ALLIANCE INTERNATIONAL CONFERENCE IN MATHEMATICAL SCIENCES
(AICMS - 2023)
Book of Abstracts

Chief Editor
Prof. Mihir Dash

Editors
Dr. Vivek Mishra, Dr. Subhradev Sen,
Dr. Supriya Devi, Dr. Srashti Dwivedi

ALLIANCE UNIVERSITY

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BOOK OF ABSTRACTS

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ALLIANCE UNIVERSITY

Private University established in Karnataka State by Act No.34 of year 2010
Recognized by the University Grants Commission (UGC), New Delhi

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About Alliance University

Alliance University was founded with an ambition to serve society with education and research and promote a global outlook that defines the future trajectory of its students.

Since its inception in 2010, Alliance University has been a forerunner in higher education, calling out to the new generation of scholars, engineers, scientists, artists, people in business, social reformers helping to shape and transform societies and communities through and beyond, around the world.

Currently, that trailblazing spirit makes Alliance University, one of the most sought-after universities in the world, featuring top-ranked academic programmes such as Alliance School of Business, Alliance College of Engineering and Design, Alliance School of Law, and Alliance Ascent College, and newly commencing Alliance School of Liberal Arts.

Nestled in the serenity of 'green' campus in Bengaluru, Alliance University is a leader in global education, with world-class infrastructure, state of the art laboratories, international

visiting faculty, exchange programmes with leading universities in the US, UK, and European Union, and linkages with Research Labs across the world.

Alliance University takes its role as an instrument of transformational impact seriously and has a vast network of alumni who have gone on to succeed across professions, from the sciences to the arts and government, throughout the world. Education at Alliance University is designed to inspire our students to become critical thinkers and to lead and change the world.

Rated among the best private universities in India, Alliance University provides a rigorous, demanding education to a diverse student community. The University has baccalaureate concentrations, postgraduate offerings, doctoral degree programmes, and several professional certificate programmes that channel its students' creativity to further knowledge and twenty-first-century skills, challenge the status quo, and deliver impact.

Alliance University counts among its faculty, top talents, recipients of the highest scholastic honors from around the world, and visionaries committed to informing and innovating the current paradigms and pushing the envelope to make a better world, going beyond what might be expected of a university.

Alliance School of
Applied Mathematics

The School of Applied Mathematics at Alliance University contains experts from the different domains of mathematics, statistics, and data science. It always encourages a research attitude among the faculty and students. The vision of the school is to become one of the leading schools in India by providing quality education and research to its stakeholders. Data science is one of the emerging fields as per the mandate of the UGC and AICTE, so the School of Applied Mathematics is strengthening its domain by organizing different programs like workshops and conferences.

About the Conference

This conference is to provide a platform for researchers with inclusiveness for all those who are associated with education and research in the fields of Mathematics, Statistics, and Data Science. This conference will develop professionalism among the students, and new concepts will be shared with the participants and delegates, which will enrich the departments and the participants. This conference promotes the original research of scholars in relevant fields, to discuss new approaches and techniques of applied mathematics for data science. This gives educationists, academics, technocrats, and other stakeholders a chance to help meet the needs of education.

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Message from Pro-Chancellor

Dear Participants,

It gives me tremendous joy to welcome all the participants to the Alliance International Conference in Mathematical Sciences. Our university has always placed a strong emphasis on Mathematics, and it is encouraging to see so many people gathered to discuss and present new developments in this area. The conference's theme, *"Mathematics and Statistics: Fundamentals for Data Science"* is especially pertinent in the modern world, where global issues and technological breakthroughs necessitate innovative and collaborative problem-solving. We must keep in mind the central place that mathematics occupies in our world as we come together to share our findings, experiences, and thoughts. It serves as the foundation for many of the technical developments that have revolutionized several aspects of our lives, including communication and information access.

We have the responsibility as academics and educators to make sure that our stakeholders have the ability, information,

and outlook necessary to have a significant impact on the world at large. This conference presents a great opportunity to work with eminent scholars and exchange ideas, that which will lead to novel insights and creative solutions. I commend the conference organizers for their efforts and dedication in hosting such a diverse talent pool of world-class resources.

Here's wishing all the participants a remarkable future ahead!

Best Wishes
Abhay G. Chebbi
Pro-Chancellor
Alliance University

Message from Vice-Chancellor

Dear Participants,

I am pleased to extend a warm welcome to you to the Alliance International Conference in Mathematical Sciences 2023. As the Vice Chancellor of Alliance University, I am delighted to see so many bright minds come together to discuss ideas and present their work in data science, statistics, and mathematics. The theme of the conference is "Mathematics and Statistics: Fundamentals of Data Science." Data science is becoming an integral part of every area of research as we generate data in every aspect of life. Seeing the past few years of the pandemic, where the world has undergone transformational change in digital form, we believe the world is now data driven. Mathematics is a crucial enabler of data-driven scientific innovation and discovery. It lays the foundation for technological advancements that have fundamentally altered our way of life and is crucial in addressing some of the most pressing global problems of our

time, including cybersecurity, business forecasting and analysis, and climate change.

You have a special opportunity to make a significant contribution as mathematicians. We can create new technology and solutions to tackle major problems like social inequality and illness prevention by utilising the power of Mathematics. I think that the work that is presented at this conference will be a key step towards achieving this objective. This conference offers a fantastic forum for exchanging information, concepts, and experiences. In order to improve our understanding of the Mathematical Sciences, we have gathered a broad group of professionals who will present their research, ideas, and breakthroughs. It is my goal that the talks and debates at this conference will spark fresh ideas and partnerships that will open the door for more advancement. During this conference, we have a rare opportunity to collaborate, exchange ideas, and push the boundaries of Mathematics. Let us continue to work together to solve the challenges facing our world, and let us inspire the next generation of scientists and mathematicians.

