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INFINITY INSIGHT

Quarterly Newsletter

Department of Mathematics & Statistics
School of Basic Sciences
Faculty of Science

https://jaipur.manipal.edu/fos/department-of-maths.php

INSIDE THIS ISSUE....

Editorial Note

EDITOR

"MATHEMATICS IS THE LANGUAGE IN WHICH THE UNIVERSE IS WRITTEN, AND THROUGH LEARNING, WE TRANSLATE ITS BEAUTY INTO SUCCESS AND INNOVATION"

Dear Readers,

As we embark on another academic year, it is our pleasure to present the 3rd edition of ***Infinity Insight-*** a quarterly newsletter of the Department of Mathematics & Statistics. This edition continues to showcase the vibrant spirit of our department, capturing the activities, achievements of our faculty members & students, and the innovative endeavors that define our community.

We would like to place on record our gratitude and heartfelt thanks to all those who have contributed to make this effort a success. Let this issue be a testament to our collective pursuit of knowledge and creativity, as we continue to strive for greater heights.

Hope you will find this edition informative and engaging as well. Looking forward to your feedback and contribution in future editions.

Happy Reading…!

Dr. Reema Jain

Link for Previous Editions:

Infinity Insight_1.0:https://flipbookpdf.net/web/site/d1fabb836f9aebc3f930a3afa58b8b1ccadb6120202403.pdf.html

Infinity Insight_1.1: https://www.flipbookpdf.net/web/site/0f818b331ddb9cc3b5872d810a1873afc9be3456202407.pdf.html

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Mr. Atreya Ghoshal
(III Sem. B.Sc. (Hons.) Mathematics)

Vision & Mission

VISION

To be a global hub for academic excellence, innovation, and human development in mathematics

MISSION

- Develop competent professionals in mathematics and statistics.
- Foster interdisciplinary collaboration for holistic problem-solving.
- Instill good human values for ethical and responsible research.
- Contribute to societal well-being through data-driven solutions.
- Cultivate leaders with a strong sense of social responsibility.

Message

HEAD OF DEPARTMENT

Greetings from the Department of Mathematics and Statistics!

We, the members of the department, feel enthusiasm to publish the third issue of our departmental newsletter, "Infinity Insight." I, as a head of the department would like to thank all the faculty members, Research scholars and students for their support and sincere efforts for the betterment and development of department. On this occasion, I congratulate all the team members of the editorial board for bringing up this issue in a better shape.

Dr. Kalpna Sharma
Head, Dept of Mathematics & Statistics
Manipal University Jaipur

EVENTS ORGANIZED

ICRAFMN-2024

2nd International Conference on RecentAdvances in Fluid Mechanics and Nanoelectronics (ICRAFMN -2024) was organized by the Department of Mathematics & Statistics, Manipal University Jaipurfrom July 10-12, 2024. It was in association with Manipal Institute of Technology Bengaluru and National Institute of Technology Uttarakhand, University Malaysia Phang Al-Sultan Abdullah, Malaysia, and Kaestsart University, Thailand. The participation of 55 eminent speakers at ICRAFMN-2024 was a testament to the significance of this conference. These experts are each pioneer in their respective fields and have laid a new path for future researchers. They shared their knowledge, experiences, and perspectives on recent advancements in fluid mechanics and nanoelectronics. Their presentations and discussions provided valuable insights to the attendees and inspired participants to further research in these fields. Interaction with more than 350 participants, researchers, faculty members, and students created a conducive environment for networking, collaboration, and interdisciplinary discussions.

Convener :
Dr Kalpna Sharma

Co-Convener :
Dr Ruchika Mehta &
Dr Alok Bhargava

SHORT TERM COURSE

A Short-Term Course on **Applied Mathematics with MATHEMATICA** was organized by the Department of Mathematics & Statistics, Manipal University Jaipur from July 15 to 19, 2024. The STC was about hands on practice of use of MATHEMATICA, LINGO and MATLAB software useful for engineering and science disciplines. Following resource person were invited for the training sessions:

Resource Person	Talk
Dr K. C. Lachwani, NITTTR Chandigarh	Introduction and Practical Sessions on Mathematica
Dr Ravinder Ahuja Manager, Evalueserve, Gurugram	Data Analysis with Python
Prof. Amit Kant Pandit, SMVDU Jammu	Research and Development

