitionistic fuzzy numbers are to be defined by satisfying some important axioms to make a complete and meaningful definition. Similarity measure has various applications in fuzzy clustering, pattern recognition and MCDM problems. In this discussion, we focus on the similarity measure defined on trapezoidal valued incomplete imprecise information of specific type and analyze its properties and applications.

Keywords: Fuzzy numbers; Intuitionistic fuzzy numbers; Similarity measure;Imprecise and incomplete information.

Bio Sketch of Speaker: Dr. V. Lakshmana Gomathi Nayagam, a distinguished Professor of Mathematics at the National Institute of Technology, Tiruchirappalli, specializes in Fuzzy Topological Structures, Fuzzy Algebraic Structures, Fuzzy Decision Modelling, and Fuzzy Clustering Modelling. His academic journey began with a BSc degree from MDT Hindu College affiliated with Madurai Kamaraj University and MSc degree from MDT Hindu College affiliated with Manonmaniam Sundaranar University, M.Phil degree from School of Mathematics, Madurai Kamaraj University. He earned his PhD from School of Mathematics, Madurai Kamaraj University.

Dr. Nayagam's professional career started as a Lecturer at Thiagarajar College of Engineering, Madurai (2001-2006), before joining NIT Tiruchirappalli, where he advanced from Assistant Professor (2006-2018) to Associate Professor (2018-2024), and Head of the Department (2020-2023), culminating in his current role as Professor. His extensive research contributions are reflected in numerous publications in esteemed journals such as Neural Computing and Applications, Neutrosophic Sets and Systems, and Soft Computing. He has been recognized with several awards including the PI for the Fund for Improvement of S&T infrastructure in universities & higher educational institutions (FIST) in 2021 and multiple certificates of appreciation for research citations and paper publications. He has also played pivotal roles in various research projects and conferences, including the UKIERI Skill Development Project and the Workshop on Algebra, Analysis, and Differential Equations. His expertise and contributions have significantly advanced the field of fuzzy mathematics. For further details, he can be reached at velulakshmanan@nitt.edu or via his profile at IRINS.

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INVITED TALK-2

SOLUTIONS OF MANY MEDICAL/DIGITAL RELATED PROBLEMS Via GRAPH THEORETICAL APPROACH

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Abstract: In this Medical/Digital World, many Practical Real-life problems can be solved with the help of the proper Mathematical / Graph theoretical Modeling of the real life situation. Using some of the existing technique or new technique, we can obtain the solution and there by interpreting with the real-life situation. For this, various Graph theoretical parameters plays an vital role for solving the Mathematical Modeling of the real life problems. Many of our various Medical/Digital problems needs exact proper Diagonalasation to perform surgeries in an efficient manner and this can be done via Graph theoretical approach. In this talk, it is proposed to explain how the various concept of Graph Theory plays significant role in the major Medical/Digital related problems in our day to day life.

Bio Sketch of Speaker: Dr. G. Mahadevan M.Sc., M.Phil., M.Tech., Ph.D., is having 30 years 2 months (as on 01-06-2024) of teaching and Research Experience in various Universities and Colleges. Currently he is working as an Associate Professor, in the dept. of Mathematics, The Gandhigram Rural Institute-Deemed to be University, Ministry of Education, Govt. of India, Gandhigram, Dindigul, Tamil Nadu since 12-10-2006 onwards to till date. Before that he served as Head of the department of Mathematics at St.Peter's Engineering College, Avadi Chennai, Adiparasakthi Engineering College, Melmaruvathur, and Head of the Dept. of Mathematics at Dr. Sivanthi Aditanar College of Engineering, Tiruchendur.

Dr. G. Mahadevan M.Sc.,M.Phil.,M.Tech.,Ph.D., is having 30 years 2 months (as on 01-06-2024) of teaching and Research Experience in various Universities and Colleges. Currently he is working as an Associate Professor, in the dept. of Mathematics, The Gandhigram Rural Institute-Deemed to be University, Ministry of Education, Govt. of India, Gandhigram, Dindigul, Tamil Nadu since 12-10-2006 onwards to till date. Before that he served as Head of the department of Mathematics at St.Peter's Engineering College, Avadi Chennai, Adiparasakthi Engineering College, Melmaruvathur, and Head of the Dept. of Mathematics at Dr. Sivanthi Aditanar College of Engineering, Tiruchendur. He also served as Head of the department of Mathematics at Anna University of Technology, Tirunelveli Tamil Nadu. His academic journey began with notable achievements during his undergraduate and postgraduate studies.

He secured College First Rank in B.Sc degree during the year 1991 at Sri Paramakalyani College Alwarkurichi, where he displayed exceptional academic prowess. Continuing his academic excellence, he clinched the First rank in the M.Sc degree during the year 1993 at V.O.C College, Tuticorin, demonstrating his commitment to scholarly pursuits. His pursuit of knowledge culminated in securing the Second rank at the Manonmaniam Sundaranar University level in an M.Phil degree, during the year 1994 at Aditanar College of Arts and Science Tiruchendur. He successfully completed his Ph.D., degree in Mathematics from Manonmaniam Sundaranar University, Tirunelveli during the year 2005. Also, he successfully completed his M.Tech degree from Manonmaniam Sundaranar University, Tirunelveli during the year 2014. His area of expertise lies in Mathematics especially Graph theory and networks, showcasing his specialization in the broader field of Mathematics.

He has published more than 147 research papers in various International/National reputed journals. In addition to that, he has published many research articles as a Book Chapter from reputed International/National Publishers. Under his guidance 11 scholars have successfully completed their Ph.D., degree and 5 scholars are doing their Ph.D., degree under his guidance. He has guided nearly 22 M.Phil dissertations and around 50 M.Sc Projects. He has written three books on Engineering Mathematics and one Text book of Calculus. He has received 16 Awards towards his outstanding contributions in Teaching and Research from various academic bodies. He is the Associate Editor of International Journal of Applied Graph Theory, and served as Guest Editor of Special issue of various International/National Journals including Springer Verlag, Germany. He served as reviewer for many research articles in various reputed International/National Journals. He presented many research papers in various

International/National Conferences and Seminars all over the world. He served as a Resource person and delivered nearly 200 invited talks for numerous International/National conferences organized by many Universities and Colleges all over India and Abroad and sharing his expertise and contributing to the intellectual discourse in the field of Mathematics.

He visited many foreign universities for the collaborative academic activities and to delivered an invited talk at Canadian University, Dubai, National University, Singapore, Build Bright University, Comboida, Universiti Tunku Abdul Rahman, Malaysia, Malaysia, Saigon University, Vietnam and Asian Institute of Technology, Thailand. He organized many International Conferences as convenor by receiving grants from DST-SERB, CSIR, UGC etc., In addition to that he served as NSS, RRC and YRC Co-ordinator. During his Research journey, he introduced nearly 32 new domination parameters in Graph Theory which has got tremendous applications in Real life. He served as an external Examiner/convenor of various Ph.D., Public via voce Board. He is a Member of Board of studies, Doctorial Committe of various Universities and Colleges all over India. He also served as Academic Council Member of Gandhigram Rural Institute-Deemed to be University. He acted as selection committee member for various academic programmes for many colleges and Universities. He served as a Member of Board of question paper setter, adjudicator of many Ph.D. thesis and various academic committees in various universities and colleges.

His area of research is Graph Theory which has got excellent applications in real life. The solution of any real life problem is nothing but finding the particular domination number of the graph theoretical representation of the real life situation. For that, we convert the physical problem into Graph theoretical Mathematical modelling especially Graph models. In this regard, he introduced nearly 32 new domination parameters with real life applications. He introduced the concept of complementary perfect domination number of a graph, which has got rich in application in developing countries. Recently he introduced the concept of triple connected domination number of a graph and corona domination number of a graph which has excellent applications in security related problems. In summary, Dr. G. Mahadevan's academic journey is characterized by consistently pursuing excellence, scholarly contributions, and active engagement in academic community-building activities. His dedication to mathematics education and research underscores his significant impact.

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INVITED TALK-3

MARKOVIAN QUEUING MODEL WITH RENEGING CUSTOMERS

Dr. M. SEENIVASAN

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Abstract: In this talk, we studied the Markovian queuing model with working vacation, reneging and server breakdown. The customer served on basis of FCFS. The arrival follows Poisson Processes and the services during the working vacation and normal working periods are distributed exponentially. After serving all the customers in the system, the server takes a vacation, at which the server serves at a low service rate which is known as working vacation. After completing the working vacation, the server switches to a normal busy period. When the server could have an unexpected failure or breakdown and needs to be repair, after the completion of the repair the regular service happens. Reneging occurs when customers abandon a queue due to prolonged wait or dissatisfaction. The Matrix Geometric method has been used to analyze this queuing model to determine the stochastic processes $\{((\boldsymbol{t}), \boldsymbol{N}(\boldsymbol{t})): \boldsymbol{t} \geq \boldsymbol{0}\}$. It is also used to determine some performance measures. Certain numerical tables are obtained, and various graphical representations are also obtained.

Keywords: Arrival rate, Service rate, Reneging, Working Vacation, Matrix Geometric Method.

AMS Subject classification: 90B22, 60K25 and 60K30.

Bio Sketch of Speaker: Dr. M. Seenivasan was awarded Ph.d degree by Annamalai University in the year 2012. He got the B.Sc, degree in Mathematics from St. Xavier's College, Palayamkottai. He did M.Sc, (Applied Mathematics) in Thiagarajar College of Engineering Madurai. He is currently working as Associate Professor and Wing Head, Department of Mathematics - DDE, Annamalai University. He has 21 years of teaching and 19 years of research experience.

His area of research is Stochastic Processes and its Applications, Graph theory and Computer Networks. He has published more than 90 research articles in reputed international journals and received 7 Best Paper Awards in various International Conferences. He has guided 22 M.Phil scholars. At present, he guided and she awarded Ph.D and submitted five Ph.d research scholars and guiding 3 Ph.d research scholars. He acted as an editorial member in more than 20 international journals.

He organized five international conferences in abroad and Twelve international conferences within India. He Coordinated 11 Faculty Improvement Programmes in different fields. He acted as Invited speaker/Keynote Speaker in more than 40 International Conferences. He acted as an editor in three Scopus Journals such as AIP, Journal of Physics and Advances in Mathematics: Scientific Journal. He received 13 International awards from Various Conferences. He got Three Indian Patents. He visited and organized the International Conference in Thailand, Malaysia, Singapore, Cambodia, Dubai, Vietnam and USA.

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INVITED TALK-4

HEAT TRANSFER OPTIMIZATION USING MACHINE LEARNING

Dr. R SIVARAJ

Associate Professor

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Abstract: Natural convective flow occurs due to the combined effects of thermal expansion and buoyancy. Natural convection finds applications in nuclear reactors, stellar physics, solar

ponds, cooling of molten metals, and fluid flows around shrouded heat-dissipation fins. The nanofluids are prepared by suspending the nano-sized particles into base-fluids such as water, ethylene glycol, oil. The nanoparticles are synthesized from metals/oxides/carbides/carbon nanotubes. Nanofluids are very useful in various applications including heat exchanger, domestic refrigerator, vehicle thermal management hybrid-powered engines microelectronics, and pharmaceutical processes. The convective flows of nanofluids in cavities is widely used to analyse the fluid flow and heat transfer in various engineering and industrial situations. Now-a-days, the accuracy of the results which are obtained using CFD techniques is highly increased. The impact of all the controlling parameters of the physical problems can be thoroughly analysed in various combinations and so the CFD techniques reduces the number of trails to set experiments and get the optimum results as well as it saves time, cost, and efforts. Further, the development of machine learning algorithms is very useful to highly optimize the values of various pertinent parameters in the mathematical models to obtain enhanced heat transfer features. Furthermore, the characteristics of various combinations of nanoparticles and base-fluids can be effectively examined using machine learning algorithms and nanofluids with optimum thermophysical properties can be identified for various heat transfer applications. With this motivation, this talk showcases heat transfer studies on convective flows of nanofluids in cavities using machine learning algorithms.

Keywords: Natural convection, nanofluids, cavities, CFD, machine learning.

Bio Sketch of Speaker: Dr. R. Sivaraj is an Associate Professor in the Department of Mathematics at Dr. B R Ambedkar National Institute of Technology, Jalandhar, Punjab, India. He earned his Ph.D. in Mathematics from Vellore Institute of Technology, India in 2012. With over 11 years of teaching and research experience, his expertise lies in fluid dynamics, heat and mass transfer, non-Newtonian fluids, nanofluids, and magnetohydrodynamics (MHD).

Dr. Sivaraj has a strong publication record with numerous papers in SCI/SCIE journals and has received multiple VIT Research Awards. His work includes extensive use of software such as Matlab, Python, and Mathematica. Dr. Sivaraj has also been involved in various international collaborations and conferences, both as a speaker and organizer.

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INVITED TALK-5

INFORMATION THEORY

Dr. G SURESH SINGH

Professor

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Abstract: The revolution of computers and communication systems in the 1960's brought it with a demand from the private sector for means to protect information in digital form and to provide security services. Beginning with the work of Feistel at IBM in the early 1970's and reaching the highest in 1977 with the adoption as a U.S. federal information processing standard for encrypting unclassified information, (DES) the digital encryption standard in the most well-known cryptographic mechanism in history. The most striking development in the history of cryptography came in 1976 when Whitfield Diffe and Martin E. Hellman published paper, "New directions in cryptography".

Bio Sketch of Speaker: Dr. G. Suresh Singh has about 29 years of teaching experience, 34 years research experience and he has published 1 book , 93 papers in International Journals, 54 papers in Indian Journals, 78 papers in Conference/Proceedings and edited 5 books. He has produced 29 Ph.Ds and there are 7 Scholars currently doing their Ph.D under his guidance. He has delivered more than 200 invited talks and attended more than 350 seminar conference and has evaluated more than 180 Ph.D theses. He has received some of the highest awards including Bharat Gaurav Award (by IIFS), Glory of India Gold Medal (by IISA), IMRF Excellence Award, ICSETS 2020 Research Excellence Award. He was also a member of the Editorial board including GSTF Journal on Mathematics, Statistics and Operations Research (JMSOR), Mapana Journal of sciences (MJS), Journal of Graph Labelings, Advances in Mathematics: Scientific Journal (AMSJ). He has been selected as a faculty member in the Civil Service Academy, Government of Kerala, Thiruvananthapuram, Kerala, Course coordinator of Refresher Course in Mathematics,

Academic Staff College, University of Kerala and Member of Subcommittee for Mathematics and Science, Textbook commission, Kerala (2010 onwards), Hon. director of centre for quantitative analysis, University of Kerala(2013 onwards), UGC – SAP Coordinator and he was a member of various committees like Faculty of Science, Cochin University of Science and Technology, Academic Council, Fatima Mata National College, Kollam (2015 - 2017), Academic Council, Mar Ivanious College, Thiruvananthapuram, Kerala (2017 onwards) and so on.

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INVITED TALK-6

DATA ANALYTICAL USING PYTHON PROGRAMMING LANGUAGE

Dr. KRISHNA KUMAR

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Abstract: Data analytics using Python has become indispensable in today's data-driven world. Python offers a robust ecosystem of libraries and tools that facilitate efficient data manipulation, statistical analysis, and visualization. This abstract provides a concise overview of essential concepts and tools necessary for effective data analytics.

Python Overview-Python is a versatile, high-level programming language known for its readability and simplicity. It supports various programming paradigms and is widely adopted in data science due to its extensive libraries tailored for numerical computing and data analysis. Mathematical Concepts through Python-Python's libraries, particularly NumPy, enable comprehensive mathematical operations essential for statistical analysis. NumPy's array-based computing and mathematical functions provide efficient handling of numerical data, crucial for data manipulation and computation.

Jupyter Notebook and Basic Package Installation- Jupyter Notebook serves as an interactive environment for Python programming, facilitating code execution, visualization, and narrative text in a single document. It supports seamless integration with data analysis libraries and simplifies the installation of necessary packages. NumPy Library for Statistical

Analysis-NumPy is pivotal for numerical computations in Python, offering powerful tools for array manipulation, linear algebra, and random number generation. It forms the foundation for statistical operations and supports efficient data processing.