Thank you.

Prof (Dr.) Anubha Singh
Vice Chancellor
Alliance University, Bengaluru

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AICMS 1

A Study on the Choice of Index in the Market Model

Mihir Dash[1], Rita S[2]

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This study examines the choice of index in the market model. The market model is used to identify systematic risk, which according to the CAPM is the only form of risk that is rewarded by excess returns. The usual diversified stock market index, which is generally constructed as a capitalisation-weighted average of major stock prices, is, according to the CAPM, hypothesised to be mean-variance efficient. However, some studies have shown that this does not always hold empirically. The choice of index would impact portfolio construction techniques and portfolio performance evaluation measures, therefore playing an important role in portfolio theory.

The study considers the market model for IT stocks in the Indian stock market, the National Stock Exchange. Along with the Nifty 50 index, the study considers other possible choices for the index, including the sectoral Nifty-IT index, the S&P 500 index, the USD-INR exchange rate, and the money market rate. The analysis was performed for a sample of nineteen IT sector stocks listed on the National Stock Exchange of India, of which nine stocks were large-cap, six were mid-cap, and four were small-cap. The study period considered was Jan. 1, 2018 – Dec. 31, 2018.

AICMS 2

Econometrics of Portfolio Optimisation Models

Mihir Dash[1], Rita S[2]

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This study compares the econometric properties of three important portfolio construction models, viz. Markowitz's (1952) mean-variance optimisation model, Konno and Yamazaki's (1991) mean absolute deviation optimisation model, and Young's (1998) minimax optimisation model, including randomness, normality, stationarity, autocorrelation, autoregressive modelling, and GARCH modelling. It is hypothesised that the mean-variance and mean absolute deviation optimisation models will have similar econometric properties, while the minimax optimisation model will have very different econometric properties from the former. The analysis was performed for a sample of nineteen IT sector stocks listed on the National Stock Exchange of India, of which nine stocks were large-cap, six were mid-cap, and four were small-cap. The study period considered was Jan. 1, 2018 – Dec. 31, 2018.

AICMS 3

Bayesian Analysis of Quadratic Transmuted Exponential Parameters with Lindley's Approximation

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Now-a-days, generalizing probability distributions is a very common practice, which uses an existing baseline probability model to capture and study the complexity of the data. Shaw and Buckley (2007) pioneer of the study on quadratic transmuted family of distributions. In this connection, this paper focused to study the behaviours of the parameters in exponential distribution on the generalization of quadratic rank transmuted map which is effective in analysing several lifetime data. The parameters are estimated using Bayesian methodology. Non-informative prior of Uniform is considered under symmetric and asymmetric loss functions and is assumed to estimate the rate and transmuted parameters of Quadratic Transmuted Exponential Distribution (QTED). Since, the Bayes estimators cannot be obtained in closed form, Lindley's approximation is used for the computation of Bayes estimators. The performance of these estimators are compared with different loss functions under Monte Carlo Simulation study in terms of mean square error.

AICMS 4

Comparative Study of Forecasting the Stock Indexes Using Brownian Motion and Artificial Neural Network

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The purpose of this study was to compare the accuracy and effectiveness of the Geometric Brownian Motion (GBM) method with the Artificial Neural Network (ANN) method for forecasting stock prices on the Bombay Stock Exchange (BSE). The researchers also examined the accuracy of the forecasts in relation to the number of days that the volatility and drift are moved. The results showed that the GBM method was more accurate than the ANN method in predicting the closing prices of the BSE index. This suggests that the GBM method may be a better option for forecasting future stock prices and guiding investment decisions.

AICMS 5

Assessing Tamilnadu's Rainfall Patterns Using Data Mining Algorithms

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This research paper aims to identify the forecasting of Rainfall in Tamil Nadu State using Machine Learning (ML) algorithms. Secondary sources of data were collected from the Department of Economics and Statistics, Chennai, covering the period from 1901 to 2020, with twelve months as the parameter. Initially, Principal Component Analysis (PCA) was used with the help of the elbow method, considering twelve months as parameters. The linear transformation between the variables was highly correlated with the input data. PCA achieved four factors, which were extracted based on the relation of the variables. The VARIMAX rotation identified the total variance explained, which was nearly seventy-five percent with four factors. The rotated component matrixes were named as winter, summer, post monsoon and monsoon seasons of Tamil Nadu. Additionally, to cross-validate these four factors, the k Mean++ machine learning algorithm was used and achieved a hundred percent classification of these weather patterns, which were visualized in the form of a scatter diagram. The monthly rainfall database was of a long period, allowing for a strong correlation and their weather patterns in Tamil Nadu to be achieved.

AICMS 6

Investigation of Topological Indices of Few Graphs

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Topological indices (TIs) are numerical invariants that relate to quantitative structure property/activity connections. The purpose of TIs was introduced to draw the data related to chemical graphs with respect to adjacent pairs of vertex degrees. These indices equip the researchers with a lot of information related to the properties and structure of the chemical compound. The concept of co-indices is considered for non-adjacent pairs of vertices. In this work, degree-based topological indices are determined for few types of graphs.