Convener : Dr Ankur Jain

ACTIVITY UNDER MoU

JOINT RESEARCH SUPERVISION

S. No.	Name of Research Scholar	Name of Supervisor	Title of Thesis	Date of Award
1	Bakari Makoja (NM-AIST)	Dr Verdiana Grace Masanja Dr Reema Jain DrAhmada Omar Ali	Modeling and Analysis of Moving Particle Effects on Blood Flow in a Stenosed Artery with Presence of Thermal Radiation	September 13, 2024

RESEARCH VISIBILITY

STUDENT PUBLICATIONS

Q1 Journal Publications					
S. No.	**Name of Scholar**	**Name of Supervisor**	**Title of Publication**	**Journal**	**Month of Publication**
1	Kavita Jat	Dr Kalpna Sharma	Significance of Darcy Forchheimer Casson Fluid Flow Past a Non-Permeable Curved Stretching Sheet	Case Study in Thermal Engineering (Elsevier)	July, 2024
2	K. Loganathan	Dr Reema Jain	Radiative Flow of Cross Ternary Hybrid Nanofluid (MoS2 TiO2, Ag/CMC-Water) in aDarcy ForchheimerPorous Medium over a Stretching Cylinder with Entropy Minimization	Heliyon (Elsevier)	July, 2024
3	K. Loganathan	Dr Reema Jain	Comparative Approach of Darcy ForchheimerFlow on Water Based Hybrid Nanofluid (Cu-Al2O3) and Mono Nanofluid (Cu) Over a Stretched Surface with Injection/Suction	Partial Differential Equations in Applied Mathematics (Elsevier)	July, 2024
4	K. Loganathan	Dr Reema Jain	An Implication of Entropy Generation in Maxwell Fluid Containing Engine Oil Based Ternary Hybrid Nanofluid over a Riga Plate	Journal of Taibah University for Science (Taylor and Francis)	August, 2024
5	Kavita Jat	Dr Kalpna Sharma	Computational Study on Torsional Casson Fluid Flow through Concentric Cylinders in a Porous Medium	Alexandria Engineering Journal (Elsevier)	August, 2024
6	Kavita Jat	Dr Kalpna Sharma	Impacts of Unsteady MHD Hybrid Nanofluid over a Non-Linear Stretchable Porous Sheet with Thermal Radiation and Gyrotatic Microorganisms	International Journal of Thermofluids (Elsevier)	August, 2024

7	Kavita Jat, Pooja Soni	Dr Kalpna Sharma	Effect of Cattaneo Christov Heat Flux Model and Elastic Deformation on Walters'BViscoelastic Fluid Flow with Porosity	International Journal of Thermofluids (Elsevier)	August, 2024
8	Kavita Jat	Dr Kalpna Sharma	Significances of Melting Heat Transfer and Bioconvection Phenomena in Nanofluid Flow over a Three Different Geometries	International Journal of Thermofluids (Elsevier)	September, 2024
9	K. Loganathan	Dr Reema Jain	Featuring the Stagnation Point Flow of Casson Nanofluid with Thermal Radiation and Swimming Microorganisms over a Stretching Sheet: A Computational Modeling Via Analytical Method	Partial Differential Equations in Applied Mathematics (Elsevier)	September, 2024
10	K. Loganathan	Dr Reema Jain	Passive Control of Bio-Convective Flow on Eyring Powell Nanofluid over a Slippery Surface with Activation Energy and Magnetic Impact	Partial Differential Equations in Applied Mathematics (Elsevier)	September, 2024

Other Journal Publications

S. No.	Name of Scholar	Name of Supervisor	Title of Publication	Journal	Month of Publication
1	K. Loganathan	Dr Reema Jain	Numerical Tackling for MHD Darcy-Forchheimer Flow of Water-Based CNTsin a Rotating Frame with Homogeneous-Heterogeneous Reactions: An Artificial Neural Network Approach	Numerical Heat Transfer Fundamentals (Q2) (Taylor and Francis)	July, 2024
2	K. Loganathan	Dr Reema Jain	Computational Analysis of Carboxymethyl Cellulose Water-Based Casson Hybrid Nanofluid (Al 2 O 3 -Cuo) Flow Past a Wedge, Cone and Plate	Modern Physics Letters B (Q2) (World Scientific Publishing)	July, 2024