Pandas Library for Data Manipulation- Pandas provides data structures like DataFrame and Series, enabling effortless data manipulation, cleaning, aggregation, and exploration. It simplifies tasks in data analytics by offering intuitive methods for handling complex datasets. Matplotlib Library for Data Visualization- Matplotlib is a versatile plotting library that enables the creation of static, animated, and interactive visualizations in Python. It supports various plot types and customization options, facilitating clear and insightful data presentation.

Time Series Analysis- Python libraries such as Pandas and Matplotlib offer specialized support for time series analysis, allowing analysts to explore sequential data, identify trends, and forecast future patterns. These tools are essential for understanding temporal data dynamics. In conclusion, this Python's role in data analytics, emphasizing its powerful libraries like NumPy, Pandas, and Matplotlib for statistical analysis, data manipulation, visualization, and time series analysis. Mastering these tools equips data analysts and scientists with the capabilities needed to derive actionable insights and support informed decision-making across industries.

Bio Sketch of Speaker: Dr. K. Krishnakumar is an accomplished Associate Professor at Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, with a rich teaching career spanning over a decade. He earned his Ph.D. in Computer Science and Engineering from Meenakshi Academy of Higher Education and Research University, Chennai. His research focuses on cloud computing, virtual machine optimization, and artificial intelligence, with numerous publications in reputed journals and conferences.

Dr. Krishnakumar is actively involved in mentoring students, developing innovative instructional methods, and coordinating departmental activities, bringing a wealth of expertise and dedication to his academic role.

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INVITED TALK-7

LEVERAGING LINEAR ALGEBRA FOR ADVANCED IMAGE PROCESSING WITH AI: A MATLAB DEMONSTRATION

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Abstract: In the rapidly evolving field of artificial intelligence (AI), image processing stands out as a pivotal application with far-reaching implications across various industries, from healthcare to autonomous driving. This paper explores the integral role of linear algebra in enhancing image processing capabilities through AI, specifically demonstrating these concepts using MATLAB, a robust environment for numerical computing and visualization.

Linear algebra, the branch of mathematics concerning vector spaces and linear mappings between them, is foundational to many image processing techniques. At its core, image processing involves manipulating and analyzing images to extract useful information, and linear algebra provides the mathematical framework to perform these operations efficiently. This paper delves into several key linear algebra concepts and illustrates their applications in image processing with AI.

There are several concepts because linear algebra is important. Mainly the reason is image representation and transformation. Images, when represented as matrices, become amenable to a variety of linear algebra operations. Each pixel in a grayscale image corresponds to a matrix element, while color images are represented as three-dimensional arrays. This matrix representation is crucial for performing transformations such as rotation, scaling, and translation, which can be efficiently handled through matrix multiplication and other linear transformations.

Furthermore, this work dealing with convolution and filtering. Convolution, a fundamental operation in image processing, can be elegantly expressed using linear algebra. By representing convolution kernels as matrices, we can apply filters to images, enhancing or detecting features

such as edges, textures, and patterns. This section will demonstrate how convolutional operations, essential for convolutional neural networks (CNNs), rely heavily on linear algebra.

However, Principal Component Analysis (PCA) is key idea for image processing through AI. PCA is a powerful technique used for image compression and feature extraction. By decomposing the image data matrix into principal components, we can reduce the dimensionality of the image data while preserving essential features. This reduction is achieved through eigenvalue decomposition and singular value decomposition (SVD), which are core linear algebra methods.

Although, the concept of Singular Value Decomposition (SVD) is one of the remarkable key factor while doing work on image processing. SVD is particularly significant in image compression and noise reduction. By decomposing an image matrix into its singular values and corresponding singular vectors, we can approximate the original image using a subset of these values, thereby achieving compression. This section will illustrate how MATLAB can be used to perform SVD and apply it to practical image processing tasks. Moreover, Eigenvalues and eigenvectors are critical in understanding various transformations and properties of images. For instance, in image segmentation and enhancement, the eigenvectors of a matrix representation of an image can reveal important structural details. This section will explore the application of these concepts in segmenting images and enhancing their quality.

Finally, Machine learning algorithms, particularly neural networks, are inherently reliant on linear algebra. Training neural networks involves operations such as dot products and matrix multiplications, which are fundamental linear algebra operations. This section will discuss how linear algebra underpins the training and functioning of neural networks, with practical examples implemented in MATLAB.

To demonstrate the practical application of these concepts, this paper includes a case study on medical image processing. Using MATLAB, we will process and analyze medical images, highlighting how linear algebra and AI can be combined to detect and diagnose medical conditions with high accuracy.

Keywords: Linear Algebra, Image Processing, Artificial Intelligence, MATLAB, Convolution, Principal Component Analysis, Singular Value Decomposition, Eigenvalues, Neural Networks, Medical Image Processing.

Bio Sketch of Speaker: Dr. R. Suresh holds a Ph.D. in Mathematics from Vel Tech Dr.RR &Dr.SR Technical University, Chennai, with expertise in chaos synchronization and control systems. He has extensive research experience and has published numerous papers in international journals. Currently, he serves as a Senior Lecturer at the University of Technology and Applied Science in Ibri, Oman.

Dr. Suresh has also served as a resource person at various national and international conferences. He has actively reviewed numerous papers and guided Ph.D. students in their research.

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INVITED TALK-8

EXPLORING FRONTIERS: ADVANCED COMPUTING AND RESEARCH WITH R

Dr. MURALI MOHAN VUTUKURU

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Abstract: The Role of R in Advanced Computing and Research, R's versatility and adaptability have positioned it at the forefront of advanced computing and research, particularly in fields requiring sophisticated statistical analysis, data visualization and modelling. This abstract investigates the multifaceted applications of R in computational science, highlighting its contributions to areas ranging from genomics to environmental modelling. It also addresses the challenges faced by researchers in leveraging R's full potential, including issues related to performance optimization and parallel computing. By exploring innovative strategies for overcoming these hurdles, in these abstract aims to inspire further exploration and innovation within the R community, fostering a culture of continuous learning and improvement.

Bio Sketch of Speaker: Dr. V. Murali Mohan is an accomplished Associate Professor with over 16 years of experience in academia, research, and industry. He holds a Ph.D. in Computer Science and Engineering from K.L. University, specializing in optimal design strategies for cloud computing resource scheduling. Currently serving at K.L. University, he has received accolades such as the Best Technical Teacher Award and Best Teacher in Academics Award.

Dr. Mohan has extensive experience as a software consultant and has contributed significantly to the field of cloud computing through his research and publications in renowned journals. He is also a certified trainer and has expertise in a wide array of programming languages and technologies, including Python, Java, MERN stack, and AWS.

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INVITED TALK-9

DYNAMICAL SYSTEMS AND ITS APPLICATIONS IN CONTROL SYSTEM

Dr. SATHIYARAJ THAMMABIYA

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Abstract: Qualitative behaviour of dynamical systems such as existence and uniqueness of solutions, controllability and stability analysis plays an important role science and engineering. Dynamical properties of integer and fractional order system and its applications will be presented in this conference.

Bio Sketch of Speaker: Dr. Sathiyaraj Thambiayya is an Assistant Professor at the Institute of Actuarial Science and Data Analytics, UCSI University, Malaysia. He holds a Ph.D. in Mathematics from The Gandhigram Rural Institute, India, and has extensive teaching and research experience, including postdoctoral research at IIT Kanpur and Guizhou University, China. His research interests encompass control systems, differential equations, fractional calculus, and AI in dynamic systems.

Dr. Sathiyaraj has published numerous papers in high-impact journals and serves on editorial boards of several international journals. He is also involved in ongoing research projects funded by FRGS and REIG-UCSI.

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INVITED TALK-10

EXPLORING DATA WITH TOPOLOGY

Dr. RAMESH KASILINGAM

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Abstract: Data has shape, and shape is the domain of geometry and in particular of its free part, called topology. The purpose of this presentation is twofold. Firstly, it offers a concise overview of how topology is applied in data analysis and the reasons behind its usage. Furthermore, I will delve into the interaction between the theoretical principles of topology and its real-world applications in data analysis.

Bio Sketch of Speaker: Dr. Ramesh Kasilingam is an Assistant Professor at the Indian Institute of Technology Madras, specializing in differential and algebraic topology, with a focus on smooth structures and geometric properties of manifolds. He holds a Ph.D. from the Indian Institute of Technology Bombay and has extensive research experience, including positions at the Indian Statistical Institute Bangalore and visits to prestigious institutions such as Stony Brook University.

Dr. Kasilingam has made significant contributions to the classification of smooth structures on high-dimensional manifolds, as evidenced by his publications in renowned journals and presentations at international conferences. He is also actively involved in academic and social initiatives within the mathematics community in India named MATHS-INDIA.

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INVITED TALK-11

GRAPH CONSTRUCTED FROM RING STRUCTURE

Dr. T. ASIR

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Abstract: Over the past 20 years, research on algebraic structures using graph theory tools has become increasingly interesting. The interaction between a ring's algebraic properties and the graph-theoretical properties of the corresponding graph is the subject of research on graphs made of rings. As an illustration, consider a ring's zero-divisor graph and total graph. Results regarding the fundamental char- acteristics of the total graphs and zero-divisor graphs of commutative rings are presented in this talk.

Keywords: Zero-divisor graph or a ring, Total graph of a ring.

Bio Sketch of Speaker: Dr. T. Asir has pursued his B.Sc. and M.Sc. in Mathematics from St. Xavier's College, Palayamkottai and his M.Phil. from Manonmaniam Sundaranar University, Tirunelveli. He has received a gold medal in M.Sc. and secured University second rank in M.Phil. He received the Ph.D. degree in Mathematics at Manonmaniam Sundaranar University and his Ph.D. work was supported by the grants "Major Project Fellowship" by University Grants Commission(UGC), India and the "INSPIRE Fellowship" by the Department of Science and Technology(DST), India.

He did his Post Doctorate under the UGC-Kothari Postdoctoral Fellowship. He was worked as an Assistant Professor and Head i/c in Department of Mathematics DDE, Madurai Kamaraj University, Tamil Nadu from Dec 2013 to July 2022. His research interest is Algebra and Graph Theory. More specifically, graphs arising from rings and vice versa.

He has published 32 research articles in International Journals (Journals like Discrete Mathematics, Discrete Applied Mathematics, Expositiones Mathematicae, Communications in Algebra, Soft Computing) and two books (including a book in Springer) with a citation count of 211 on Web of Science, 273 on Scopus and 461 on Google Scholar. He has completed three projects UGC-Startup grant, SERB-MATRICS project and Deanship of Scientific Research at King Abdulaziz University, Saudi Arabia. Currently, his research is supported by CSIR project. Also, he has received travel grants from DST (2012), UGC (2015), SERB (2019) and CSIR (2020) to deliver talks at International Conferences held at AlAin-UAE (2012), Thailand (2015), Palestine Israel- Egypt (2019) and Sharjah-UAE (2020). Further, received grants from SERB, CSIR and MKU to conduct an International Conference during January, 2018. Further 5 Ph.Ds and 25 M.Phil.'s have been awarded under his guidance.

Moreover, he has delivered more than 75 invited talks at various National/International conferences and Orientation/Refreshers programs. He has served as a referee of several international journals in the frame of pure and applied mathematics. Furthermore, he has developed online mathematical content through MOOC Courses "Core and Pedagogy of Mathematics", "Modern Algebra" and "Graph Theory" in SWAYAM Platform (MHRD).

Paper ID: ICATCEM-101

A STUDY ON DESCRIPTION AND JUSTIFICATION OF THE PROBLEM USING NEUTROSOPHIC COGNITIVE MAPS

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Abstract: In this paper, we discussed about a application of Neutrosophic sets to decision support plays a vital role among researches. The theory of fuzzy measures only the grade of membership. It fails when the problem contains relations between attributes/nodes i.e. indeterminate. This paper suggests a new technique based on Neutrosophic cognitive Maps (NCMs) for the best decisions from a multi objective approach (decisions, diagnosis and prediction) during the execution of many problems simultaneously. FCMs has been mostly applied for decision making process in various fields such as sports, medicine, business and so on but this method doesn't consider the indeterminacy relation between the two or more concepts, whereas NCMs can represent the indeterminacy between concepts. The new technique contains Neutrosophic sets in the map's connections. This paper deals with the description and justification of the problem using neutrosophic cognitive maps with illustrative examples.

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Paper ID: ICATCEM-102

PERFORMANCE APPRAISES OF HETEROGENEOUS QUEUEING SYSTEM WITH TRISECTIONAL FUZZY ORDERING APPROACH

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Abstract: This article diagnosis the cost and profit appraises of Heterogeneous Queueing system by Trisectional Fuzzy Ordering technique. Ranking fashions are dominated a momentous role in defuzzification. This turns the fuzzy nature as crisp nature. Our suggested

ordering routine is very easy to analyze the cost and profit appraises of all queues. In the end we have verified our recommended technique by an example.

Key words: Fuzzy sets, Fuzzy numbers, Heterogeneous Queueing System, Trisectional Fuzzy Ordering.

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Paper ID: ICATCEM-103

FLOQUET THEORY FOR A VOLTERRA INTEGRO-DYNAMIC MATRIX SYLVESTER SYSTEM ON TIME SCALES

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Abstract: In this paper, we examine the periodic solution for the Volterra integro-dynamic matrix Sylvester system on periodic time scales, encompassing both discrete and continuous dynamical systems, as well as those with a combination of discrete and continuous components. We discuss the relationship between the Kronecker Product Volterra integro-dynamic system's solution and the corresponding system's limiting equation. We also develop integrability conditions for the resolvent of Kronecker Product Volterra integro-dynamic systems.

Keywords: Periodicity; Resolvent; Volterra integro-dynamic; limiting equation, Kronecker Product

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Paper ID: ICATCEM-104

SYNCHRONIZATION OF A COMPLEX DYNAMICAL NETWORKS USING ADDITIVE TIME-VARYING DELAYS

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Abstract: This study focuses on the synchronization analysis of complex dynamical networks

(CDNs) using additive time varying delays. However, to overcome obstacles like actuator faults, a suitable uncertainty and disturbance estimator (UDE)-based controller technique is employed. Furthermore, to ensure the synchronization of the proposed system, a new Lyapunov functional is designed, and by using Jensen's inequality, sufficient conditions are obtained in terms of linear matrix inequality (LMI). At last, a numerical result is presented to demonstrate the efficacy of the theoretical findings.

Keywords: complex dynamical networks; additive time-varying delays; uncertainty; asymptotical synchronization; actuator faults; Uncertainty and disturbance estimator.

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Paper ID: ICATCEM-105

HEAT AND MASS TRANSPORT OF A STAGNATION POINT HNF FLOW ACROSS STRETCHED SURFACE WITH ARRHENIUS KINETICS AND CHEMICAL REACTION

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Abstract: This paper is worked on two-dimensional stagnation point HNF flow with the impact of Arrhenius kinetics energy along with chemical reaction over a stretching /shrinking sheet. Heat source/sink and radiation flow are taken into account while modelling energy expression. This work stands out for its innovative hybrid nanofluid mathematical model, which addresses a hitherto unexplored subject with various implications. Appropriate similarity transformations lead to ordinary Differential equations. The bvp4c MATLAB technique is applied the O.D.E. are labelled to switch the P.D.E.'s along with boundary conditions as per similarity variations. Graphic representations are used to discuss pertinent parameters. Engineering quantities, like Sherwood, Nusselt numbers and Skin friction coefficients are explained quantitatively in a table format. Temperature distribution slowdown versus higher Chemical reaction Rc ($0.1 \leq Rc \leq 0.5$) and Sc ($0.5 \leq Sc \leq 0.6$) parameters while decays for larger Prandtl number ($1.5 \leq Pr \leq 7$).

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Paper ID: ICATCEM-106

COMPLETE EXTENSION AND ADJACENCY MATRIX OF TOTAL GRAPHS

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Abstract: Field extensions involve the fundamental concept of beginning with a base field and then, through various techniques, expanding it to create a larger field that in cludes the base field and fulfills additional properties. G. Suresh Singh and Sunitha Grace Zacharia introduced the concept of graph extension by adding edges to G in a particular way and also proved some characterizations. In this paper, we try to obtain the complete extension of total graphs of some classes of graphs. Also we study the general form of the adjacency matrix of the total graph of a graph G, and discuss the complete extension of $T(G)$ in terms of adjacency matrix and incidence matrix of G and $L(G)$.