AICMS 7

An Analytical Study of Financial Modelling of CAPM Application in Valuation of Leading Indian Stocks

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The Capital Asset Pricing Model (CAPM) is a well-known and popular equity valuation model in finance which can render itself to even a layman in not so technical terms. According to Investopedia1, CAPM is defined as a Mathematical Model that estimates the expected return of an investment based on its riskiness relative to the rest of the market. The measure of systematic risk used here is Beta. The CAPM can be extended further by comparing the computed expected return with the actual return delivered by the stock which can provide insight into its appropriate valuation. A study in this respect was carried out by the researcher on 90 leading stocks in the Indian equity market over the period of one year from November 2021 to October 2022 and the valuation results (prediction of over or under valuation) decisions were compared with the average price gain of the same stocks over the next three months. The study using simple parametric statistical tools and its findings are enumerated in this paper which contributes towards the dichotomous validation of the CAPM model in today's VUCA world.

AICMS 8

Chaos and Control in the Covid-19 Dynamical System

Vivek Mishra[1], Sarit Mitra[2] Mihir Dash[3]

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In the present article, the dynamical system of COVID-19 has been analyzed under different parameters. The chaotic nature of the dynamical system has been observed. The active control method has been utilized for controlling the chaos in the system. The dynamical system has been considered with fractional order so that memory concepts can be included in the system. The SIR model has been used to simulate the spread of the disease.

AICMS 9

Prediction of Solubility of Anastrozole in Supercritical CO2 for the Development of Green Processing Using a Neural Fitting Approach

Chandan K [1], Peeta Basa Pati [2] and K. V. Nagaraja [3]

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This work investigates the solubility data for Anastrozole medicine in a supercritical fluid, and models were created to estimate the solubility values. The primary goal was to develop a predictive system for predicting drug solubility in a variety of operational factors for advanced green pharmaceutical manufacturing. Temperature and pressure are the characteristics employed based on the model's inputs. Neural fitting network is employed for modeling the problem. This model is used to simulate drug solubility and produce better results. One advantage of using a neural fitting method for a regression problem is the ability to model non-linear relationships. It can also learn to generalize well from the training data to unseen data. This means that they can accurately predict outputs for new inputs that were not seen during the training process. The model created in this study was discovered to be precise and durable in predicting drug solubility in supercritical solvents, and it can be utilised to build supercritical processing for advanced pharmaceutical production of solid oral dosage.

AICMS 10

Variant of Schnorr Signature Scheme Using Modified RSA Cryptosystem

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Digital signature is an important tool of cryptography which provides authentication to messages that are communicated over public channel. Schnorr signature is considered to be the simplest signature based on the difficulty of solving discrete logarithm problem. Intensive research is being carried out to improve the security of Schorr signature scheme. In this paper a new variant of Schnorr signature scheme using the concept of linear groups is proposed. As schemes based on the difficulty of multiple hardness are found to be more secure, the concept of modified RSA cryptosystem based on matrices is combined with matrices discrete logarithm problem. The security and complexity analysis of the scheme are also discussed.

AICMS 11

The Comparative Assessment of Digital Environment Development in Russia and Worldwide Based on Cluster Analysis

Ilia Zarov

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The paper discusses the application of Digital Adoption Index (DAI) developed by World Bank and used for an estimation of digital environment development across the world's countries. The DAI includes components assessing the digital development of government, businesses and people, and an integrated assessment of overall digital development of a country. Using cluster analysis of the publicly available DAI data for 2018 and 2020, the author aims to understand which cluster Russia belongs to, given the levels of digital development of government, business and people. The cluster analysis indicates the structural changes of digital development across the world from 2018 to 2020, as well as Russia's continuous place in the cluster of digitally advanced countries, typically represented by higher levels of economic development.

AICMS 12

Sign Preserving Weighted Essentially Non-Oscillatory Scheme

Arun Govind Neelan[1], Vinoth Paramanantham[2], Vijumon V.T.[3] and Jishnu Chandran R[4]

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Higher-resolution flux reconstruction is required to obtain an accurate solution to transport equations. The limiters and weighted essentially non-oscillatory schemes (WENO) are some of well-known the high-resolution schemes commonly used for higher-order cell-interface flux calculations. Some of the popular limiters like minmod, super-bee, and beta-limiters return zero as output when the slope of the left and right stencils are opposite. This property makes the limiters more robust and stable especially when strong shocks or discontinuities are formed in numerical simulations. The classical WENO schemes do not care about this issue. In this work, we propose a Riemann initial condition where most of the WENO schemes fail. We also propose a simple cure to this problem which we call a sign-preserving WENO scheme. The present scheme is tested on several gas-dynamics Euler equations to show the robustness of the scheme.

AICMS 13

Development of the Optimal Trajectory of Ascendant Analytics Based on the Integration of Statistical and Machine Learning Methods (On the Example of Data Analysis for the States of India)