3	K. Loganathan	Dr Reema Jain	Homogeneous Heterogeneous Reactions on Darcy ForchheimerFlow of SWCNTs/MWCNTs over a Bidirectional Riga Plate with Nonlinear Radiation and Non-Uniform Heat Source/Sink	Modern Physics Letters B (Q2) (World Scientific Publishing)	August, 2024
4	Kavita Jat	Dr Kalpna Sharma	Novel Features of Radiating Hybrid Nanofluid Flow Past aNonlinear Stretchable Porous Sheet with Different Nanoparticles Shape	Numerical Heat Transfer, Part B: Fundamentals	August, 2024
5	Pooja Agarwal	Dr Reema Jain	Heat And Mass Transfer Analysis of Chemically Reactive Powell-Eyring Nanofluid Flow over a Wedge: ANumerical Approach	Contemporary Mathematics (Q4) (Singapore)	August, 2024

FACULTY PUBLICATIONS

Q1 Journal Publications				
S. No.	**Name of Faculty**	**Title of Publication**	**Journal**	**Month of Publication**
1	Dr Anil Ahlawat Dr Shilpa Chaudhary	Heat Convection and Irreversibility of Magneto-Micropolar Hybrid Nanofluids within a Porous Hexagonal-Shaped Enclosure Having Heated Obstacle	Nanotechnology Reviews	July, 2024
2	Dr Reema Jain	Thermally Radiative Flow of MHD Powell-Eyring Nanofluid over an Exponential Stretching Sheet with Swimming Microorganisms and Viscous Dissipation: ANumerical Computation	International Journal of Thermofluids (Elsevier)	July, 2024
3	Dr Reema Jain	Computation of SoretEffect in Sisko Nanofluid Flow over a Stretching Sheet Encompassing Chemical Reaction and Viscous Dissipation	Case Studies in Thermal Engineering (Elsevier)	September, 2024

Other Journal Publications				
S. No.	**Name of Faculty**	**Title of Publication**	**Journal**	**Month of Publication**
1	Dr Garima Agarwal	Analysis of the COVID-19 Pandemic and Prediction with Numerical Methods	International Journal of Mathematics for Industry	July, 2024
2	Dr Pooja Sharma	Computational Analysis of Entropy Generation Optimization for Cu Al_2O_3Water Based Chemically Reactive Magnetized Radiative Hybrid Nanofluid Flow	AIP Advances	July, 2024
3	Dr Ashish Kumar Dr Monika Saini	Improved Ratio Estimator Under Simple and Stratified Random Sampling	Life Cycle Reliability and Safety Engineering	July, 2024
4	Dr Sunil Joshi	A New Class of Integrals Connected with Polynomials and Extended Generalized Mittag-Leffler Function	Sahand Communications in Mathematical Analysis	July, 2024
5	Dr Monika Saini Dr Ashish Kumar	Availability Optimization of Bolts Manufacturing Plant Using Particle Swarm Optimization and Genetic Algorithm	Journal of the Nigerian Society of Physical Sciences	August, 2024
6	Dr. Ashish Kumar Dr Monika Saini	Stochastic Modeling and Optimization of Turbogenerator Performance Using Metaheuristic Techniques	Quality and Reliability Engineering International	August, 2024
7	Dr Ankur Kumar Jain	Optimal Control Model of Malicious News Spread on Social Networks Having Hidden Accounts	Results in Control and Optimization	September, 2024
8	Dr Ashish Kumar Dr Monika Saini	Stochastic Modeling and Availability Optimization of Nuts Manufacturing Plant Using Markov Process and Particle Swarm Optimization	Austrian Journal of Statistics	September, 2024
9	Dr Garima Agarwal Dr Alok Bhargava	Some New Results on Fractional Integrals Involving Srivastava Polynomials, (P, Q) Extended Hypergeometric Function and M Series	Journal of Computational Analysis and Applications	September, 2024