Keywords: Adjacency matrix, completely extendable graph, deficiency number, total graphs.

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Paper ID: ICATCEM-107

CASSON CONVECTIVE HEATING OF AN EXPONENTIAL STRETCHING SHEET WITH VARIABLE THERMO-PHYSICAL PROPERTIES DURING A SLIP FLOW ANALYSIS

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Abstract: The research examined thermal conductivity and temperature-dependent viscosity in a magneto-steady free convective Casson fluid with non-Newtonian boundaries. An exponential stretch occurs on a surface that generates a lot of heat, but it produces it exponentially with the flow. A natural convection flow occurs in a system when buoyancy is driving the flow and internal heat is generating at an exponential rate, along with the slip of velocity and boundary boundaries. An analysis of the problem relies on the transformation of the boundary layer linked partial differential equations provide non-linear ODEs so as to evaluate it. With the aim of numerically solve the equations, we used the MATLAB bvp4c solver embedded in the MATLAB software. It was found that the velocity and temperature sketches of the fluid boundary layer were affected by a variety of parameters which were investigated by a parametric study. According to the results of the parametric study, the flow controlling factors have a great impact on flow sketches that result from the flow control parameters. There are various engineering and industrial processes relevant to these findings, which contribute to the understanding a fluid dynamics as well as heat transfer characteristics in this specific system with practical applications in various engineering and industrial fields.

Keywords: Variable thermal conductivity; Casson; MHD; convective boundary condition; velocity slip; Variable viscosity;

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Paper ID: ICATCEM-108

FUZZY SOFT BOOLEAN NEAR SEMIRINGS

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Abstract: In this paper, we introduce and investigate the concept of fuzzy soft Boolean near semirings. We examine a few of their fundamental characteristics by giving pertinent instances. Furthermore, we offer the fuzzy ideals and fuzzy soft ideals that characterise zero

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Paper ID: ICATCEM-109

A STUDY ON ANTI-ADJACENCY MATRICES OF SOME GRAPHS

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Abstract: Let G be a simple undirected graph with vertex set $V(G) = \{v_1, v_2, \ldots, v_n\}$ and edge set $E(G) = \{e_1, e_2, \ldots, e_m\}$. The anti-adjacency matrix of G, denoted by $B(G)$ is the $n \times n$ matrix $B(G) = (b_{ij})$, where $b_{ij} = 0$ if $v_iv_j \in E(G)$ or otherwise $b_{ij} = 1$. In this paper we discuss the anti-adjacency matrices of the resultant graph after performing some graph theoretic operations on the two given graphs.

Keywords: Anti-adjacency matrix, tensor product, disjunction, composition, m-tensor product, m-disjunction, m-composition.

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Paper ID: ICATCEM-110

INVESTIGATION OF SOME PRODUCT RELATED PATHS OF OUTER PERFECT CONNECTED AT MOST TWIN DOMINATION NUMBER

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Abstract: Recently the concept of outer perfect connected at most twin domination number of a graph was introduced and studied by the authors. A set $S \subseteq V(G)$ is said to be an outer perfect connected at most twin dominating set (OPCATD-set) of G if every vertex $v \in V - S$, $1 \leq |N(v) \cap S| \leq 2$ and $< V - S >$ is connected and has a perfect matching. The minimum cardinality of an OPCATD-set is called the outer perfect connected at most twin domination

number (OPCATD-number) and is denoted by $\gamma_{opcat}(G)$. In continuation, in this paper we investigate this parameter for different products of paths.

Keywords: Outer perfect connected at most twin domination number, Cartesian product, Corona product, Strong product and Lexicographic product.

AMS Subject Classification: 05C69

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Paper ID: ICATCEM-111

GRAPH THEORETICAL ANALYSIS OF SARS-COV-2 SPIKE PROTEIN

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Abstract: The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) spike protein is the main surface antigen of the coronavirus. The global pandemic that has affected the majority of countries and territories in 2019 was caused by the emergence of the SARS-CoV-2 spike protein. Graph theoretical analysis is an important area of the research in biological networks. First, we introduce Pt-graph of peptide/protein based on physicochemical properties and adjacency of amino acids in the corresponding peptide/protein. From the graph-theoretical analyses of Pt-graph, we get some observations about the relations among the amino acids, physicochemical properties of amino acids and peptide/protein and it may help in the future evolution of peptide/protein and drug design. Here we analyze the Pt-graph of SARS-CoV-2 spike protein.

Keywords: Amino acid, SARS-CoV-2 spike protein, Graph, Pt-graph, biological networks.

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Paper ID: ICATCEM-112

GENERALIZED COMPOSITION OF SOME CLASSES OF GRAPHS

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Abstract: Graph operations in Graph theory is an active area of research. We can con struct a new graph by performing various graph theoretic operations on the given graphs. In 2015, Acharya and Mehta introduced the concept of generalized cartesian product of graphs. Also in 2019, Manju V. N. and G. Suresh Singh defined the generalized composi tion of graphs. In this article, the generalized composition of various classes of graphs are derived.

Keywords: Graph operations, Generalized composition.

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Paper ID: ICATCEM-113

TOPOLOGICAL INDICES OF SK-JOIN AND ARMS-PRODUCT OF GRAPHS

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Abstract: Topological indices has a significant role in chemical Graph Theory. In this paper we discuss some topological indices of the newly constructed family of graphs through the graph theoretic operation namely SK-join and ARMS-product of two graphs. Some well known topological indices such as first and second Zagreb indices, Harmonic indices, and Geometric-Arithmetic indices are derived for these two newly introduced operations.

Keywords: SK-join, ARMS-product.

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Paper ID: ICATCEM-114

MEASURES OF ASSIGNMENT PROBLEM WITH FUZZY ORDERING TECHNIQUE

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Abstract: Assignment problem is a magnificent subject and is engaged all the time in solving problems of engineering and management science. In this paper, we proposed a new ranking procedure to find the optimal solution. The optimal solution is totally based on the ranking procedure. The costs of values are considered as triangular fuzzy numbers. Ranking fuzzy numbers plays a huge role in decision making under fuzzy environment. This ranking technique is most reliable method, simple to apply and can be used for all types of assignment problems. Our idea is to convert the fuzzy values into crisp values by applying Robust Ranking Technique. We apply the crisp values in the assignment problem. Then the optimal solution of fuzzy assignment problem is obtained by using Fuzzy Hungarian Method. From the numerical examples it is obvious that the proposed ranking measure is easy to calculate and cost-effective for a fuzzy assignment problem and provides much more optimal value.

Keywords: Fuzzy set, Fuzzy number, Triangular fuzzy number, Fuzzy assignment problem, Ordering Technique.

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Paper ID: ICATCEM-115

NUMERICAL ANALYSIS OF DARCY FORCHHEIMER CONVECTION FLOWS OF BUONGIORNO'S NANOFLUID PAST A SEMI-INFINITE PLATE WITH VISCOUS DISSIPATION EFFECT.

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Abstract*:* This paper provides a thorough numerical investigation that takes viscous dissipation into account while analysing Darcy-Forchheimer convection flows of Buongiorno's nanofluid model via a semi-infinite plate. The dynamics of the nanofluid are described by Buongiorno's model, which takes thermophoresis and Brownian motion into consideration. By applying the required non-similarity transformations, the controlling partial differential equations are converted into a set of non-linear ordinary differential equations. Following transformation, these equations are numerically solved by a robust computational method (KBFDM). The study looks at how important parameters affect the flow, heat, and mass transfer characteristics, such as the Eckert number, thermophoresis parameter, Darcy number, Forchheimer number, and Brownian motion parameter. The findings show that the velocity and temperature profiles of the nanofluid are strongly influenced by both the Darcy and Forchheimer numbers. Moreover, viscous dissipation increases the thickness of the thermal boundary layer, suggesting that it plays a crucial part in the system's energy transfer. The results offer important new information for engineering applications including the optimisation of nanofluid-based thermal management systems. Moreover, the presence of nanoparticles, which are determined by the thermophoresis parameters, buoyancy ratio, and Brownian motion, affects the temperature and concentration boundary layers. This work provides comprehensive knowledge on the complex interplay between several physical processes in nanofluid convection, with potential applications in biomedical devices, advanced cooling technologies, and thermal management systems. The findings demonstrate how important it is to take into consideration several concurrent impacts to accurately predict and optimize the behavior of

nanofluids in practical engineering applications.

Keywords: Darcy-Forchheimer convection flows; Buongiorno's nanofluid model; semi-infinite plate; viscous dissipation; thermophoresis; Brownian motion; Darcy number; Forchheimer number; Eckert number.

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Paper ID: ICATCEM-116

SKOLEM DIFFERENCE MEAN LABELLING OF TREE RELATED GRAPHS

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Abstract: The graph $G = (V(G), E(G))$ with p vertices and q edges is called Skolem difference mean labelling denoted as SDML graph if $f: V(G) \longrightarrow \{1,2 \ldots p+q\}$ is an injective mapping such that induced bijective edge labelling $f*: E(G) \longrightarrow \{1,2, \ldots, q\}$ defined by $f*(uv) = \frac{|f(u)-f(v)|}{2}$, if $|f(u)-f(v)|$ is even otherwise $f*(uv) = \frac{|f(u)-f(v)+1|}{2}$, if $|f(u)-f(v)|$ is odd. In this article, we exposes the tree graph Skolem difference mean labelling together with its families of Branch tree, Tree Attached $K_{1,n}$, Y-tree, E-Tree, T-Tree.

Keywords: Skolem difference mean labelling, Branch tree, Tree Attached $K_{1,n}$, Y-tree, E-Tree, T-Tree.

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Paper ID: ICATCEM-117

FUZZY REMOTE SENSING

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Abstract: Remote sensing change detection (CD) plays an important role in Earth observation. In this paper, we propose a novel fusion approach for unsupervised CD of multispectral remote sensing images, by introducing majority voting (MV) into fuzzy topological space (FTMV).

The proposed FTMV approach consists of three principal stages: (1) the CD results of different difference images produced by the fuzzy C-means algorithm are combined using a modified MV, and an initial fusion CD mapisobtained; (2) by using fuzzy topology theory, the initial fusion CD map is automatically partitioned into two parts: a weakly conflicting part and strongly conflicting part; (3) the weakly conflicting pixels that possess little or no conflict are assigned to the current class, while the pixel patterns with strong conflicts often misclassified are relabeled using the supported connectivity of fuzzy topology. Experimental results on three real remote sensing images confirm the effectiveness and efficiency of the proposed method.

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Paper ID: ICATCEM-118

THREE-DIMENSIONAL SWIRLING FLOW OF MAXWELL FLUID WITH DIFFUSION-THERMO AND THERMAL-DIFFUSION EFFECTS

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Abstract: This study aims to investigate the impact of activation energy on the flow of a hybrid nanofluid over a rotating stretching cylinder with torsional motion and a heat source/sink. The paraffin wax-sand-propylene glycol– water-based hybrid nanofluid has been used in the study. By adopting appropriate similarity transformations, the modeled partial differential equations are transformed into a set of ordinary differential equations, which are then solved using the finite element method. The numerical integration's validity and reliability, as well as the newly obtained discoveries, were thoroughly analyzed. Results reveal that the larger Reynolds number values enhance the system's inertial force, which resists the liquid accelerating force and declines both velocities and heat transport. The heat source/sink parameter has a favorable impact on the thermal profile, but larger Schmidt number values restrict mass transfer. The improved values of the chemical reaction rate parameter augment the mass transport rate, but non dimensional activation energy parameter has negative impact on Sherwood number.

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Paper ID: ICATCEM-119

REVOLUTIONIZING WIRELESS TRAFFIC USAGE FORECASTING: TRANSFORMER WITH ATTENTION MECHANISM

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Abstract: In order to optimize network performance and guarantee optimal utilization of resources in dynamic wireless settings, it is necessary to revolutionize wireless traffic forecasting. This will enable proactive resource allocation. this study gives a comprehensive analysis of the spatial and temporal traffic dynamics in networks using real-time data from a corporate network with 470 access points. Machine learning models developed using the Transformer framework provide a fresh perspective to time series data predictions. Time series data may be analyzed for hidden dynamics and complicated patterns using this method, which makes advantage of the brain's attentional processes. Importantly, the study finds AP groups with high traffic use that have strong seasonality patterns and not so strong ones. This study employs and assesses a variety of forecasting approaches, including using the Holt-Winters approach, a SARIMA model, a GRU model, a CNN model, and a model constructed using convolutional neural networks... Finally, the study confirms the possibility of better wireless network resource management by illuminating the intricate patterns behind network traffic and presenting a novel method for forecasting.

Keywords: wireless traffic usage forecasting; Transformer model; self-attention mechanisms; (APs); Holt Winters; SARIMA; Networks for Convolutional Neural Processing (CNNs); Gated Recurrent Units (GRUs).

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Paper ID: ICATCEM-120

POWER EDGE DOMINATION NUMBER OF CERTAIN GRAPHS IN ITS CORONA PRODUCT

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Abstract: For a graph $G(V,E)$ with size n any edge $f \in E$, a set $S' \subseteq E$ is said to be power edge dominating set of graphs G if each edge $e \in E - S'$ is dominated in S' by the following rules if :(i) an edge f in G is in power edge dominating set (in short PEDS), then it dominates itself and dominates all the adjacent edges of f, (ii) a observed edge g in G has $m > 1$ adjacent edges and if $m - 1$ of these edges are observed earlier, then the remaining non-observed edge is also observed by $g \in G$. The minimum cardinality of a power edge domination number of G denoted by $\gamma'_{ped}(G)$. In this paper we investigate the power edge domination number of corona product of certain graphs.

Keywords: Power dominating Set, Power Edge Domination, Power Edge Domination Number, Corona Product.

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Paper ID: ICATCEM-121

POWER EDGE DOMINATION OF CERTAIN ACIDS IN DAILY LIFE

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Abstract: For a graph $G(V,E)$ with size n, and for any edge $f \in E$, a set $S' \subseteq E$ is said to be an power edge dominating set of graph G if each edge $g \in E - S'$ is dominated by the following rules: (i) an edge f in E is in power edge dominating set (in short PEDS), then it

dominates itself and dominates all the adjacent edges of f (ii) an observed edge h in E has $m > 1$ adjacent edges and if $m - 1$ of these edges are observed earlier, then the remaining non-observed edge is also observed by $h \in E$. The minimum cardinality of a power edge domination number of G is denoted by $\gamma'_{ped}(G)$. In this paper we investigate the power edge domination number for certain acids in our daily life.

Keywords: Power Domination, Power Edge Domination, Power Edge Domination Number, Acids.

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Paper ID: ICATCEM-122

EXPLORATION OF CTATD NUMBER FOR POWER GRAPH OF SOME NOTABLE GRAPHS

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Abstract: Recently the concept of complementary triple connected at most twin domination number of a graph was introduced by G Mahadevan et al [2]. A set $S \subseteq V$ is called an complementary triple connected at most twin dominating set ($CTATD(G)$), if every vertex $v \in V - S$, $1 \leq |N(v) \cap S| \leq 2$ and $< V - S >$ is triple connected. The minimum cardinality taken over all the complementary triple connected at most twin domination number of G and is denoted by $CTATD(G)$. The authors obtained this number for many peculiar types of graphs and discussed some nice results. In this article we examine this parameter for the power graph of some notable graphs.

Keywords: Triple connected, [1,2] dominating set, triple connected domination number, power graph.

AMS classification number: 05C69

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Paper ID: ICATCEM-123

MEAN CORDIAL LABELING IN DUPLICATE GRAPH OF PATH AND STAR RELATED GRAPHS

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Abstract: In this paper, we prove that the extended duplicate graph of path graph EDG(P_m), $m \geq 2$, the extended duplicate graph of comb graph EDG(CB_m), $m \geq 2$, the extended duplicate graph of twig graph EDG(T_m), $m \geq 2$, extended duplicate graph of ladder graph EDG(Lm), extended duplicate graph of bistar graph EDG($B_{m,m}$), $m \geq 2$ and the extended duplicate graph of double star graph EDG($DS_{m,m}$) $m \geq 2$ are mean cordial.