Elena Zarova

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The development of machine learning methods and the emergence of new data sources raise methodological issues of combining "traditional" statistical methods based on hypotheses predefined by the researcher, and machine learning methods based on the concept of data mining, suggesting the absence or only partial use of predefined statistical hypotheses. Based on the integration of real statistical data on the states of India, collected from various official databases, the author created an information and analytical online platform. Using the data of this automatically updated platform, the principles of combining "traditional" methods of statistics and machine learning at the stages of "ascendant" analytics (from exploratory data analysis (EDA) to cognitive analytics) were developed and implemented. At the same time, the "optimality" of the choice is substantiated from the content and quantitative positions. For this, criteria for choosing a classification and regression method from possible options for "traditional" methods and machine learning methods (supervised and unsupervised) were developed and tested based on the author's proposed transformations of the known Akaike and Schwartz information criteria. At the same time, in contrast to the traditional application of these information criteria, an

increase in the number of unpredetermined factor variables is positively assessed if this does not increase (or only within a given threshold) the approximation error. Methods for forming a classification trajectory directly (or indirectly) based on regression are also proposed. In this case, the choice of method is based on a balance between an increase in the number of predictors due to the identification of latent predictors and a decrease in intracluster variance. In this case, we are talking about the choice (or substantiation of the sequence) of methods of cluster analysis, discriminant analysis, clustering based on PCA, neural networks and other methods. The algorithms proposed by the author for the formation of a bottom-up analytics trajectory based on a combination of traditional statistical methods and machine learning methods provide an increase in efficiency and a reduction in the time of analytics of complex economic and social objects.

AICMS 14

Efficient Evaluation of Lift and Drag Characteristics for The Hydroacoustic Analysis of Marine Current Turbines by Finite Elements

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The lifting surfaces for marine current turbines depend on one of the important characteristics of acoustic noise produced from its surface. The operational acoustic field behaviour must be known in the designing process of such airfoils utilized in marine applications. Field behavior and the coalition of mechanical waves around the airfoil generate the hydroacoustic nature. The significant designs of the hydrofoil sections such as NACA0012 and NACA0018 have been employed in marine environment applications. Lift and the drag produced in the movement of these airfoils depicts the major hydrodynamic analysis. The present analysis produces an accurate result for modelling a peripheral design for marine current turbines using finite cubic elements. These characteristics have been evaluated at Reynolds number 5×10^6 and Mach number 0.033 at different angle of attacks. The results show that the finite elements provide a computationally efficient and accurate solution to the problem of hydroacoustic analysis, demonstrating the potential of this method to support the design and optimization of marine current turbines.

AICMS 15

Empirical Analysis of Taylor's Series in Machine Learning and Artificial Intelligence

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This paper presents the empirical analysis of Taylor's series on Artificial Intelligence which is one of the important aspects of producing efficient solutions in various fields. Computers are impressive in data management and deep learning is used in exploiting this data into creating effective solutions for existing problems. The functions present in the processing layers can be calculated by Taylor's series in simple terms. As in the human brain layers of neurons just pass the electrical impulses in and out. This simple structure helps in understanding, mimicking the environment, and creating new things from the existing ones. Many complex problems in the present situation require computers to mimic this ability. Researchers have created digital layers to process the data in terms of functions to understand the model, which is deep learning and a subset of machine learning. The data through Taylor's series is also represented through functions and the constraints are represented through the number of unknown terms. Machines with maximum efficiency solve the functions with finite resources to improve the lives of billions. The study focuses on the application of Taylor's series in various algorithms and models, including regression and optimization methods. The results of the analysis indicate that Taylor's series can be effectively used to improve the accuracy

and efficiency of machine learning algorithms. The study also highlights the limitations and challenges associated with the application of Taylor's series in these fields.

AICMS 16

Methods for the Analysis of Spatial Autoregression (SAR) in the Study of Socio-Economic factors of Employment in Cities

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Cities and urban agglomerations that attract labor resources are the drivers of socio-economic development of regions and countries. Already, more than 80% of global GDP is generated in cities, and until 2030 almost half of the total increase in global GDP will come from about 400 largest cities.

But this leads to a significant gap between regions and does not contribute to the harmonious development of the territories, and also contradicts the UN Sustainable Development Goals. This paper focuses on urban employment issues, as one of the most important elements of sustainable development, directly related to demography. Issues of socio-economic factors influencing employment require deep methodological study. One of the most important elements of which is the collection of relevant and comparable baseline data at the municipal level. Unfortunately, conventional statistical observation don`t always provide the required quality and depth of data. The way out is to enrich the data with information from administrative sources. Based on the use of SAR technologies, the relationships between various socio-economic parameters of municipalities are modeled, taking into account their ambiguous mutual influence distributed in space and time, as well as the influence of "centers of gravity" – large cities and urban agglomerations.

The selected set of methods makes it possible to emphasize the features of territories, identify "centers of gravity" and points of growth, which ultimately allows to develop recommendations for regional authorities on balanced management of territories and decision-making based on a data-driven approach.

AICMS 17

Family History in Breast Cancer Development

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We study the family-specific risk of disease development, with a specific focus on breast cancer (BC). Our aim is to prove that family information is indeed crucial in the risk prediction models for BC, and that it can contribute to identify and target the highest-risk families for possible tailored, more intensive, screening. Specifically, we develop and compare some univariate and multivariate semiparametric disease onset models. We assume that family members are characterized by a true common risk (multiplicative frailty) of developing BC that is latent and unchanged from birth. We thus build a multivariate shared frailty Cox model for the age at onset, and a derived univariate frailty Cox model. As a further comparison, we also implement the widely used univariate Cox model with a covariate that captures any previous first-degree (mother and sisters) family history of BC as replacing the true frailty risk. Comparisons are made on model-generated data in terms of accuracy in risk prediction, focusing on the posterior frailty mean and median. In addition, we explore the use of the family-specific estimated posterior probability of belonging to the highest-risk families. We implement the models on a multi-generational dataset merged with BC registry data, within a collaboration with Karolinska Istitutet. In addition, we discuss

through parametric survival models the difficulties in estimating cure-rate models that allow for a fraction of subjects who will never experience the disease onset no matter how long they live.