Book Chapter/Conference Publications				
S. No.	**Name of Faculty**	**Title of Publication**	**Book/Conference**	**Month of Publication**
1	Dr Anamika Jain	ANFIS for Markovian Unreliable Retrial Queue with Differentiated Vacation	Lecture Notes in Networks and Systems	July, 2024
2	Dr Mohd Rizwanullah	An Optimization of Inventory Control in Supply Chain Under Time Varying Holding Costs with Exponential Demand Rate	3rd International Conference on Computational Modelling, Simulation and Optimization (ICCMSO) IEEE XPLORE	August, 2024

PAPER PRESENTATION

S. No.	Name of Scholar	Name of Supervisor	Title	Conference	Date
1	Kavita Jat	Dr Kalpna Sharma	Radioactive Couple Stress Channel Flow of Casson Fluid using Differential Transform	2nd International Conference on Recent Advances in Fluid Mechanics and Nanoelectronics (ICRAFMN -2024)	July 10-12, 2024
2	Pooja Soni	Dr Kalpna Sharma	Effect Of Cattaneo Christov Heat Flux Model and Elastic Deformation on Walters' B Viscoelastic Fluid Flow with Porosity	2nd International Conference on Recent Advances in Fluid Mechanics and Nanoelectronics (ICRAFMN -2024)	July 10-12, 2024
3	Rakhi Mathur	DrLaxmi Poonia	Bianchi Type-II Inflationary Space Time Model in Presence of Flat Potential	2nd International Conference on Recent Advances in Fluid Mechanics and Nanoelectronics (ICRAFMN -2024)	July 10-12, 2024

WORKSHOP/SHORT TERM COURSE ATTENDED

S.No.	Name of Student	Program	Workshop/School/STC	Venue	Date
1	Suryaprakash	V Sem. B.Sc. (Hons.) Mathematics	Innovation,Designand Entrepreneur (IDE) Bootcamp (Phase-I)	All India Council for Technical Education (AICTE) and the Ministry of Education's Innovation Cell (MIC) at Amity University Rajasthan	September 23-27, 2024

INNOVATION / IPR

S.No.	Title of Invention	Published/ Granted	Inventor	Published in/Granted by	Date
1	A Perpetual Monthly Calendar	Published	Atreya Ghoshal & Dr Kalpna Sharma	Govt. of India	June 07, 2024
2	A Method For Selecting Sustainable Suppliers Within A Green Supply Chain Framework Using The Fuzzy Topsis Technique	Published	Dr Mohd Rizwanullah & Guman Singh	Govt. of India	July12, 2024

AWARDS & ACHIEVEMENTS

STUDENT ACHIEVEMENTS

S.No.	Name of Student	Program	Achievement	Date
1	Atreya Ghoshal	III Sem. B.Sc. (Hons.) Mathematics	TMA Pai Merit Scholarship	2024-2025
2	Suryaprakash	V Sem. B.Sc. (Hons.) Mathematics	Internship at Manipal University Jaipur (Admission Department)	May 20- July 31, 2024
3	Atreya Ghoshal	III Sem. B.Sc. (Hons.) Mathematics	Participation inAryabhatta National Maths Competition (ANMC-2024)	August,2024
4	Vidhi Gharia	III Sem. B.Sc. (Hons.) Mathematics	Participation on Aryabhatta National Maths Competition (ANMC-2024)	August, 2024

ACADEMIC VISIT

S. No.	Name of Faculty	Institute/University	Purpose	Date
1	Dr Alok Bhargav	IIT BHU	Academic Visit	July 03-05, 2024
2	Dr Reema Jain	National University of Singapore, Singapore	Academic Visit & Talk during an International Conference SciCADE2024 @ NUS	July 15-19, 2024

SEND OFF ANNOUNCEMENT

Dr Ayush Tripathi, Assistant Professor relieved from the Department of Mathematics & Statistics in the month of September 2024. He left the job for better prospects and expressed his gratitude towards the Department and MUJ as well. We thank him for his efforts and contribution during his tenure with us and wish him all the best in his future endeavors. His efforts as an Associate Editor of our newsletter "Infinity Insight" are also appreciated.