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Paper ID: ICATCEM-124

AN ANALYSIS OF RECENT DEVELOPMENTS IN CROP RECOMMENDATION SYSTEMS DRIVEN BY MACHINE LEARNING

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Abstract: Agriculture is essential to the world's food security, and sustainable agricultural methods depend on crop productivity optimization. Utilizing machine learning (ML) techniques, crop recommendation systems help farmers choose crops based on a variety of parameters, including soil characteristics, climate, and past crop performance data. An overview of the machine learning techniques used in crop recommendation systems is given in this abstract. To clean and standardize input data, such as soil nutrient levels, temperature, precipitation, and crop production records, data preparation techniques are first used. By removing unnecessary features from unprocessed data, feature engineering techniques

improve model performance. Predictive models are frequently constructed using machine learning (ML) methods such as decision trees, random forests, support vector machines, and neural networks. These models use historical data to forecast agricultural yields in various environmental scenarios and suggest appropriate crops. Nevertheless, comprehensive surveys that would aid academics and developers in comprehending the importance of serverless computing in various scenarios are still lacking. Presenting research findings that have been published in this field is so crucial. To gather relevant data for this systematic study, 275 research publications on serverless computing from reputable literature sources were thoroughly assessed. Subsequently, Additionally, methods like collaborative filtering and clustering help to find patterns and similarities across different locations and crops, allowing farmers to receive customized advice based on their unique needs and limitations. Furthermore, via learning from feedback and adjusting to shifting environmental dynamics, algorithms utilizing reinforcement learning may gradually enhance crop selection tactics. Crop recommendation systems based on machine learning provide farmers with useful tools for making decisions. They promote sustainable farming practices and help farmers maximize crop output in a variety of farming situations.

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Paper ID: ICATCEM-125

MAGNETOHYDRODYNAMIC FLUID FLOW AND HEAT TRANSFER DUE TO STRETCHING CYLINDER IN A POROUS MEDIA

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Abstract: The numerical solution of magnetohydrodynamic flow and heat transfer over a stretching cylinder saturated in a porous media is analyzed in this paper. The flow allows electric current to pass through. The governing system of Partial differential equations is converted into ordinary differential equations utilizing similarity transformations. The equations are solved by implicit Runge-Kutta-Bucher together with Nachtsheim-Swigert

iteration scheme. Dimensionless quantities like velocity and temperature of the flow in terms of parameters involved. Skin friction coefficient, Prandtl number and Reynolds number and the Nusselt number are substantially augmented with the increase in mixed convection parameter, *Ri*, magnetic field parameter, *M*, and porosity parameter, *K*. We discuss the thickness of the boundary layers under the influence of various parameters involved in the flow. Moreover, the thermal boundary layer for the Cu–Al_2O_3/H_2O hybrid nanofluid is wider in comparison with that for Cu–H_2O and Al_2O_3–H_2O nanofluid.

Keywords: Porous medium, Stretching Cylinder, Heat transfer

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Paper ID: ICATCEM-126

PREDICTION OF ROAD SEGMENTATION USING COMPUTATIONAL INTELLIGENCE

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Abstract: Predicting road segmentation is an essential challenge in the real estate industry. Several deep learning algorithms have been applied to forecast segmentation. These algorithms forecast values using a dataset of segmentation properties. The dataset includes information such as location, surrounding forest, a nearby train station, and the size of the road. We trained our models on the dataset and evaluated their performance using the accuracy. Deep belief networks beat both multi-layer perception and radial base function networks in forecasting land values, according to our findings. This is owing to its capacity to manage complicated, structured datasets as well as its ability to automatically handle missing values and outliers. As a result, we advocate using Deep belief networks for prediction. The model is a Generative Adversarial Network (GAN) designed for image-to-image translation, specifically for converting satellite images to maps. It consists of a generator and a discriminator. The generator is responsible for generating high-quality maps from satellite images, while the discriminator is trained to distinguish between real maps and generated maps.

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Paper ID: ICATCEM-127

PERFECT DOMINATION ON BIPOLAR PERFECT FUZZY MATCHING

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Abstract: Bipolar fuzzy sets are utilized to represent both the positive and negative aspects of uncertainty related to objects, and the bipolar fuzzy graphs are employed to illustrate the structural relationship between uncertain concepts. In these graphs, vertices and edges are assigned positive and negative membership function values to highlight the contrasting levels of uncertainty. This study introduces the notion of perfect domination within perfect bipolar fuzzy graphs. The dominating set refers to the set of vertices in that control structure of fuzzy graph. The primary contribution of this paper lies in expanding the concept of perfect domination from fuzzy graphs to perfect bipolar fuzzy graphs. We also define the perfect fuzzy matching and apply perfect domination to perfect bipolar fuzzy matching and also determined some properties for bipolar fuzzy graphs.

Keywords*:* Bipolar fuzzy graph, Perfect Domination, Perfect fuzzy matching, Bipolar perfect fuzzy matching, Perfect domination on Bipolar fuzzy graph.

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Paper ID: ICATCEM-128

MULTI PARAMETER FUZZY BINARY SOFT SET APPROACH TO DECISION MAKING PROBLEMS

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Abstract: Multi-Criteria Decision-Making (MCDM) problems are those problems that deals with evaluation and selection of alternatives based on multiple criteria. This article aims to solving MCDM problems by extending the definition of fuzzy binary soft sets for two parameter sets and is called extended fuzzy binary soft sets. Also, operations such as "AND" and "*MaxMin*" are defined and illustrated with examples. Further, an algorithm to solve MCDM problems by extended fuzzy binary soft sets is presented. Finally, an application of proposed algorithm for decision making is discussed.

Keywords: Fuzzy sets, Fuzzy soft sets, Fuzzy binary soft sets, Resultant matrix, MCDM problems.

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Paper ID: ICATCEM-130

ANALYSIS OF THERMODYNAMIC CRITICAL BEHAVIORS AND JOULE-THOMSON EXPANSION OF A CHARGED BLACK HOLE IN ADS SPACE WITH DARK ENERGY CANDIDATES

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Abstract: In this article, we chose a charged AdS black hole embedded in the universe filled with dark energy candidates. By making use of the equation of states of Linear Redshift Parametrization dark energy model we find out the corresponding energy density of the concerned black hole. Consequently thermodynamic construction is analyzed for various parameters of the concerned black hole. In the study of Gibbs free energy the corresponding

curves show cuspidal nature. Physical significance of those cusps analyzed. While discussing the Joule-Thomson expansion, the corresponding curves show discontinuities for the dark energy models. Significance of such discontinuities are interpreted in this paper. For the concerned, the corresponding temperature curves show asymptotic behavior for the different values of charge parameters. Implications of this type of nature of such curves are represented in this article. In charge-potential phase space critical points up to first order are found. From criticality analysis, the initial and final phase of the black hole is investigated in this work.

Keywords: AdS black hole, Hawking temperature, Gibbs free energy, Heat capacity, Joule Thomson expansion.

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Paper ID: ICATCEM-131

ANALYSIS ON UTILIZING HUMAN-CENTERED NETWORKS, AN EXPERIMENTAL VERIFICATION OF THE RESERVE ALLOCATION MOVEMENT PROCESS ON ORDER SYSTEMS

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Abstract: Enterprise enterprises benefit greatly from the effective use of human resources. Using the human capital of a business more efficiently reduces the cost of creating new goods and services, increases worker efficiency, and adds value to the enterprise. Employees within the business build a network of professional ties as they work together to create products and advantages for the company. In this research, we present a method depending on the human-centric networking disclosed through the event logs to assist decision-making about the distribution of human resources inside an organization. In particular, methods for allocating resources in companies are made using knowledge gathered from human-centric networks developed during the information systems' operational phases. We clarify the optimal resource

allocation determined by various metrics by using social network measurements and acceptability possibilities for human resource allocation. For the purpose of planning human resource allowances in accordance with these networks, the overall architecture and situations are also outlined. In addition, we verify the idea using an experimental validation using real-world data sets. This strategy will provide a brilliant response to help companies allocate resources within their own organizations.

Keywords: Human-centric networks, the distribution of human resources, business process management, mining processes, and order systems that are process-aware.

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Paper ID: ICATCEM-132

NEUTROSOPHIC IMPLICATIVE WI-IDEALS IN LATTICE WAJSBERG ALGEBRA

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Abstract: We consider the idea of MBJ-Neutrosophic implicative WI -ideals and by establishing the characterizations of a MBJ-Neutrosophic implicative WI Ideal we depict the rules how a MBJ-Neutrosophic implicative WI ideal acts as a MBJ-Neutrosophic WI ideal and we are able to derive the relation between them.

Keywords: MBJ-Neutrosophic implicative WI Ideal, MBJ-Neutrosophic WI ideal, lattice H-WAJSBERG Algebra.

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Paper ID: ICATCEM-133

MOTION OF HYBRID NANOFLUID WITH FOURIER HEAT FLUX, VISCOUS DISSIPATION AND NONLINEAR RADIATIVE HEAT FLUX FLOWING THROUGH A DISK

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Abstract: This paper examines the significant impact of pertinent flow parameters on both nanofluid and hybrid nanofluids respectively. The hybrid nanofluids examined in this research is a non-Newtonian fluid which behaves symmetrically is of great significance in heat transfer modeling. The analysis was examined as a steady two-dimensional flow with nonlinear radiative and viscous dissipative effects through a rotating disk. The model in the form of partial differential equations (PDEs) was changed into ordinary differential equation using transformation variables. The transformed ODEs were eventually solved by using the Runge-Kutta along shooting techniques. The impact of flow parameters on the flow was graphically presented. In the graphical outcomes, the increase in magnetic field was found to decrease the velocity curves. The nonlinear thermal radiation was found to enhance the Nusselt number, temperature and velocity but limit the local skin friction.

Keywords: Hybrid nanofluid; (Ag, MnZnFe2O4&Cu) nanoparticles; Pure water base fluid Viscous dissipation; Cattaneo-Christov heat flux; Non radiative Heat Flux; Rotating disk; RK Method; Shooting Technique.

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Paper ID: ICATCEM-134

N×3 FSSM WITH BREAKDOWN INTERVAL TO MINIMIZE TOTAL RENTAL COST INCLUDING TRANSPORTATION TIME

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Abstract: This paper endeavor a study of N×3 FSSM with breakdown interval to minimize the total rental cost of machines with transportation time. The purpose of the paper is to attain an optimal sequence to reduce the rental cost under the specified rental policy when breakdown interval and transportation time of jobs are taken into account. The algorithm mentioned in this paper is easily interpreted by an example.

Keywords: Flow shop scheduling, Breakdown interval, Transportation time, Rental Policy, Optimal sequence.

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Paper ID: ICATCEM-135

PERFECT DOMINATION ON BIPOLAR PERFECT FUZZY MATCHING

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Abstract: Bipolar fuzzy sets are utilized to represent both the positive and negative aspects of uncertainty related to objects, and the bipolar fuzzy graphs are employed to illustrate the structural relationship between uncertain concepts. In these graphs, vertices and edges are assigned positive and negative membership function values to highlight the contrasting levels of uncertainty. This study introduces the notion of perfect domination within perfect bipolar fuzzy graphs. The dominating set refers to the set of vertices in that control structure of fuzzy graph. The primary contribution of this paper lies in expanding the concept of perfect domination from fuzzy graphs to perfect bipolar fuzzy graphs. We also define the perfect fuzzy matching and apply perfect domination to perfect bipolar fuzzy matching and also determined some properties for bipolar fuzzy graphs.

Keywords*:* Bipolar fuzzy graph, Perfect Domination, Perfect fuzzy matching, Bipolar perfect fuzzy matching, Perfect domination on Bipolar fuzzy graph.

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Paper ID: ICATCEM-136

A DATA SAFETY METHOD THAT USES AN ADJACENT MATRIX THAT REPRESENTS THE GRAPH TO ACQUIRE THE KEY FOR BOTH DECRYPTION AND ENCRYPTION

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Abstract: Sensitive information should never be sent over an unsecured connection because it could be intercepted by unauthorized persons and its privacy compromised. Thus, designing a cryptosystem that meets safety requirements for the confidentiality, integrity, and reliability of data transmitted has grown essential and unavoidable. Actually, a great deal of research is being conducted in this field. It has been demonstrated that, notwithstanding the fact that many cryptosystems are being suggested in the scientific literature, there are significant differences in their reliability and efficacy. Safeguarding data has been essential to human existence from the beginning of time. Among the most important techniques in cryptography provides safe

safeguarding information and message transmission, and graph theory is one way to do this. There are numerous methods for encrypting and decrypting data. Specifically, cryptography is employed to render the text incoherent and unreadable in order to ensure the adversaries are unable to decipher its meaning. It's utilized in a wide range of applications that affect many facets of our everyday lives, including e-commerce, electronic communications (including mobile communications), corporate transactions, Pay-TV, transmitting financial data, computer authentication, and sending confidential messages. Through concealment, cryptography offers protection and privacy for the sensitive data. It is accomplished using mathematical methods. A cryptographic technique is considered secure if it can't be broken in a reasonable length of time, even if the adversary knows the algorithm and key size that are being utilized. In this research, we propose a technique that obtains keys for decryption and encryption using an adjacent matrix approximation of the graph.

Keywords: Data encryption, replacement, adjacent matrix, and cryptography, data decryption.

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Paper ID: ICATCEM-137

APPLICATION OF PLITHOGENIC SETS IN DATA MINING

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Abstract: Data mining has become a crucial task nowadays where large data is to be analysed, to identify patterns and extract useful information. Data mining involves finding and quantifying predictive and descriptive relationships from raw data, transforming it into knowledge useful for decision making. There are a variety of mathematical tools that are available in like Crisp, Fuzzy, Intuitionistic Fuzzy Sets, and Neutrosophic Sets to handle uncertainty that arises in the process of data mining. Plithogenic set is a generalization of these four sets. This study aims to determine whether the Plithogenic aggregation operation is more effective than other sets in terms of accuracy while in decision making. To achieve greater accuracy, the Plithogenic aggregation operation, utilizing Fuzzy Set, Bipolar Fuzzy set, Intuitionistic Fuzzy Set, Neutrosophic Set, and Bipolar Neutrosophic set applies t-norm and t-conorm. The paper presents an illustration to demonstrate the accuracy achieved through the use of Plithogenic aggregation operators in decision making.

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Paper ID: ICATCEM-138

AN INTERVAL-VALUED TRAPEZOIDAL INTUITIONISTIC FUZZY EINSTEIN WEIGHTED GEOMETRIC AGGREGATION OPERATOR FOR DECISION MAKING

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Abstract: Aggregating information is a significant task in many real-world problems, particularly in decision making. In multi-criteria decision making (MCDM) problems, aggregation techniques are used to combine the multiple competing criteria. This paper proposes an aggregation operator (AO) for interval-valued trapezoidal intuitionistic fuzzy sets (IVTrIFSs). In the Present approach the weighted geometric AO and Einstein operational laws are combined to develop an IVTrIF Einstein weighted Geometric AO. The properties of AOs such as idempotency, monotonicity and boundedness are validated. Furthermore, a numerical example is solved, and the results are compared with the existing methods. The comparative analysis shows that the result with the proposed AO coincides with the existing methods, demonstrating that the proposed AO serves as an alternative approach for aggregating IVTrIF information.

Keywords: IVTrIFSs, Einstein operations, MCDM, IVTrIFEWGA operator, Einstein Geometric operator, Dice similarity measure.

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Paper ID: ICATCEM-139

M-FRACTIONAL GRANULAR DIFFERENTIABILITY FOR FUZZY NUMBER VALUED FUNCTIONS

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Abstract: This paper introduces and examines the novel concept of the fuzzy M-fractional granular derivative (M-FGD), substantiating its classical properties and highlighting its versatile applicability. Additionally, we define the M-fractional granular integral (M-FGI) and systematically investigates its fundamental properties. Through comprehensive examples and graphical illustrations, we elucidate the practical implications of M-FGD and M-FGI, showcasing their efficacy in addressing diverse mathematical scenarios. Furthermore, the paper explores the solution methodology for the M-fractional granular initial value problem (M-FGIVP), providing a detailed discourse on solving such problems and showcasing the practical utility. This research establishes a theoretical framework for understanding fuzzy M-fractional granular derivatives and integrals, laying the groundwork for their application in diverse mathematical contexts and serving as a catalyst for innovative solutions across scientific disciplines.