AICMS 18

Econometric Modeling and Forecasting of the Impact of Water Consumption on the Growth of Agricultural Production in the Republic of Uzbekistan

Sayfullo Ahmedov[1], Bobir Tursunov[2] and Elena Zarova[3]

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The economy of Uzbekistan is closely dependent on the results of agricultural production, which, due to the country's natural features, requires intensive irrigation and melioration. Water consumption in agriculture is associated with the need for irrigation - this is the supply of water to crops on lands with a lack of natural water due to engineering and other measures. Also, water consumption is determined by land reclamation measures, which means a radical improvement of land through hydraulic, technical, chemical, agroforestry, agrotechnical and other measures. Currently, a number of Decrees of the President and Decrees of the Government are in force in the Republic of Uzbekistan, aimed at increasing the competitiveness and efficiency of agricultural production based on the technological, organizational and economic development of irrigation and melioration. To develop effective measures to regulate the development of water consumption in agriculture in Uzbekistan, information-efficient indicators of predictive analytics are

needed, for the development of which a block econometric model was built based on clustering the regions of Uzbekistan by indicators, including:

The volume of water received annually in the sectors of the national economy (m3 per 1 worker); growth rates of agricultural production by regions (%); water transmission (mln m3/ha); the volume of water consumed per 1 ha in the regions (thousand m3 per 1 ha).

Cluster analysis over five-year time intervals (2005, 2020, 2015 and 2020) showed that the composition of clusters is quite stable in time and there is a direct relationship between indicators of the intensity of water supply and water consumption in agriculture and indicators of the growth of agricultural production. However, during the Covid 19 period, the nature of this statistical dependence reversed, which gave a prolonged autoshock effect, which was taken into account when building the econometric model.

The developed model made it possible to obtain a variant forecast for the growth of agricultural production in the medium term (until 2027), taking into account the targets of state programs for the development of irrigation and melioration and the possibility of achieving them.

AICMS 19

Impact of Covid-19 on Educational Techniques

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The COVID-19 pandemic had a significant impact on the education system. Students were affected worldwide. Schools, colleges, and universities were forced to close, resulting in the widespread adoption of remote learning. This transition was challenging for many students, especially those without access to adequate technology or a suitable learning environment at home. Additionally, students have also faced increased stress and anxiety due to the pandemic, affecting their mental health and overall well-being. Remote learning had a mixed impact on students during the COVID-19 pandemic. Some of the positive effects include increased flexibility, convenience in scheduling, and reduced transportation costs. The long-term effects of the pandemic on education and students are yet to be fully understood, but it is likely that they will include disruptions to learning, increased inequalities, and changes to the way education is delivered in the future.

AICMS 20

A Machine Learning approach for Predicting Brain Stroke

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Approximately 7.9 billion people live on Earth now. People are currently experiencing a wide range of health problems, illnesses, strokes, and other conditions. An emergency medical situation exists when it comes to brain stroke. When the blood flow to the brain or certain areas of the brain is cut off or there is any other disruption in the process, it is called a stroke. As a result, there is a reduction in the supply of nutrients and oxygen to the brain tissues. In this instance, brain cells start to perish every minute. The brain stroke can be of two types, namely Ischemic and hemorrhagic. Hence the aim of our working system is to reduce the chances of brain stroke or better prevent them by taking few inputs from the user and predicting the output based on the data entered. The process is done using the machine learning techniques and the working system have obtained an accuracy of 94.2% approximately.

AICMS 21

Social Anxiety among Trainee Audiologist and Speech Language Pathologist in Bangalore: A Cross Sectional Study

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Social anxiety generally refers to an overwhelming fear on social situations. Having social anxiety among people may be very prevalent and specific to certain situations, however this can turn into a serious mental health disorder such as social anxiety disorder (SAD).

Aim of the study:

1. To compare social anxiety among student audiologist and speech language pathologist between social and clinical situations

2. To check the reliability of the questionnaire that have used for the assessment purpose.

AICMS 22

On Characteristics of t-Norms under the Doubt Q-Fuzzy T-Sub algebra and Ideals in BP-Algebra

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We propose the t-norm of the doubt Q-fuzzy T-subalgebra and the T-ideal of the BP-algebra, and investigate some of their properties in this work. In addition, we define properties of Cartesian products of doubt Q-fuzzy T subalgebras and T-ideals of BP algebras. These are treated in detail along with other algebraic properties.

AICMS 23

On Distributional Properties and Application of Truncated Mirra Distributions

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In this research investigation, we have introduced and studied truncated versions (lower, upper, and double) of Mirra distribution (Sen et al.~2021). Different structural and distributional properties, such as, moments, generating functions, popular entropy measures, order statistics, and survival characteristics of the upper truncated Mirra distribution have been investigated in detail along with different characteristics. Method of maximum likelihood has been applied to estimate the unknown parameters of the unknown parameter in truncated Mirra models. Monte-Carlo simulation experiments have been performed for comparing the performances of the proposed method of estimation for both small and large samples under the lower, upper and double versions. Real life data have been analysed to understand the applicability and relative importance of the truncated models with respect to other important lifetime distributions.