Some Techniques for Calculation of Pi

Two researchers, Arnab Saha and Aninda Sinha, were exploring string theory when they unexpectedly discovered a new formula for Pi(π), one of the most famous constants in math. While working on their quantum theory project, they developed a formula to optimize certain calculations. To their amazement, they realized that this formula could also be used to calculate the digits of pi. This impressive work has just recently sparked interest in the range of techniques developed over time to calculate Pi, with differences in efficiency and complexity at various levels.

The New Discovery

This formula of Sena and Saha includes a series expansion with a parameter (Lambda). It produces infinite series which converge toward Pi. Again, this is so interesting but must be read in the context of the history of generally accepted ways to approximate Pi.

Classical Techniques to Approximate Pi

1. **Achimedes' method:** This was one of the earliest attempts to determine the approximate value of Pi. It was said that the approximate value of Pi belongs to the range:

$$\frac{223}{71} < \pi < \frac{22}{7}$$

2. **Series of Madhava:** In the late 14th century, Madhava de Sangamagrama proposed the following series for π/4:

$$\pi = \sqrt{12}\sum_{k=0}^{\infty}\frac{(-3)^{-k}}{2k+1}$$

Leibniz later independently developed the same series, leading to the common name "Madhava-Leibniz series" to acknowledge both mathematicians. The following is the Madhava-Leibniz series:

π/4 = 1 - 1/3 + 1/5 - 1/7 + …..

Efficiency: This series converges very slowly. For example, using only the first four terms gives an approximation that is about 0.2 away from Pi. To achieve an approximation much closer to Pi, one has to sum up thousands of terms making it rather impractical compared to what is known today.

3. **Ramanujan's Series:** Among Ramanujan's most notable achievements is:

$$\frac{1}{\sqrt{2}} = \left(\frac{2\sqrt{2}}{9801}\right)\sum_{k=0}^{\infty}\frac{(4k)!(1103+26390k)}{(k!)^4\cdot 396^{4k}}$$

Convergence: This series converges with astounding speed so that about five terms suffice to yield tens of decimal places and often yields approximations correct to 10^-40.

4. **Chudnovsky's Formula:** The best-known formula for 1/π is given by

$$\frac{1}{\pi} = 12\sum_{k=0}^{\infty}\frac{(-1)^k(6k)!(13591409+545140134k)}{(3k)!(k!)^3\cdot(640320)^{(3k+3/2)}}$$

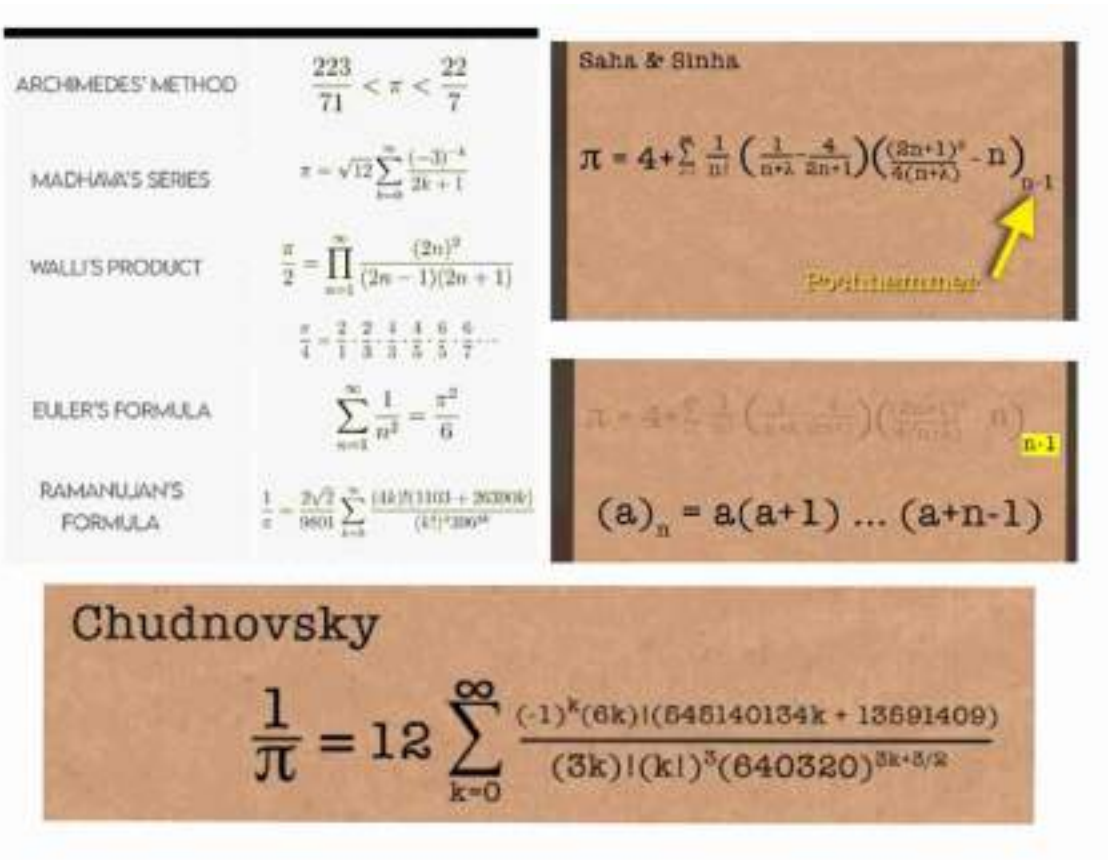
Efficiency: The technique converges very fast; in terms of few terms, it calculates Pi to trillions of decimal places.