Keywords: Fuzzy number, Granular differentiability, Fuzzy function, M-fractional derivative.

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Paper ID: ICATCEM-140

NUMERICAL SOLUTION OF FUZZY NEUTRAL DELAY DIFFERENTIAL EQUATIONS BY NYSTROM METHOD

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Abstract: In this paper, we study the numerical solution of Fuzzy Neutral delay differential equations

$$\begin{aligned} \tilde{y}'(t) &= \tilde{f}(t, y(t), y(t-\tau), y'(t-\tau)), \quad a \le t \le b, \\ \tilde{y}(t) &= \tilde{\phi}(t), \quad t \in [\tau, a] \end{aligned}$$

$\tau \le a \le b$, where $\tilde{f}$ is Volterra operator (that is , f depends only on y(s) and y′(s) for $\tau \le s \le t$) and $\tilde{\varphi}$ is a prescribed initial function. The results are obtained by using Nystron method.

Also we state the convergence and stability of proposed the method. Example are presented to illustrate the above method.

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Paper ID: ICATCEM-141

M-FRACTIONAL GRANULAR DIFFERENTIABILITY FOR FUZZY NUMBER VALUED FUNCTIONS

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Abstract: This paper introduces and examines the novel concept of the fuzzy M-fractional granular derivative (M-FGD), substantiating its classical properties and highlighting its versatile applicability. Additionally, we define the M-fractional granular integral (M-FGI) and systematically investigates its fundamental properties. Through comprehensive examples and graphical illustrations, we elucidate the practical implications of M-FGD and M-FGI, showcasing their efficacy in addressing diverse mathematical scenarios. Furthermore, the paper explores the solution methodology for the M-fractional granular initial value problem (M-FGIVP), providing a detailed discourse on solving such problems and showcasing the practical utility. This research establishes a theoretical framework for understanding fuzzy M-fractional granular derivatives and integrals, laying the groundwork for their application in diverse mathematical contexts and serving as a catalyst for innovative solutions across scientific disciplines.

Keywords: Fuzzy number, Granular differentiability, Fuzzy function, M-fractional derivative.

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Paper ID: ICATCEM-142

PERFECT DOMINATION ON BIPOLAR PERFECT FUZZY MATCHING

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Abstract: Bipolar fuzzy sets are utilized to represent both the positive and negative aspects of uncertainty related to objects, and the bipolar fuzzy graphs are employed to illustrate the structural relationship between uncertain concepts. In these graphs, vertices and edges are assigned positive and negative membership function values to highlight the contrasting levels of uncertainty. This study introduces the notion of perfect domination within perfect bipolar fuzzy graphs. The dominating set refers to the set of vertices in that control structure of fuzzy graph. The primary contribution of this paper lies in expanding the concept of perfect domination from fuzzy graphs to perfect bipolar fuzzy graphs. We also define the perfect fuzzy matching and apply perfect domination to perfect bipolar fuzzy matching and also determined some properties for bipolar fuzzy graphs.

Keywords: Bipolar fuzzy graph, Perfect Domination, Perfect fuzzy matching, Bipolar perfect fuzzy matching, Perfect domination on Bipolar fuzzy graph.

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Paper ID: ICATCEM-143

AUTOMATED BREAST CANCER DETECTION AND CLASSIFICATION USING CONVOLUTIONAL NEURAL NETWORKS: A SYSTEMATIC APPROACH

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Abstract: Breast cancer is still a important cause of death for females among the world. It's really important to catch it early and accurately classify it in order to improve patient outcomes. This paper introduces a cool way to automatically detect and classify breast cancer using Convolutional Neural Networks (CNNs). The method they propose uses the latest CNN architectures to extract features and classify the cancer, which leads to really accurate and reliable results. They trained and tested their models using a big dataset of mammographic images that were annotated. To see how well the models worked, they used performance metrics like accuracy, sensitivity, and AUC-ROC. The proved results stated that the CNN-based system they developed performed way better than traditional methods, so it could be a super useful tool for doctors and clinicians. If they integrate this automated system into clinical practice, it could make a big difference by catching cancer early, reducing misdiagnosis, and ultimately saving more lives.

Key words: Breast cancer, Convolutional Neural Networks (CNNs), early detection, mammographic images, accuracy, sensitivity, AUC-ROC, automated system.

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Paper ID: ICATCEM-144

PRIME ANTI-MAGIC LABELING OF SOME SPECIAL TREES

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Abstract: A graph which admits Prime Anti-Magic Labeling(PAML) is called Prime Anti-Magic graph (PAMG).A Prime Anti-Magic Labeling of graph G is an bijective function

$f: V(G) \to \{1,2, \ldots . |V|\}$ such that every pair of adjacent vertices $u$and v, g. c. d $\big(f(u), f(v)\big) = 1$ and the induced mapping $f^*: E(G) \to N$ defined by $f^*(e = uv) = \Sigma f(u, v)$ where $(u, v) \in E(G)$ is injection and all the edge labeling are distinct. In this Article the idea of Prime Anti-Magic labeling is investigated with some tree graphs.

Keywords: Coconut Tree, Y-Tree, F-Tree, PAML, PAMG.

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Paper ID: ICATCEM-145

k-EVEN AND k-ODD SEQUENTIAL HARMONIOUS LABELING IN CERTAIN CLASSES OF GRAPHS

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Abstract: The concept of graph labeling was introduced by Rosa in 1967. A graph labeling is an assignment of integers to the vertices or edges or both subject to certain condition(s). If the domain of the mapping is the set of vertices (or edges), then the labeling is called a vertex labelling (or an edge labeling). In the intervening years various labeling of graphs have been investigated in over 2000 papers [1]. E. Sampath kumar introduced the concept of duplicate graph and proved many results [2]. The introduction of harmonious graphs was introduced by R.L. Graham and N.J Sloane and investigated the same on some standard graphs [4]. Z. Liang and Z. Bai introduced odd harmonious labeling [5]. Even harmonious labeling was introduced by P.B Sarasija and R. Binthiya and investigated the same on some standard graphs [6].The establishment of odd sequential graphs was done by Singh and Varkey [9]. Gayathri and Hemalatha gave the brief history about even sequential harmonious labeling of trees,cycle related graphs [12]. In this paper, we prove the existence of k-odd sequential harmonious labeling and k-even sequential harmonious labeling in extended duplicate graph of path related graphs.

Keywords: Duplicate graph, k-odd sequential harmonious labeling, k-even sequential harmonious labeling.

AMS Subject Classification: 05C78

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Paper ID: ICATCEM-146

A NEW ALGORITHM FOR SOLVING LINEAR FRACTIONAL PROGRAMMING PROBLEM USING THE HEXAGONAL NEUTROSOPHIC FUZZY NUMBER

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Abstract: This paper introduces a new approach for solving linear fractional programming problem (LFPP) by converting the objective function into two simple linear programming problems (LPPs) and solved by simplex method to get its optimal solution. Here, the coefficients of both the constraints and the objective function of LFPP are hexagonal neutrosophic fuzzy numbers. In this paper, we proposed a new type of ranking function to convert hexagonal neutrosophic fuzzy number into crisp number. Finally, a simplex method is applied to get an optimal solution. A real-time implementation of the suggested method has been taken to demonstrate its benefits, stability and precision of proposed method. Further, a comparative study has been made by solving few numerical examples taken from base papers using the proposed new ranking method with previous existing methods available for solving Linear fractional programming problem to prove that the optimal solution obtained by using the proposed approach are higher optimized.

Index Terms: Fuzzy numbers, Hexagonal Fuzzy Numbers and Hexagonal Neutrosophic Fuzzy Numbers.

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Paper ID: ICATCEM-147

OPTIMIZING FITNESS FUNCTION OF CUTTLEFISH OPTIMIZATION FOR CLUSTERING

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Abstract: Clustering is a basic classification strategy for cre ating predictive models based on grouped data. Bio-inspired algorithms have attracted much attention from researchers and have shown high performance. The fitness function is particularly critical in clustering with distance based metric, as errors can mislead the system and results in poorer clusters. This paper suggests enhancing cluster centroids by optimizing the fitness function of the cuttlefish algorithm through classification results which improves performance and model efficiency of clustering. We validate the robustness of our method by running it on a series of benchmark UCI machine-learning repositories. The efficiency of the model is being measured by using key performance metrics like F-measure, accuracy, Calinski Harabasz(CH) index, Com putation time and standard deviation. This technique improves both clustering performance and model quality by increasing cluster centroids in addition to readjusting the fitness function during classification. These results show that using this method can indeed be a strategy, for organizing data into clusters.

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Paper ID: ICATCEM-148

EQUITABLE POWER EDGE DOMINATION NUMBER OF EXTENDED DUPLICATE GRAPH OF SOME SPECIAL GRAPHS

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Abstract: The concept of a duplicate graph, as introduced by [2] E. Sampath Kumar, involves creating a new graph, denoted as $DG(V', E')$, by duplicating each vertex in the original graph while preserving the edges between them. In fact, a duplicate graph is one that is created by copying the vertices of an existing graph while leaving the edges connecting them intact. This idea helps academics and practitioners work with a modified form of a graph while maintaining

the original graph's structure and interactions, which is useful in a variety of graph theory applications, experiments, and analysis. We refer to G as a graph, where V denotes a collection of vertices and E denotes a collection of edges.[7] The equitable power dominating set S is a subset of V in the power dominating set G if b is the neighbouring observed vertex for each vertex a such that the difference between degrees a and b is less than or equal to 1, that is $|d(a) - d(b)| \leq 1$. The novel concept of "Equitable Power Edge Domination" is defined as follows: The edge equitable dominating set $S' \subseteq E$ in G, an edge f_1 that is not in S' will be shown to be adjacent to an edge f_2 such that $|d(f_1) - d(f_2)| \leq 1$ is seen. This is known as a "Equitable Power Edge Dominating set. The number of components in a group of graphs with equitable power edge domination is known as the equitable power edge domination number, and it is the graph represented by $\gamma'_{eped}(G)$. The Equitable Power Edge Domination number (EPEDN) of a few duplicate graphs, which is represented by the $\gamma'_{eped}(DG)$. In this study, we determine the EPEDN of certain extended duplicate graphs, including extended duplicate graphs of path, comb, twig, star, extended duplicate graph of bistar, extended duplication graph of double star, and ladder.

keywords: Duplicate graph, Equitable Power Edge Domination Number, EPEDN of Duplicate graph, EPEDN of Extended Duplicate graph.

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Paper ID: ICATCEM-149

ASSESSMENT OF THE MOST EFFECTIVE APPROACH FOR FEATURE ACQUISITION UTILIZING VARIATION QUANTUM CLASSIFIERS FOR REAL-WORLD DATASETS

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Abstract: Recently, there seems to be much interest in relate quantum-enhanced methods to address a assortment of machine learning problems. Numerous approaches that make utilization of the hybrid resources of defective quantum devices through classical computing methods are commonly employed for guided learning. Among these methods, variation quantum classification (VQC) may offer a quantum advantage by taking advantage of skin tone so as to be hard to subtract employing traditional technique. Its presentation is determined by its translation of a classical human face into a quantum-enhanced space of features. While many other quantum-mapping methods have already been introduced thus far, efficient mappings of disconnected attributes—as zip code, age grouping, and other people—which are often crucial for classifying pertinent datasets, have not received as much attention. We first introduce the effective mapping to translate these discrete characteristics into just a handful of qubits for VQC using quantized random-access coding (QRAC). We describe several encoding schemes and show their strengths and constraints in algebraic simulation. We demonstrate empirically that QRAC can assist in accelerating VQC's training by lowering its parameters through the reduction of the mapping's qubit count. By testing the QRAC within VQC on real-world datasets, we validate its efficacy using various simulators and actual quantum equipment.

Keywords: supervised learning, variation quantum algorithms, quantum machine learning, quantum random-access coding (QRAC), and discrete features.

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Paper ID: ICATCEM-150

VARIATIONAL ITERATION METHOD FOR SOLVING SYSTEM OF Q-FRACTIONAL DIFFERENTIAL EQUATIONS

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Abstract: In this paper, we extended the variational iteration method (VIM) for finding the solution system of q-fractional differential equations(q-FDEs). the classical VIM gives good approximations for finding the solution of the (q-FDEs). In this A q -analogue of Lagrange multiplier is presented. The fundamental benefit of the current technique is that it can boost the convergence of the iterative approximate solutions relative to the approximate solutions acquired through the usage of the conventional variational new release approach. An illustrative example is supplied to expose the credibility of this modification

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Paper ID: ICATCEM-151

EQUITABLE POWER DOMINATION NUMBER OF CRYSTAL STRUCTURE IN METALS

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Abstract: A power dominating set $S \subseteq V$ in $G = (V, E)$ is said to be an equitable power dominating set, if for every vertex $v \in V - S$ there exists an adjacent vertex $u \in S$ such that the difference between degree of u and degree of v is less than or equal to 1, that is $|d(u) - d(v)| \leq 1$. The minimum cardinality of an equitable power dominating set of a graph G is said to be the equitable power domination number of G and is denoted by $\gamma_{epd}(G)$. A crystalline material is one in which the atoms are situated in a repeating or periodic array over large atomic distances; that is, long-range order exists, such that upon solidification, the atoms will position themselves in a repetitive three-dimensional pattern, in which each atom is bonded to its nearest-neighbor atoms. All metals, many ceramic materials, and certain polymers form crystalline structures under normal solidification conditions. In this paper we investigate the equitable power domination number for the Crystal Structure in Metals.

Keywords: Power dominating Set, Equitable Power Domination, Equitable Power Domination Number, Crystal Structures, Type of crystal structure.

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Paper ID: ICATCEM-152

MEASURES OF ASSIGNMENT PROBLEM WITH FUZZY ORDERING TECHNIQUE

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Abstract: Assignment problem is a magnificent subject and is engaged all the time in solving problems of engineering and management science. In this paper, we proposed a new ranking procedure to find the optimal solution. The optimal solution is totally based on the ranking procedure. The costs of values are considered as triangular fuzzy numbers. Ranking fuzzy numbers plays a huge role in decision making under fuzzy environment. This ranking technique is most reliable method, simple to apply and can be used for all types of assignment problems. Our idea is to convert the fuzzy values into crisp values by applying Robust Ranking Technique. We apply the crisp values in the assignment problem. Then the optimal solution of fuzzy assignment problem is obtained by using Fuzzy Hungarian Method. From the numerical examples it is obvious that the proposed ranking measure is easy to calculate and cost-effective for a fuzzy assignment problem and provides much more optimal value.

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Paper ID: ICATCEM-153

ANALYSING OF ESCD-NUMBER FOR SOME PECULIAR GRAPHS

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Abstract: G. Mahadevan et. al [6] introducted the concept of external staircase corona dom ination number of graph. A dominating set $S \subseteq V$ is said to be an external staircase corona dominating set (ESCD-set), if every vertex in $< S >$ is either a pendent vertex or a support vertex and $< V - S >= rK_2$. The minimum cardinality of an exter nal staircase corona dominating set is called the external staircase corona domination number (ESCD-number) of G and is denoted by $\gamma_{ESC}(G)$. In this paper, we examine the ESCD-number for some peculiar graphs.

Keywords: Pendent vertex, Support vertex, Corona domination number, Perfect matching.

AMS classification number: 05C69.

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Paper ID: ICATCEM-154

EXPLORATION OF CORONA COVERING NUMBER OF TENSOR PRODUCT OF GRAPHS

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Abstract: Given a graph G, set $S \subseteq V(G)$ is said to be vertex cover set if every edge in E(G) is incident to at least one vertex of S. The minimum cardinality taken over all the vertex cover set is called vertex covering number and it is denoted by $\alpha(G)$. A vertex cover set $S \subseteq V(G)$ is said to be corona cover set if every vertex in $< S >$ is either a pendant or a support vertex. The minimum cardinality taken over all the corona cover set is called corona covering number and it is denoted as τ_C. In this paper, we investigate this parameter for Tensor product of graphs.