AICMS 24

On Some Stochastic Comparisons of Renewal, Trend Renewal and Quasi Renewal Processes

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Usual stochastic order relations between random variables to compare renewal, trend renewal and quasi renewal processes is proposed and studied in this article. The objective is to study usual stochastic order to compare renewal, trend renewal and quasi renewal processes based on ageing properties of the generating inter-arrival times. An ordinary renewal process is a subclass of the generalized counting process, where the inter event times are independent and identically distributed non-negative continuous random variables having common distribution function F(.) known as renewal distribution. Trend renewal process (Lindqvist, 1993) is a time-transformed renewal process, where the time transformation is given by a trend function $\lambda(.)$, where $\lambda(t) \geq 0$ for $t \geq 0$. The quasi-renewal process is a generalized renewal process, proposed by Wang and Pham (1996), whose applications may be found in imperfect maintenance. Furthermore, the results obtained are illustrated with a few examples as well as remarks.

AICMS 25

Risk Prediction for Right-Censored Survival Data: An Empirical Comparison of Traditional Vs. Machine Learning Methods

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Survival analysis provides the statistical framework for time-to-event modelling. We compare the traditional approach to risk prediction for right-censored survival data based on the Cox proportional hazards model, to machine learning approaches for the same purpose. Our analysis is based both on synthetic data and implemented on data from randomized clinical trials studying adjuvant treatment for breast cancer.

AICMS 26

Neuro-Soundings in Industry 7.0 Decisions

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The purpose of this research is to reveal the dominant processes of fluid intellect (gf) in the human brain. The primary aim is to model neuro-managerial fluid intellect at an explorative as opposed to complex deductive task level by mapping human brain waves using an electroencephalograph (EEG). The aim is to firstly combine neuro-managerial science with the common psycho-neuro-economic modeling approach. And secondly, to seek empirical evidence of the multiple neural systems involved in fluid intellect. The output from which is a contribution at the nexus of investigative/behavioral research and computational economics with the aim of expanding the use of computational models and replication to complement and/or explain results for industry 7.0 decision makers.

The intention is to put into operation a variety of agent-based models in order to capture the regularities observed in experimental data. The objective is to monitor brain wave drivers to better understand managerial behaviour and preference making. This paper proposes chess - board dynamic conditions matrix with ideas that; (a) frogspawn patterns of heretical appraisal; and, (b) link methodological differences. Through a computational approach an attempt is made to clarify how neural investigations realize 'mental stimuli' in managerial fluid intellect making. The focus of the research is to understand

the neural processes involved in how managers actually craft fluid intellect, and to understand their mechanisms of fluid intellect industry 7.0 decision making.

AICMS 27

Simple Encryption

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We have heard an enough number of times about what an encryption is, and a dozen of practical importance since the last three decades due to the development in the field of computer science data resource and Internet sharing. Re-visiting the concept says in short sentence, to convert your given information to a different source format which is only recognised/revised/ repacked only by its required receiver. This research paper is about a simple encryption which can be made using elementary programming languages rather than any other official encryption methods on internet which indeed are hard and requires large steps to understand. This algorithm can be used when the device could be customized or old enough to access communication service like email but, not communication application because any access through them while using internet are usually universally programmed and implemented which could be traceable in the end by an unknown source or program. The main aim of the program is to implement offline and send the encrypted data totally programmed by yourself any day.

AICMS 28

Crime Rate Prediction Using Machine Learning

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Crime prediction is a scientific method for detecting patterns and trends in crime. By identifying patterns of past crimes or identifying the most common types of crime in an area, crime forecasting can help to prevent recurring crimes in an area, building a Crime Prediction System speeds up the investigation of crimes and lowers the crime rate. Various methodologies are available such as association rule mining, decision trees, neural networks, and Bayesian networks, but the K-NN classification algorithm and K-Means Clustering are selected to implement the system. K-Means algorithm clusters data according to the similarities between data samples, while K-NN algorithm classifies new data into already formed clusters by measuring its distance with nearest clusters. Features important for proper prediction of crime makes use of the hour when the crime took place, Latitude, Longitude and type of crime happened. The proposed system minimizes errors significantly in predicting crimes, making it one of the most promising systems for use.

AICMS 29

Alternate Data Compression

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We have had different way to store data in different places, like writing records of data by mortal scientists which are even seen as an amazing piece of art by Einstein or the paintings in cave by first human generation saying how their adaptation to nature is different from ours, etc.., But all these information are represented in billion ways spread all over the planet. Out of all areas used to store data, computer devices are still the most prominent and the most successful instrumented used for store tons and tons of chunky billion data into megabytes of storge. Even if we have succeeded in making them efficient, we still have been running out of storage data day by day for thousands of different reasons. This is where data compression has come into place form history of computer technologies, a large continuous form of binary data to smaller format which has to be easy enough to unpack it later when needed. We already have different methods to do this compression, and I have tried an alternative method from my inventory which could be useful for most practical scenario. This data impression method has worked more easier than other actual methods found to extract the same data.

AICMS 30

To have Permanent Watermark on Softcopies

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The age of digitalization has to be the present because of the ratio we have over today's generation to use any method necessary to capture using a handful pocket devices like mobiles phones to personal computer that can make their memories to their freedom and benefit. Now, nowhere around this world is fair to help everyone's wellbeing without their profit. Out of this classical speech, can we consider a case of a software photoshop designers, where they are trying to establish or build a software from years of Computer science architecture, but the credit is lost as soon as person pulls out the watermark using any anti-tools, leaving no signing of credits to creator nor post. This can also lead to lost source information and end as a useless to unknown areas. To abolish this, simple watermark is not enough where it could be removed by common colour correction found online, we have to implement a software program, where only the creator has to access and alter the data in an Image or Video filing initially.