5. **Walli's Product:** This is yet another method for the calculation of Pi.

$$\frac{\pi}{2} = \prod_{n=1}^{\infty}\frac{(2n)^2}{(2n-1)(2n+1)}$$

6. **Euler's Formula:** This is another method which gives the approximate value for

$$\sum_{n=1}^{\infty}\frac{1}{n^2} = \frac{\pi^2}{6}$$



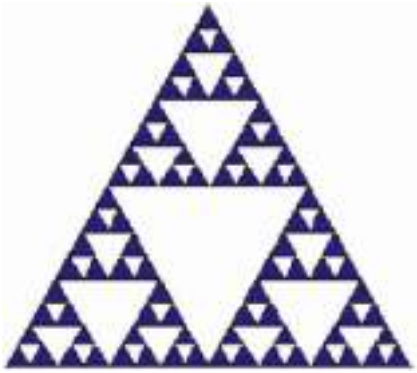
Conclusion

While Saha and Sinha have come up with a new method that follows fresh trails, it is yet to show the possibility of convergence faster than established methods like the Ramanujan-type or Chudnovsky. Exploring the calculation of Pi in mathematics is a great journey toward understanding how some mathematical inputs evolve in relationship between history and modernism. We will continue with our deep research on Pi and its representations, showing an interplay of history and innovation in mathematics.

Harjot Singh & Atreya Ghoshal

The World of Fractal Geometry

The smooth and regular forms of classical geometry have helped people measure and understand their surroundings, but when it comes to portraying nature's complexity, these smooth structures frequently prove to be the incorrect type of abstraction. Benoît Mandelbrot pioneered the discovery of the ideas that would eventually become an entirely new field: fractal geometry. Fractals are a type of geometric repetition in which gradually smaller copies of a pattern are nested inside one another, resulting in the appearance of the same complicated designs several times. This implies that when you delve further into the minutiae of a fractal, you will see a reproduction of the whole. The classic examples are ferns, snowflakes, lightning and electricity, plants and leaves, rivers and topography, clouds, and crystals. Each split in a tree, from trunk to limb to branch to twig, is similar, but with minute variances that give more depth and insight into the overall workings of the tree. Fractal geometry is also utilized to simulate the human lung, blood arteries, nervous systems, and a variety of other



Have practical uses in a variety of disciplines, including telecommunications, computing, and medical. Fractals blur the border between order and chaos, indicating that even when things appear random, there is an underlying mathematical beauty that regulates our surroundings. As study advances, the applications of fractal geometry are anticipated to grow, enhancing our understanding of both natural and man-made events.

Drashti Tailor

PHOTO GALLERY

Punjab Kesari, 14 July 2024

इंजीनियरिंग और विज्ञान की कुंजी है गणित : पद्मश्री यादव

INSPIRED BY LIFE

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