Keywords: Vertex covering, pendant vertex, support vertex.

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Paper ID: ICATCEM-155

TRIPLE CONNECTED CERTIFIED DOMINATION NUMBER OF TRIANGULAR GRID

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Abstract: The Concept of Triple Connected Certified Domination number was introduced by Mahadevan et.al. A dominating set S in G earns the label of a Triple Connected Certified Dominating set (TCCD-set) under specific conditions: for every vertex v belonging to S, either the intersection of its neighborhood with the complement of S is empty, or it has a cardinality k where $k \geq 2$. Furthermore, any three vertices within S must form a path within the subgraph induced by S. The cardinality of the smallest TCCD-set within G defines the Triple Connected Certified Domination number (TCCD-number), represented as $\gamma_{TCC}(G)$. In this article, we have generalized this parameter for the triangular grid of power h where $1 \leq h \leq 3$.

Keywords: Domination number, triple connected, certified domination, triple connected certified domination, triangular grid, square graph, cube graph

AMS classification number:05C69

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Paper ID: ICATCEM-156

ANALYZING CORONA DOMINATION NUMBERS OF GENERALIZED MYCIELSKIAN GRAPH OF SOME GRAPHS

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Abstract: Recently, Mahadevan et al. introduced the idea of corona domination number, which is defined as, if every vertex in the induced graph of a dominating set is either a pendant vertex or a support vertex, then that dominating set is said to be a corona dominating set, its minimum cardinality is called corona domination number and is denoted by γ_{CD}.In this article, the *CD*-number for the generalized Mycielski an graph of some graphs was computed. Also, the *CD* numbers were given explicitly instead of giving their bounds. The γ_{CD}number for the graphs considered in this article is identified using some number theory technique.

Keywords: Domination number, corona domination number, generalized Mycielski an graph.

AMS classification number:05C69

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Paper ID: ICATCEM-157

AN APPLICATION OF NEUTROSOPHIC FUZZY SOFT MATRIX IN MATERIAL SELECTION

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Abstract: The application of fuzzy set theory is essential in many areas including engineering and medicine. A wide range of fuzzy matrix models have been developed to tackle multifaceted

features of issues related to decision-making. Soft set theory is a useful tool in the uncertain and challenging environment we live in today. This paper proposes a technique for determining the difference between two neutrosophic fuzzy soft matrices and offers examples to show how this technique might be used in decision-making, especially when choosing materials. Building this decision-making process is based on a survey that investigates the relationship between businesses and the quality of their machinery.

Keywords: Fuzzy set, Fuzzy matrix, Neutrosophic fuzzy soft matrices, Decision-making, Materials.

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Paper ID: ICATCEM-159

IMPACT OF VACCINATION AND TREATMENT STRATEGIES ON TUBERCULOSIS CONTROL IN INDIA: AN EXTENDED SEIRVT MODEL ANALYSIS

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Abstract: This paper presents an extended SEIRVT (Susceptible-Exposed-Infectious-Recovered-Vaccinated-Treatment) model to examine the dynamics of tuberculosis (TB) spread and the effectiveness of vaccination and treatment strategies in India. The model divides the population into seven compartments: Susceptible (S), Exposed (E), Latent Infected (L), Infectious (I), Recovered (R), Vaccinated (V), and Treatment (T). By using differential equations, we simulate the disease's progression and evaluate the effectiveness of vaccination and treatment programs. Our findings highlight the critical role of comprehensive vaccination and treatment programs in reducing TB prevalence and provide insights into optimizing these strategies to achieve maximum public health benefits.

Keywords: Tuberculosis Control, Mathematical Modelling, Vaccination Strategies, Treatment Programs.

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Paper ID: ICATCEM-159

TRANSLATES OF VAGUE IDELAS OF SUBSTRACTION BCK/BCI -ALGEBRAS

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Abstract: In this paper, the concept of vague translates of Idelas in substration BCK/BCI algebras are introduced. The idelas of vague extentions multiplications of vague idelas with several related properties investigated.Also the relationships between vague translates, vague extentions and vague multiplications of vague idelas are investigated.

Mathematics Subject Classification: 35Q61,44A10, 44A15, 44A20,44A30,44A35,81V10.

Keywords: Vague set (VS), Vague Ring (VR), Vague ideal,vague increasing translate operator ($T_{\alpha+}$), vague dicreasing operators ($T_{\alpha-}$).

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Paper ID: ICATCEM-160

MODELING NONLINEAR WAVE PROPAGATION WITH QUINTIC TRIGONOMETRIC B- SPLINE BASIS: A STUDY ON THE MODIFIED EQUAL WIDTH EQUATION

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Abstract: This paper uses a trigonometric quintic B-spline collocation with a finite element technique to explore the propagation of the solitary waves of the modified equal width equation (MEW). Temporal and Spatial domain are discretized using the numerical techniques like Crank- Nicolson (C-N) and finite element (FEM). For the purpose of linearizing the non-linear terms, the Rubin-Graves method is utilised. The Von-Neumann methodology is used to

illustrate the stability analysis of the trigonometric quintic B-spline collocation (TQBC) method. The accuracy of this approach is up to O (h4 + Δt) convergence order. The current work is supported by two test problems that examine various aspects such as single solitary waves, Maxwellian initial condition MEW equation. The method's low memory storage requirements and computational efficiency are evidenced by its L2, L∞, root mean square error (RMS) with computational time cost, and order of convergence.

Keywords: Modified equal width (MEW) equation, Trigonometric quintic B-spline collocation (TQBC), Crank Nicolson (C-N), Finite Element Method (FEM), Stability and Convergence analysis.

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Paper ID: ICATCEM-161

SIMILARITY BASED OCCLUDED FACE RECOGNITION USING DYNAMIC TEXT WRAPING AND GREEDY STRATEGY

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Abstract: Person Faces can be obscured in a variety of methods, including masks, sunglasses, eyeglasses, scarves, and so on. Human facial identification can be concealed by wearing these ornaments on the face. In two ways, a novel suggested method for recognizing occluded faces with fewer images has been developed employing the ideas of Structural Similarity Index Measure, Dynamic Time Warping, and Greedy Strategy (SDAG). First, detectable face images are selected from a gallery face collection using the Structural Similarity Index Measure (SSIM), which offers critical data for restoring the occluded portion of the face region. Second, rather than employing all the images from the Gallery Face Dataset, a smaller number of images may be utilized to evaluate occluded face identification using a mix of Dynamic Time Warping and the Greedy method (DAG). Experiments and results on the FEI, Caspeal-R1 dataset show improved accuracy while minimizing performance time.

Keywords: Face Recognition, similarity, Occlusion, SSIM, DTW, Greedy.

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Paper ID: ICATCEM-162

FUZZY SOFT GAMMA BOOLEAN NEAR RINGS

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Abstract: We present and explore the idea of fuzzy soft gamma Boolean near rings in this study. We analyse some of their basic properties by providing relevant examples. We also provide fuzzy soft ideals and fuzzy ideals that describe zero symmetric Boolean near rings.

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Paper ID: ICATCEM-163

FUZZY ANT COLONY OPTIMIZATION AND DEEP LEARNING BASED METHODS TO EXTRACT BIO EVENTS FROM BIOMEDICAL LITERATURE

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Abstract: Bio-Event Extraction from biomedical literature plays vital role in biomedical information extraction. It has achieved desired results with annotated datasets using various feature-based approaches, machine learning based approaches and kernel-based approaches. However, conventional manual feature extraction methods require time and experience for feature designing. In order to overcome this problem, we used deep learning based automatic feature extraction to extract features without any supervision. Our approach also includes fuzzyAnt Colony Optimization (ACO) based feature selection and CRF- RNN classifier to train and extract the events. Also, we used list wise learning to rank algorithm to classify the events. Finally pattern matching techniques are used to extract event modification and

enrichmentanalysis. Our method uses three different corpuses to evaluate the performance BioNLP 2013, BioInfer and LLL. Experimental results show that our method achieves superior results than the previously developed systems on the above mentioned three corpuses.

Keywords: Bio-Event Extraction, biomedical information extraction, machine learning, fuzzy ACO, CRF, RNN

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Paper ID: ICATCEM-164

THE RISE OF CUSTOMIZED GENERATIVE AI MODELS

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Abstract: This continuing project seeks to investigate the implications of generative artificial intelligence (GenAI) for enterprise systems. Using a grounded theory method, we examine the Salesforce platform ecosystem. Data gathering includes all stakeholder groups inside the Salesforce platform ecosystem, offering a comprehensive view of GenAI's consequences. Our recent findings shed light on the tremendous benefits of GenAI, as well as the associated obstacles in the field of enterprise platforms. Furthermore, our first findings indicate GenAI's ramifications in three important areas: platform capabilities, platform architecture, and platform governance. Our study aims to contribute to the ongoing discussion on the transformative value of GenAI for digital platforms as well as the evolution of corporate platforms into future generations. Customizing AI to fit a company's specific goals requires consideration of organizational culture, operations, and business strategy in addition to the technology itself. The path to designing and implementing customized AI presents problems that must be overcome through an organized method. This article explores the nature, evolution, and implications of Generative AI Models in the business world, focusing on how personalizing these tools might provide a competitive advantage.

Keywords: Artificial Intelligence, GenAI, Data gathering, Sales force platform.

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Paper ID: ICATCEM-165

AUTOMATED & ALGORITHMIC APPROACH OF IOT IN HEALTH CARE SYSTEM

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Abstract: The Internet of Things (IoT) refers to the advancement of technology with internet, thereby enabling machines to develop a sensor-based node that can obtain precise information. The sensors placed in gadgets help the system to identify the conditions, scrutinize the constraints, and render appropriate solutions with minimal human interference. The greater degree of automation and the incorporation of accurate results through smoother integration have procured a larger audience for IoT [19]. An IoT system is integrated and constructed through an algorithmic embedding, and connectivity inorder to effectuate best results. However, the need to analyse the optimal model of IoT device, and the combination of algorithmic implementation is largely dependent on the problem that is defined. To obtain deeper insights to an IoT system, it is important to understand the components that are necessitated [19], and the requirement and role that they play in rendering the throughput. The primary aspects that IoT is constructed with is illustrated.

This IoT concept renders an introductory knowledge on domains, and proffers an insight into the health components, and the correlation it holds with the amino acid deposition. The valine and leucine, along with other amino acids are further comprehended to provide a clear understanding of the health gremlins that may be triggered due to their excessive accumulation in the human system. The entities that compound the domain knowledge are further explicated in this chapter to provide unambiguous perception of the necessitates for the proposed methodology. The definition of the problem that explains the need to monitor the amino acid consumption in relevance to the corporeal features emphasizes on the need for constructing a combi-national database comprising of invasive and non-invasive attribute values. The symptoms for the identified diseases such as heart attack and osteoporosis are also explained to understand the early signals that could be diagnosed thereby evading complications.

Keywords: IoT devices, Rasberry Pi, Sensors, Aurdino, MATLAB, Frequency.

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Paper ID: ICATCEM-166

VIBRATION ANALYSIS OF CRACKED MICRO BEAMS REINFORCED WITH FUNCTIONALLY GRADED BNNT COMPOSITE STRUCTURES

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Abstract: The behavior of Functionally Graded Boron Nitride Nano tube-Reinforced Composite (FG-BNNTRC) concerning micro beam cracks during free movement is investigated in this study. BNNT can be added to a matrix of polymers in four distinct manners to give reinforcements. The BNNTRC substance features are expected by the standard of integrating fractured micro beams. This study's primary goal is to investigate the free vibration properties of FG-BNNTRC cracked micro beams. It is crucial to focus on evaluating how different BNNT reinforcing structures, volume %, dimension/thickness ratio, and length scale elements affect vibration frequencies. This paper evaluates the vibration of fractured micro beams having length dependency using the modified couple stress theory. Following examining the effects of various causes, it emerges that the frequencies exhibit noticeable variances. The study shows that when the thickness of the beam becomes closer to the length scale parameter, the size impact gets stronger. The thickness of the beam grows, and the size impact decreases. The results are significant consequences with the design in addition to developing innovative composite materials for micro-scale applications, demonstrating the details of the complex interplay among nano scale reinforcements and structural integrity.

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Paper ID: ICATCEM-167

MULTIPLE SLIP EFFECTS ON MHD NON-NEWTONIAN NANO FLUIDS OVER STRETCHING SHEET IN AN INCLINED PLANE

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Abstract: The current study focuses on analysing the magnetohydrodynamic properties of a Casson nanofluid with electrical conductivity. The nanofluid flows over an inclined stretching sheet while being subjected to a heat source, thermal radiation, and homogeneous chemical reaction. The study utilises numerical methods to investigate the effects of multiple slip phenomena. The study includes the application of wall suction/injection and Navier's first-order slip to analyse the velocity, temperature, and concentration at the wall. The governing equations have been transformed into nonlinear ordinary differential equations (ODEs) through the use of similarity transformations. By employing the homotopy analysis method (HAM), we have successfully derived the numerical solution for the nonlinear ordinary differential equations (ODEs) and their corresponding boundary conditions. The impact of various parameters on the velocity, temperature, and concentration field has also been demonstrated. Multiple slip flow is utilised in various practical domains like microelectromechanical systems, nanoelectromechanical systems, microorganism flow, and rarefied gas flow, among others.

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Paper ID: ICATCEM-168

A SURVEY ON RECENT TRENDS IN ANALYTICAL INEQUALITIES IN TERMS OF TRIGONOMETRIC AND HYPERBOLIC FUNCTIONS.

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Abstract: Analytical inequalities serve as a cornerstone in the foundation of mathematics, providing deep understandings. Into the relationships between various mathematical functions. In this comprehensive survey paper, we examine a series of notable research contributions that generalize fundamental inequalities in mathematics and explore their applications in diverse domains. The works of distinguished mathematicians YJ Bagul, RM Dhaigude, C. Chesneau SB Thool, And M Kostić are central to our examination. Their combined work has helped us to understand different sides of inequalities and how they can be useful in further research.

Keywords: Sinc and Hyperbolic Sinc Functions, circular, inverse circular, inverse hyperbolic and exponential functions, Jordan type inequalities, Cusa-Huygen's

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Paper ID: ICATCEM-169

NONLOCAL ANALYSIS OF RAYLEIGH-TYPE WAVE PROPAGATING IN A GRADIENT LAYERED STRUCTURE

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Abstract: The present article aims to study the propagation behaviour of Rayleigh-type waves using the nonlocal theory of elasticity in a layered structure constituted of a gradient transversely isotropic stratum perfectly bonded with a gradient monoclinic substrate. At first a constitutive relation is established for the assumed layered structure. Thereafter in view of suitable boundary conditions dispersion relation for the propagation of Rayleigh-type wave is obtained by considering a complex quantity wavenumber. The obtained result well agrees with the classical result and therefore validates the present study. The phase velocities and the attenuation coefficient for the Rayleigh-type wave propagation are numerically computed for the materials *CdSe* and *LiNbO*3; and the same are illustrated graphically. A significant effect of the affecting parameters on the propagation and the attenuation curves are depicted against the wavenumber. Comparative analysis of the influence of these parameters on the propagation and attenuation of Rayleigh type waves is marked distinctly which serves as a salient feature of the present study. The techniques utilised the present problem and the obtained results may find potential application in various aspects.

Keywords: Rayleigh-type waves, elasticity, monoclinic, phase velocity, attenuation.

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Paper ID: ICATCEM-170

OPTIMIZING HEAT TRANSFER IN NANOFLUID FLOWS WITHIN RECTANGULAR ENCLOSURES FEATURING A CENTRAL CYLINDER

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Abstract: Given the extensive use of nanofluids in thermal engineering system designs, the free convection of nanofluids within rectangular enclosures has been widely studied. Typically, heat transfer across a rectangular enclosure improves when a pure base fluid is replaced with a nanofluid. This study aims to showcase the effectiveness of a numerical methodology for addressing such issues. The pressure-velocity form of the Navier-Stokes equations and the energy equation are employed to model the mass, momentum, and energy conservation of the fluid within the cavity. The dimensionless governing equations and boundary conditions are solved using the Galerkin Finite Element Method (GFEM). The effects of the Rayleigh number on flow patterns, represented by streamlines and isotherm plots, as well as on heat transfer rates across the enclosure, are analyzed and discussed.