AICMS 31

A New Type of Closed and Open Maps in Topological Spaces

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Let $(X.\tau)$ and (Y,σ) be two topological spaces. A function $f:(X,\tau)\rightarrow(Y,\sigma)$ that maps closed sets to closed sets is known as a closed map. Likewise, an open map is a function that maps open sets to open sets. In this work, a new type of closed and open maps called gg-closed maps and gg-open maps in topological spaces are introduced and studied. A relation between these maps with existing maps in topological spaces is established and represented in the figure. Also, important properties of these maps are discussed along with the examples. Further, introduced and studied the concepts of gg*-closed maps and gg*-open maps in topological spaces.

AICMS 32

QSPR Analysis of Few Antibiotic Drugs Used in Various Ailments

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High-throughput screening is a very expensive process for investigating the chemical libraries. It is a traditional method which consumes a lot of time. The selection of lead molecules for drug design/research may be done by Quantitative Structure–Activity Relation (QSAR) modelling that can be chosen based on the data from reference compounds, being active and inactive. Good topological indices are required that represents the molecular features of the respective molecular activity. In this work, 12 antibiotic drugs are studied for which nine degree-based topological indices are computed. QSPR analysis is carried out for six physicochemical properties of the compounds and a detailed summary is mentioned in the conclusion. The article is concluded with appropriate references.

AICMS 33

Linear Programming Technique to Minimize the Production Cost for A Manufacturing Company

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This paper demonstrates the use of linear programming technique to optimize the production cost of Cartons at Shree Lakshmi Craft. The primary data is collected from the owner of the company. A linear programming problem (LPP) was framed based on the following constraints, raw materials, production capacity and demand per month. Further the LPP was solved using graphical method and simplex method (excel solver). The results showed that the company should manufacture 3,60,000 unit of cartons per month in order to minimize the cost of production.

AICMS 34

Estimation of Volume under ROC Surface for Diagnostic Classifier Following Exponential Distribution

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Biomarkers play a vital role in detecting the presence of disease or medical condition of interest. The challenging tasks in clinical diagnosis are to interpret the performance of biomarkers. To evaluate the biomarker's efficiency, the most advantageous tool used is Receiver Operating Characteristic (ROC) Curve. For two class problems (abnormal and normal), various models and alternatives are developed to find the biomarker's performance. In this study, the two-class problem has been further extended to the three-class problem i.e. (normal, suspicious and abnormal). The three-class exponential ROC model, Volume Under the ROC Surface (VUS), asymptotic variance and Confidence Interval (CI) for VUS have been derived. The model has been validated using simulated data from the underlying distribution.

AICMS 35

Impact Of Emoji Advertisement on Consumer Purchase Decision: Through A Lens of AIDA Model

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In a research paper by Ge & Gretzel (2018), they said "use of variety of language options to persuade customers as it is the of marketing is creating consumer satisfaction at a profit". Because of the new language modes that social media has produced, such as animated tickers, graphics interchange format (GIF), emoticons, and emojis, social media rhetoric goes beyond the realm of marketing rhetoric as it is now practiced. The use of these novel linguist constructions in consumer interactions on social media is crucial. In order to create, carry out, and manage their rhetorical strategies in a way that can elicit favourable consumer responses in this new persuasion realm, businesses must therefore embrace such inventive language. According to Statista Research Department (2022), 5.03 billion people use the internet, and 4.7billion utilize social media. Turner (2022) estimates that as of October 2022, there would be10.98 billion mobile connections, 6.64 billion smartphone users, and 7.26 billion mobile phone users worldwide. This research paper will focus on how brands can use emoji advertising to increase customer engagement and motivation to purchase. The model used will be the AIDA (Awareness, Interest, Desire and Action) model to see how a food emoji advertisement can lead to ordering

food. The AIDA model in this research where awareness is understanding the message of the emoji advertisement, interest is the reaction to the emoji advertisement, desires the engagement through the emoji advertisement and action is ordering food. The two brands chosen for this research are from the food industry, McDonald's and Domino's.

AICMS 36

Vehicle Routing Problem in Agrilogistics

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Management and supply of fresh agriculture products to different cities is a cumbersome task in today's scenario. Information driven integrated supply chain management provides a support to reduce the inventory cost, product value and reduce the time-lag between the production and availability & accessibility of agro-products in market. The study conducted focused to optimize the operational cost by using vehicle routing problem technique. The paper investigates the evolution of Travelling Salesman problem in supply chain management in Agri-logistics using optimization technique.

AICMS 37

The Regulatory Challenges of Fintech in India

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The fintech industry has rapidly grown in recent years, disrupting traditional financial services and creating new opportunities for consumers and businesses. However, this growth has also brought regulatory challenges for fintech companies and policymakers. This research paper explores the regulatory challenges facing the fintech industry, including issues related to data privacy, cybersecurity, consumer protection, and competition. The paper examines the current regulatory landscape and the different approaches taken by regulators around the world. Additionally, the potential implications of regulatory challenges on fintech innovation, access to finance, and financial stability. The research highlights the need for effective and balanced regulation that fosters innovation while protecting consumers and promoting financial stability. Fintech companies offer innovative solutions such as mobile payments, peer-to-peer lending, Robo-advisory services, and blockchain-based solutions that have disrupted traditional financial services. Regulators are increasingly concerned about the potential for data breaches, identity theft, and cyber-attacks, which can have severe consequences for consumers and the financial system. Competition is also a regulatory challenge for fintech companies, as they often compete with established financial institutions that have significant market power and regulatory advantages. Regulators need to ensure a level

playing field for all players in the financial industry to promote innovation and consumer choice. The regulatory landscape for fintech varies widely across different countries, with some jurisdictions embracing fintech innovation and others taking a more cautious approach. Different regulatory approaches and the potential implications for fintech innovation, access to finance, and financial stability. Overall, the research highlights the need for a balanced and effective regulatory framework that fosters innovation while protecting consumers and promoting financial stability. A collaborative approach involving fintech companies, regulators, and policymakers is necessary to address the regulatory challenges facing the fintech industry.