Keywords: Nanofluid, Free convection, Rectangular enclosures with central cylinder, Heat transfer.

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Paper ID: ICATCEM-171

ANALYSIS OF THE HIV/AIDS EPIDEMIC POPULATION MODEL INCORPORATING TIME DELAY

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Abstract: In this article, an HIV/AIDS epidemic model with screening and time delays has been discussed [9]. We have incorporated a time delay between the time of contact of an infected person and the time of known into the model. The linear stability of the system in various cases is analysed and the effect of delays on the stability of the endemic equilibrium is discussed.

Keywords: delay differential equation and stability analysis.

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Paper ID: ICATCEM-172

NONLOCAL APPROACHES TO STRAIN GRADIENT ELASTICITY

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Abstract: Classical elasticity struggles to explain certain static and dynamic behaviors of materials. Two advanced theories, strain gradient elasticity and nonlocal elasticity, have emerged in the past five decades to address these limitations. Nonlocal elasticity breaks from classical ideas by considering stress at a point to be influenced by stresses throughout the entire material. Strain gradient elasticity, on the other hand, incorporates not only strains and velocities but also their variations (gradients) into its calculations of energy. Despite their

seemingly distinct approaches, there's a strong belief that these theories share common ground. This research explores this connection by deriving all existing strain gradient elasticity theories from a nonlocal perspective using Hamilton's principle. This approach not only reveals the inherent nonlocal nature of strain gradient elasticity but also links its internal parameters to the material's "nonlocal horizon" (the range of influence). The analysis proposes a combined nonlocal behavior for both elasticity and inertia within the material. For simplicity, the focus is on one-dimensional wave propagation in an infinite domain. However, by using Hamilton's principle, the framework can be extended to finite domains, defining the equation of motion and boundary conditions simultaneously.

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Paper ID: ICATCEM-173

A STUDY ON A NONLINEAR FRACTIONAL DERIVATIVE INVENTORY MODEL

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Abstract: This paper presents a mathematical model for deteriorating items with nonlinear demand rate and without shortage. Initially, the model is solved using Differential Transform Method. The model is further enhanced as a system of fractional differential equations and solved using Homotopy Perturbation Method. Sensitivity analysis is carried out to analyse the obtained results of both the models.

Keyword: Inventory model, Differential Transform Method, Homotopy Perturbation.

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Paper ID: ICATCEM-174

LATTICES BASED THREE PARTY AUTHENTICATED KEY AGREEMENT SCHEME IN MEDICAL IOT FOR POST-QUANTUM ENVIRONMENT

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Abstract: Due to rapid advancement in IoT, the way people work and live is changing deliberately. Medical IoT (MIoT) is a highly significant application in the world of IoT, allowing the user to communicate with smart medical devices with the help of a hospital gateway node. The 3-party AKA technique, which utilizes public-key cryptography, is applied to create a private communication channel. At present, in MIoT, they are using the authenticated key agreement (AKA) schemes, which are based on classical cryptography such as ElGamal, RSA, ECC, etc. Now as quantum computing becomes a reality, all these schemes become outdated in the post-quantum environment due to the Shor algorithm. To overcome the problem stated above, a scheme called a Three-party authenticated key agreement scheme by utilizing lattices for Medical IoT is proposed to accomplish security and efficiency in a post-quantum environment. The proposed scheme's formal and informal security analysis has also been given. Performance analysis and comparison are also provided with the existing schemes.

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Paper ID: ICATCEM-175

COMPARATIVE ANALYSIS OF ROUGH SETS ON INTERVAL VALUED INTUITIONISTIC FUZZY APPROXIMATION SPACES AND INTUITIONISTIC FUZZY APPROXIMATION SPACES

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Abstract: The notion of an intuitionistic fuzzy approximation space, which hinges upon an intuitionistic fuzzy proximity relation, represents a generalization of the knowledge base concept. However, an interval-valued intuitionistic fuzzy approximation space that is contingent upon an interval-valued intuitionistic fuzzy proximity relation constitutes an even more robust generalization of the knowledge base concept in comparison to the intuitionistic fuzzy approximation space. Consequently, rough sets defined on interval-valued intuitionistic fuzzy approximation spaces extend the concept of rough sets on intuitionistic fuzzy approximation spaces. This paper elucidates how rough sets on interval-valued intuitionistic fuzzy approximation spaces yield enhanced results over rough sets on intuitionistic fuzzy approximation spaces in the realm of knowledge representation.

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Paper ID: ICATCEM-176

THE IMPACT OF BOUNDARY LAYER SLIP AND CONVECTIVE CONDITIONS ON THE FLOW OF A NEWTONIAN HYBRID NANOFLUID OVER A STRETCHING SURFACE INCORPORATING NONLINEAR RADIATION

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Abstract: This study examines the effects of boundary layer slip and convective conditions on the behavior of a Newtonian hybrid nanofluid, composed of Cu and Al_2O_3 nanoparticles suspended in water, flowing over a stretching surface with nonlinear radiation. The study transforms the governing partial differential equations (PDEs) into ordinary differential equations (ODEs) using similarity transformations and solves them numerically with MATLAB's bvp4c function. By varying key parameters such as the Eckert number and magnetic parameter, the research analyzes their influence on velocity, temperature, skin friction, and the Nusselt number. Results indicate that the hybrid nanofluid exhibits significantly higher skin friction and Nusselt number compared to a standard nanofluid,

showcasing its potential for improved thermal management. This study offers valuable insights into the flow and thermal properties of hybrid nanofluids, underscoring their enhanced heat transfer capabilities and contributing to the optimization of industrial cooling systems.

Keywords: Boundary layer slip, Convective conditions, Newtonian hybrid nanofluid, Nonlinear radiation, Similarity transformation, Stretching surface.

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Paper ID: ICATCEM-177

UNSTEADY MHD FLOW OF $Zn - TiO_2/H_2O$ NANOFLUID WITH NON-LINEAR RADIANT ENERGY ON AN ELONGATED SURFACE UNDER THERMAL STRATIFICATION

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Abstract: Hybrid nanoparticles excel in physical strength, mechanical resistance, chemical stability, thermal conductivity, and other properties compared to individual nanofluids. The thermal performance of hybrid nanofluids has become a prominent focus in recent studies. Extensive research has been conducted on theoretical correlations to estimate the thermophysical characteristics of nanofluids. This investigation pertains to the dynamics of a hybrid nanoliquid ($Zn - TiO_2/H_2O$) streaming on an elongated surface influenced by non-linear radiant energy, thermal stratification and magnetic force. The computational solutions are obtained by performing a scaling analysis followed by applying the prevalent numerical scheme to the system of equations. The flow features are visually examined for flow variables that occurred in the mathematical analysis. The results indicate that the hybrid nanofluid exhibits higher thermal measures compared to the monolithic nanoliquid. Radiant energy and

thermal stratification have an inverse influence on temperature. Magnetic effects dampen the flow velocity. The frictional drag is weakened by magnetic and unsteadiness parameters. The shape factor of the nanoparticles, volume fraction of Zn particles and thermal stratification amplifies the rate of heat transport.

Keywords: MHD; hybrid nanofluid; non-linear thermal radiation; thermal stratification

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Paper ID: ICATCEM-178

PROPAGATION OF ACOUSTIC SURFACE WAVES IN LAYERED CYLINDRICAL STRUCTURES THROUGH ELECTROSTRICTIVE MATERIALS

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Abstract: The Electrostrictive core is assumed to have hexagonal symmetry and the overlay to be electrically shorted in the study of acoustic surface waves travelling around an Electrostrictive cylinder with metallic overlays. To explain how these waves behave, the dispersion equation that controls the system is constructed. In particular, the inquiry focuses on different layer materials and their thicknesses, and it entails examining numerical findings for a variety of factors, such as phase velocities and displacement. The investigation shows that the dispersion characteristics are significantly influenced by the thickness of metallic layers, such as those made of gold and chromium. On the other hand, relatively little effect on dispersion has been seen in the case of aluminium layers. An asymptotic expansion for the dispersion equation is constructed along with the numerical analysis. In summary, this study offers significant new understandings of the interactions of metallic overlays, electrostrictive cores, and acoustic surface waves. These understandings have practical implications for a range of materials science and wave propagation research applications.

Keywords: Acoustic Surface Waves, Electrostrictive Material, Displacement, Layered Cylinders

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Paper ID: ICATCEM-179

SOME FIXED POINT THEOREMS IN A GENERALIZATION OF FUZZY B-METRIC-SPACE

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Abstract: In this paper, inspired by the concept of Fuzzy b-metric space, we introduce the concept of extended Fuzzy b-metric space. We also establish some fixed point theorems for self-mappings defined on such spaces. Our results extend/generalize many pre-existing results in literature.

Keywords: Fixed Point; Fuzzy -b-metric, fuzzy-b-metric-like spaces.

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Paper ID: ICATCEM-180

WEAKLY ODD HOLE-FREE GRAPHS AND ITS SUBCLASS

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Abstract: A graph is weakly odd hole-free if it does not contain a chordless odd cycle on at least seven vertices as an induced subgraph. Clearly, the class of weakly odd hole free graphs is a superclass of odd hole-free graphs. In this paper, we define a graph operation one-four join and generate a subclass M of weakly odd hole-free graphs using one-four join. The class M of graphs contains all P_4-free graphs, all bipartite graphs, complement of all bipartite graphs, all split graphs, all complete expansion of C_5, and complement of all cycles. In [1], we generated a subclass of odd hole-free graphs using a new graph operation one-three join. Though, one-four join is an extension of one-three join, M is a huge class.

Keywords: Odd hole-free graphs, One-three join, Graph Operations.

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Paper ID: ICATCEM-181

NANOFLUID FLOW WITH MOTILE GYROTACTIC MICROORGANISMS SWIMMING THROUGH AN EXPONENTIALLY STRETCHING SHEET WITH CHEMICAL REACTION GOVERNED BY SISKO MODEL

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Abstract: In this study, we examine gyrotactic microorganisms in an exponentially stretching sheet influenced by chemical reactions within a Sisko nanofluid. The research investigates the rates of mass and heat transfer among nanoparticles and swimming microbes, utilizing various parameters. Results are depicted graphically, and tabular data provide detailed local skin friction, Nusselt number, Sherwood number, and motile density values. Similarity variables are employed to derive higher-order nonlinear ordinary differential equations from the physical model. To solve these, the RK-Fehlberg method, combined with a shooting strategy, is applied using MATLAB software, transforming the original partial differential equation (PDE) into a set of ordinary differential equations (ODEs). This approach enables a numerical solution and comprehensive analysis of the system under investigation.

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Paper ID: ICATCEM-182

QUADRANT PROGRESSIVE SUPPLY CHAIN MODEL FOR DEVELOPING PRODUCTS WITH QUALITY IMPERFECTIONS AND INSPECTION ERRORS

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Abstract: Agricultural producers must make sure their products fulfil quality standards before they are sold in order to safeguard the interests of customers, as mandated by legislation or regulatory norms. Like other production systems, agricultural production frequently falls short of ideal quality, which causes some goods to fall short of specifications. Errors can occur

in the inspection process, leading to the possibility of misclassifying the product quality. Type-I and Type-II inspection errors are among the many types of classification errors that can occur throughout the inspection process. In order to address these issues in the agricultural sector, this paper suggests a quadrant progressive supply chain model, with a particular emphasis on the production and distribution of developing crops. The model is made to minimise the inventory model's optimal cost, a suggested solution process, and a few others. The model's goal is to minimise the inventory model's optimal cost. A method for doing so is suggested, and a few fuzzy arena parameters, such as holding and ordering costs and the traditional classical inventory element's triangular fuzzy number, are altered to produce the inventory model's ideal score function. Sensitive analysis is then used to identify more sensitive parameters, offer management insight, and support the model.

Keywords: Agricultural supply chain, Developing products, Inventory management, Joint economic lot size, Imperfect quality, Inspection errors and defuzzification.

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Paper ID: ICATCEM-183

SOIL CLASSIFICATION USING DEEP LEARNING TECHNIQUES

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Abstract: The objective of this project is to classify the four types of soil images using deep learning models that is the Convolutional Neural Networks (CNN) and the Artificial Neural Networks (ANN). Each model classifies four types of soils, namely alluvial soil, black soil, red soil, and clay soil using images. The input images consisted of over 1600 images of the above-mentioned soil types,70% were used for training the model and the remaining 30% were used as the testing set, prior to model training the transforms module of the pytorch library was used to pre-process the dataset and improve the model generalization by using data wrangling methods to avoid model overfitting. The Pytorch library was used again to create the Neural Network Classes in both the models, and the dask library was used to obtain the distribution of images according to the different soil types. The ANN-based model was then trained and tested until it showed an improvement in accuracy of around 88% to 91%. Similarly, the CNN-based Model was trained until it showed an increase in accuracy of 92% to 96%. The f1 score calculated for CNN was 0.9253 and for ANN was 0.9318. Furthermore, the ROC Curves and Confusion Matrix were used from the sklearn metrics library to calculate the accuracy of the predictions made by the models. From the analysis it is interpreted that the Convolutional Neural Network-based Model is the most efficient classifier for image datasets.

Keywords— Deep Learning Models, Soil Classification, Convolutional Neural Networks (CNN), Artificial Neural Networks (ANN), Confusion Matrix, ROC Curves, F1Score.

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Paper ID: ICATCEM-184

A STUDY ON MATHEMATICAL ANXIETY AMONG ENGNEERING STUDENTS WITH CERTAIN DEMOGRAPHIC VARIABLES

Abstract: Mathematics subjects are the main subject of engineering students, they need a higher focus to ensure that they truly master the learning required. It has long been associated with complexity in an increased anxiety levels in academic settings. Mathematical knowledge is directly related to the ability to do logic, analytic, systematic, critical, and creative thinking.

This study investigates the level of mathematical anxiety in certain demographic variables. Normative survey method was adopted and stratified random sampling was chosen for study. 300 First year Engineering students of both Hostlers and Day students participated in this study were obtained from KL University of Vijayawada city. The main objectives were 1.To study the level of mathematical anxiety among engineering students 2. To study the influence of the mathematical anxiety among engineering students with certain variables like gender, locality, birth order, residential and academic stream. The study revealed that moderate level of anxiety of engineering students. Gender, locality is significantly influenced their mathematical anxiety. Birth order and academic background have not significant influence on their mathematical anxiety. . Data were visually represented using pie chart and statistical analysis involved calculating correlation coefficients and conducting one-way ANOVA tests where on the corresponding factors in both samples.

Key words: Mathematical anxiety, engineering students, demographic variables.

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Paper ID: ICATCEM-185

BIPOLAR FUZZY IDEALS OF GAMMA SEMIRINGS

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Abstract: In this article, we explore the notion of Bipolar fuzzy ideals of Γ-semirings. Later we characterize Bipolar fuzzy ideals of Γ-semirings to crisp Γ-semiring. Further the relation between Bipolar fuzzy ideals of Γ-semirings and their level cuts is investigated.

2020 Mathematics Subject Classification. 03E72, 16Y60, 16Y80.

Key words and phrases: Γ-semiring; bipolar fuzzy set; bipolar fuzzy ideal.

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Paper ID: ICATCEM-186

ON EXPONTENTIAL TYPE BOUNDS FOR P-GENERALIZED CIRCULAR AND HYPERBOLIC FUNCTIONS

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Abstract: In this paper, we obtain exponential bounds for the generalized circular and hyperbolic functions with one parameter *p*. Our results are natural generalizations of some existing results for classical circular and hyperbolic functions.

Keywords: Generalized circular functions, generalized hyperbolic functions, eigenfunctions, exponential bounds, inequalities.

MSC Classification(2010). 26D05, 33B10, 33E30.

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Paper ID: ICATCEM-187

REFINED POLYNOMIAL-EXPONENTIAL BOUNDS FOR INVERSE TRIGONOMETRIC FUNCTION ARCSIN(X)

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Abstract: In this paper, we have obtained refined bounds $\sum_{k=0}^{\infty} \alpha^k x^{2k+1} e^{\beta x^2}$ of polynomial-exponential type for inverse trigonometric function arcsin(x), where α, β are reals. The results obtained in this paper are tighter than the existed one in the literature of same kind.

Keywords: Inverse trigonometric function, Polynomial-Exponential bounds, Arcsine function, Inequalities.

MSC(2010). 33B10, 26D05, 26D07, 26D20.

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Paper ID: ICATCEM-188

DIFFERENTIAL GEOMETRY TANGENT BUNDLES ENDOWED WITH QUARTER-SYMMETRIC NON-METRIC CONNECTION (QSNMC) IN A LORENTZIAN PARA-KENMOTSU MANIFOLD

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Abstract : In this present paper, the complete lifts of a QSNMC from an LP-Kenmotsu manifold to its tangent bundle. The lifts of the curvature tensor, Ricci tensor, projective Ricci tensor, and Einstein manifold equipped with QSNMC in an LP- Kenmotsu manifold to its tangent bundle are studied. The necessary and sufficient requirements for the Ricci tensor lifts to be symmetric and skew-symmetric, as well as the lifts of the projective Ricci tensor to be skew-symmetric in the tangent bundle, are provided. An example of complete lifts of four-dimensional LP- Kenmotsu manifolds in the tangent bundle is provided.

Key words: Lorentzian para-Kenmotsu manifolds, complete lifts, tangent bundle quarter-symmetric non-metric connection, partial differential equations, mathematical operators, curvature tensor, projective Ricci tensor, Einstein manifold.

AMS Subject Classification: 53C15, 53C50.

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Paper ID: ICATCEM-189

UNIQUE COMMON FIXED POINT THEOREM FOR FOUR MAPS RATIONAL TYPE CONTRACTION IN SYMMETRIC SPACES

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Abstract: In this paper we obtain a unique common fixed point theorem for four mappings satisfying a rational type contractive condition in symmetric spaces. Also we give an example to illustrate our theorem.

Keywords: symmetric space, weakly compatible.

Mathematics Subject Classification: 54H25, 47H10.

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Paper ID: ICATCEM-190

STABILITY CONCEPTS OF FLOQUET LINEAR SYLVESTER MATRIX DYNAMIC SYSTEM ON TIME SCALES

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Abstract: This manuscript investigates the periodic solution of linear Sylvester matrices dynamics system on time scales. These matrices encompass both discrete and continuous components, as well as systems that combine discrete and continuous cases. Using the vectorization operator, the linear Sylvester matrix dynamic system on time scale is transformed into an equivalent Kronecker product of linear dynamic systems on time scale. The Floquet theory is expanded to incorporate Lyapunov transformations and their diverse properties that preserve stability. In addition, the generalized exponential function that forms the foundation of a canonical Floquet decomposition on time scales and is utilized to analyze periodic issues of both homogeneous and nonhomogeneous natures is developed. This paper examines two examples T=R and T=Z to demonstrate the practicality of this theory.

Keywords: Floquet theory, Lyapunov transformation, Floquet decomposition, Time scale, Stability.

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Paper ID: ICATCEM-195

A NOVEL ASYMMETRIC KEY AGREEMENT PROTOCOL OVER GROUP CODES AND GALOIS FIELD

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Abstract : In recent times, the day-to-day activities of humans are technology driven where security of information is vital. Cryptographic algorithms are designed to conceal the information which is accessible by an authorized recipient. The concealed message is shared among the trusted and authenticated users through a secure protocol. In this paper, a novel and secure Asymmetric Key Agreement Protocol is proposed which applies the mathematical theory of encoding functions and Galois fields. The protocol is analyzed on the basis of time, space and security. The application of the proposed protocol in Online Voting, E commerce and telemedicine are explored in the paper.

Keywords: Key Agreement Protocol, Encoding function, Galois Field, Online Voting, E-commerce, Telemedicine.

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Paper ID: ICATCEM-196

DIFFERENTIAL GEOMETRY ON LP-KENMOTSU MANIFOLDS ADMITTING THE QUASI CONFORMAL CURVATURE TENSOR

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Abstract: In this article, we explore a new class of Lorentzian almost paracontact metric manifolds namely Lorentzian para-Kenmostu (briefly LP-Kenmostu) admitting the tensor field W(X, Y), known as, the Quasi-conformal curvature tensor. We study an LP-Kenmotsu manifold satisfying the curvature condition R(X ,Y).W = 0 and derived various necessary and sufficient conditions for such a manifold is to be an Einstein manifold, where R(X ,Y) is considered as a derivation of the tensor algebra at each point of the manifold for tangent vectors X, Y. Further, we study Quasi-conformally recurrent LP-Kenmotsu manifolds and have shown that such a manifold is a space of constant curvature, provided it satisfies certain curvature conditions.

Key words: Lorentzian paracontact manifold, Quasi-conformal tensor, Curvature tensor, η-Einstein manifold.

AMS Subject Classification: 53C15, 53C50.

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Paper ID: ICATCEM-197

FACIAL EMOTION RECOGNITION USING CNN

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Abstract : This paper uses the TensorFlow and Keras frameworks to construct a Facial Emotion Recognition system using Convolutional Neural Networks (CNN) in Python. The

main goal is to correctly classify seven emotion categories based on facial expressions. Preprocessing data, designing the model architecture, training, and evaluating the project are all included. With the aid of the Image Data Generator from Keras, data augmentation is performed by using methods like rescaling, horizontal flipping, and width and height changes. In order to efficiently capture spatial dependencies within facial features, the CNN architecture is built with many convolutional layers, batch normalization, max-pooling, and dropout layers. The accuracy metric, Adam optimizer, and categorical cross-entropy loss are used in the compilation of the model. The model runs through several training epochs, and the optimal weights are saved depending on validation accuracy through the use of a callback mechanism. Matplotlib is used to visualize training and validation loss as well as accuracy. The model's performance is assessed using a confusion matrix in the final section of this paper. Understanding the model's accuracy in categorizing emotions in the validation dataset is possible thanks to this matrix. It is appropriate for incorporation into a variety of applications involving affective computing and human computer interaction, since the implementation shows promising results in facial emotion recognition.

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SKIN CANCER LEISON CLASSIFICATION VIA HAM10000 DATASET

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Abstract - Skin cancer is a serious health concern that requires care. Early skin detection is crucial to assisting patients. Neural networks need additional training to address skin disorders because of a lack of different data sets. We adopted HAM10000, which stands for "HUMAN AGAINST MACHINE WITH 10000 TRAINING IMAGES," to make the prediction in order to correct this. This study aims to develop an intelligent skin cancer detection model through the application of modern machine learning techniques. The program will use data, including photographs, to assess and classify skin lesions in order to identify possible cancers. If this research is able to uncover any early warning indicators, it could have a major influence on treating skin cancer sooner and improving patient outcomes.

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Paper ID: ICATCEM-199

ENHANCED CROP YIELD FORECASTING VIA ML, DL, AND STATISTICAL TECHNIQUES

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Abstract - This study aims to enhance crop yield prediction accuracy by leveraging a combination of statistical methods, machine learning (ML) algorithms, and deep learning (DL) techniques. The dataset comprises 19,689 records, encompassing features such as crop type, crop year, season, state, area, production, annual rainfall, fertilizer usage, pesticide usage, and yield. We explored various predictive models, including traditional statistical approaches like Linear Regression and Lasso Regression, and machine learning methodssuch as Random Forest, Support Vector Machine (SVM), Decision Tree, GradientBoosting Machines (GBM), K-Nearest Neighbors (KNN), and Gradient Descent. Additionally, advanced deep learning architectures, namely Long Short-Term Memory(LSTM) networks, Recurrent Neural Networks (RNNs), and Fully Connected Neural Networks (FCNNs), were employed to capture

intricate patterns within the data. The comprehensive evaluation focuses on comparing the performance of these models using metrics such as root mean square error (RMSE), mean absolute error (MAE), and coefficient of determination (R^2). The results of this study provide valuable insights into the efficacy of different modeling approaches for crop yield prediction, thereby contributing to more informed agricultural planning and decision making processes.

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Paper ID: ICATCEM-200

DIFFERENTIAL GEOMETRY ON A CLASS OF LORENTZIAN PARA-KENMOTSU MANIFOLDS ADMITTING THE W3-PROJECTIVE CURVATURE TENSOR

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Abstract: In this paper, we explore the geometrical significance of a new class of Lorentzian almost paracontact metric manifolds namely Lorentzian para-Kenmostu (briefly LP-Kenmostu) admitting the W_3-projective curvature tensor and obtained several interesting results. We have shown that a W_3-flat LP-Kenmotsu manifold is an Einstein manifold and a W_3- symmetric LP-Kenmotsu manifold is a flat space. As a special case, it is shown that a W_3-semi symmetric LP-Kenmotsu manifold is a W_3-symmetric manifold. At the end, we have shown that an LP-Kenmotsu manifold satisfying the condition $\operatorname{div} W_3(X, Y)Z = 0$ is an Einstein manifold and it is of constant scalar curvature with curvature $n(n-1)$.

Key words: Lorentzian paracontact manifold, Scalar Curvature, Einstein manifold.
AMS Subject Classification: 53C15, 53C25

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Paper ID: ICATCEM-201

DIFFERENTIAL GEOMETRY A STUDY ON CERTAIN CURVATURE TENSORS IN LP-KENMOTSU MANIFOLDS ADMITTING A GENERALISED SYMMETRIC METRIC CONNECTION

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Abstract. In this article, we study certain curvature properties of both concircular and projective curvature tensors in Lorentzian Para-Kenmotsu manifolds with respect to the generalized symmetric metric connection. We obtain several interesting results pertaining to ξ concircularly and ξ-projectively flat LP-Kenmotsu manifolds with respect to the generalized symmetric metric connection. Further, we study LP-Kenmotsu manifolds $\tilde{\nabla}\tilde{Z}(\xi, V)S=$, where $\tilde{Z}$and $\tilde{S}$are the concircular curvature equipped with the condition0 (,). tensor and Ricci tensor respectively with respect to the generalized symmetric metric connection.

Key words: Lorentzian para-Kenmotsu manifolds, generalized symmetric metric connection, Concircular curvature tensor, Projective curvature tensor, Ricci tensor. AMS Subject Classification: 53C15, 53C25.

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Paper ID: ICATCEM-202

DIFFERENTIAL GEOMETRY TANGENT BUNDLES ENDOWED WITH QUARTER-SYMMETRIC NON-METRIC CONNECTION (QSNMC) IN A LORENTZIAN PARA-KENMOTSU MANIFOLD

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Abstract. In this present paper, we investigate the properties of the lifts of various curvature tensors such as the Ricci tensor, projective Ricci tensor and Einstein manifold endowed with QSNMC in an LP-Kenmotsu manifold to its tangent bundle. The necessary and sufficient requirements for the lifts of the Ricci tensor to be symmetric and skew-symmetric are derived. Further, we also obtain the conditions for the lifts of the projective Ricci tensor to be skew-symmetric in the tangent bundle. At the end, we gave an example of complete lifts of four-dimensional LP- Kenmotsu manifolds in the tangent bundle.

Key words: Lorentzian para-Kenmotsu manifolds, complete lifts, tangent bundle quarter-symmetric non-metric connection, partial differential equations.

AMS Subject Classification: 53C05, 53C07, 53C25, 58A30.

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Paper ID: ICATCEM-203

ADVANCED BLOOD VESSEL SEGMENTATION IN FUNDUS IMAGES USING FUZZY LOGIC TECHNIQUES

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Abstract: Retinal vessel segmentation is an essential part of pathological inquiry in fundus imaging. Automatic blood vessel identification fixes many of the issues with the manual segmentation process. Most unsupervised segmentation algorithms use conventional thresholding techniques for vessel extraction at the end. It could lead to the loss of some vessel

pixels, which would lead to inaccurate diagnosis of retinal diseases. In this work, we include fuzzy concepts into two threshold-based vessel recognition methods: T-normalized cut and hypergraph clustering. T-normalized cut gives more robust and accurate image processing and

flexible and efficient method for deciphering and interpreting complicated image data is provided by hypergraph clustering. This generates a mask consisting of membership values instead of binary values. The resulting membership image (mask), which is obtained by applying the two fuzzy-based thresholding algorithms to each image independently, is fused to create a single membership mask. Uncertain union functioning is used to perform the fusion.

Keywords: Fundus images, blood vessel segmentation, T-Membership, Fuzzy thresholding, Hypergraph clustering.

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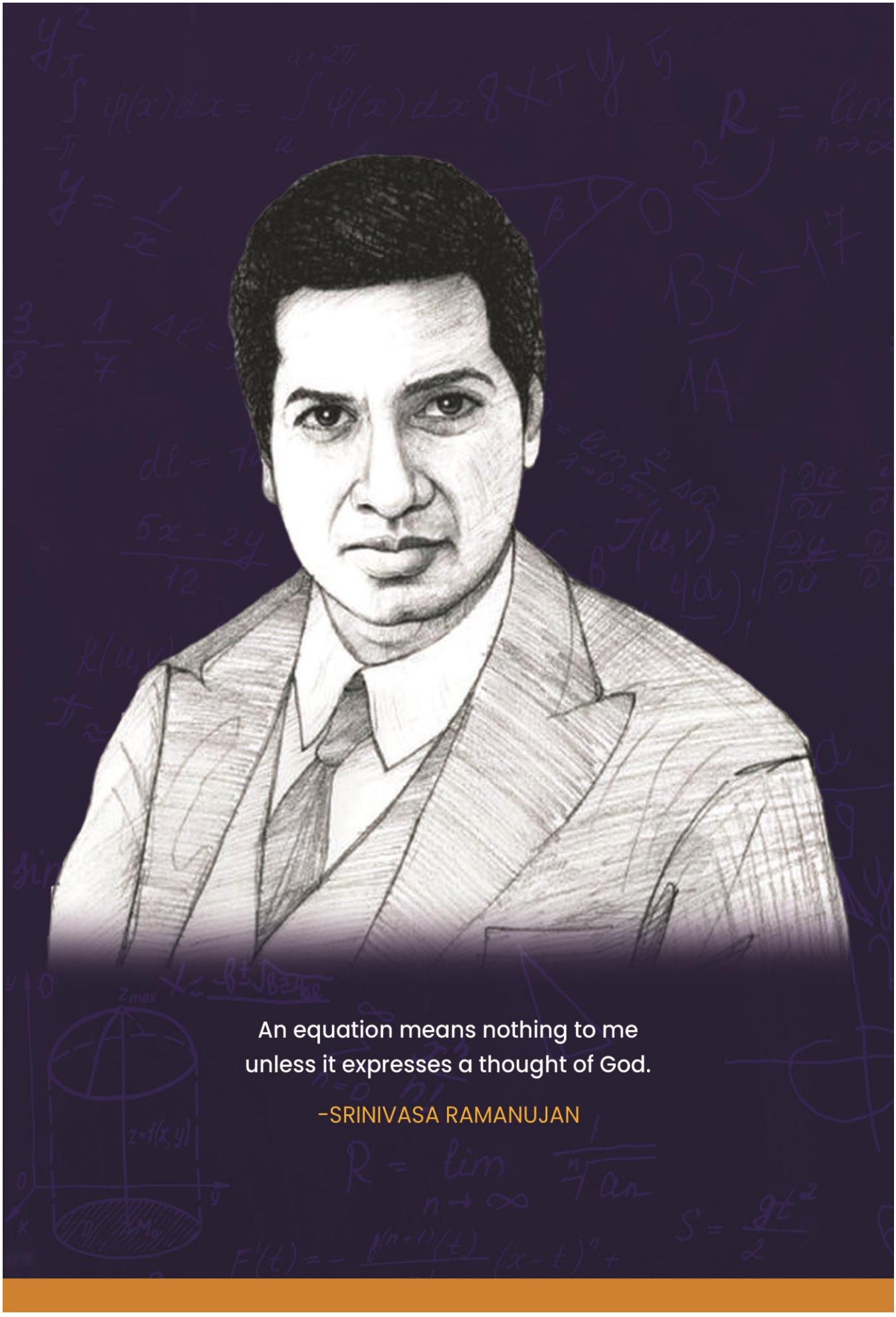
An equation means nothing to me
unless it expresses a thought of God.
-SRINIVASA RAMANUJAN