AICMS 38

Super Keepers in Talent Management – A Bibliometric Analysis

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In the current business context, with its complexities and uncertainties, organizations face numerous challenges in retaining talent. Key talent is a scarce resource and organizations engage in the "War for Talent" a term coined by McKinsey (1999). Human capital can be a source of sustained competitive advantage (Barney,1992). Over the last two decades, numerous studies have been conducted on the subject looking at various aspects of Talent Management. However, there is a dearth of information on how key talent is also referred to as "super keepers". This study is an attempt to bridge this gap and looks at the evolution of the subject and various perspectives using bibliometric techniques.

AICMS 39

A Review of Nutrition Optimization using Linear Programming

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Quality food having proper nutritional value directly corresponds to human health and quality of life. The deficiency of just few micro-nutrients can lead to mild to severe health conditions. Maintaining adequate nutritional requirements for all is an economical challenge obvious by the prevalence of malnutrition and scarcity of food in most developing and underdeveloped countries. Also, the need of Nutritional Optimization can't be ruled out for developed countries fully. Comparison of Diet Optimization techniques based on Linear Programming (LP), Dynamic Programming (DP), Genetic Algorithms (GA) and Particle Swarm Optimization (PSO) has been discussed in this study. This study also discusses major LP solutions that were developed in past two decades that witnessed the rise in computational capabilities of computers in parallel to solve these problems optimally. Furthermore, the study provides a detailed and comparative analysis of different studies based on nutritional, economical, ecological and acceptance constraints using LP. LP proves to be an important tool for providing solutions to different classes of diet problems and can contribute to alleviate nutritional deficiencies; however, there is still a possibility of future

work combining different degrees of a variety of constraints to provide more optimal solutions. In addition, it has been observed in the study that LP shows a high potential to provide unimaginable new diet recommendations from the food items available based on nutritional requirements.

AICMS 40

Artificial Intelligence as Competitive Advantage for Business Sustainability

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Artificial Intelligence (AI) is the ability of machines to perform certain tasks, which need the intelligence showcased by humans. AI allows machines to understand and achieve a specific goal which includes both machine learning and deep learning. Machine learning refers to machines automatically learning from existing data without being assisted by human beings, whereas deep learning allows the machine to absorb huge amounts of unstructured data such as text, images, and audio. AI can enable businesses to analyse customer data, identify their behavioural patterns, and target the right customers with the right products at the right time. AI can apply powerful predictive capabilities and intelligent grid systems to manage the supply and demand. Through the systematic literature review, this research paper analyses the convergence of the AI and corporate strategy for business sustainability. It aims to explore the benefits of AI, ways to increase the operational efficiencies and to make better business decisions.

AICMS 41

Typology of Customer Intention to Use Digital Payment Systems in India. A Cluster Analysis

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India has one of the fastest-growing Fintech landscapes in the world. According to PhonePe and Boston Consulting Group, India's digital payment will triple from $3 million to $10 trillion by 2026. The Unified Payment Interface (UPI) introduced by the Government of India in 2016 witnessed ₹ 4 trillion in value transactions till date. The digital payments infrastructure under the UPI are Digital payment modes considered are BHIM-UPI, IMPS, NACH, AePS, NETC, debit cards, credit cards, NEFT, RTGS, PPI and others. In this paper, we apply cluster analysis to examine the behaviour of customers in using digital platforms for financial transactions. For instance, Gex z may prefer digital wallets; Gen y may prefer credit card payments, and baby boomers use only ATMs. Applying fuzzy clustering, k means, and hierarchical clustering, our study categorises the customers based on their intention to use digital payments. Post classification, we aim to create Typology for various classes of customers. Our research output would facilitate the stakeholders to under the customer segmentation for digital payments and come out with appropriate strategies for digital payments.

AICMS 42

Statistical Approach to Evaluate the Crop Yield

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The increasing population and the ever-increasing demand for agricultural product laid a considerable interest of scholars, mathematicians and statistician to estimate the gap existing between the crop productivity and the need of production. Numerous methods are being adopted by mathematicians to evaluate the yield potential of a crop, but there is no such approach that predict the site and season specific crop based on the existing dataset. The purpose of the model formulated is to develop a novel approach to identify the crop yield using different statistical and optimization tools. Multi-criteria decision-making techniques and multi-regression model results is being compared to evaluate the impact of field parameters on crop yield and production.

AICMS 43

Empirical Evidence of Rhetoric Effect Strategies in Advertising

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Understanding GenZ consumer behaviour is difficult given that this generation comprises 25% of the Indian population. On the other hand, rhetorical persuasion techniques are frequently employed, tried, and true, and they are part of the communication mix. Therefore, the purpose of this study is to investigate how rhetorical persuasion techniques used in advertisements affect Gen Z consumers' decision to buy. The threshold model for consumers' purchase decision process in the form of logistic regression has been applied to examine the influence of ethos, pathos, and logos on the purchase decision of GenZ consumers in India in order to achieve the research's objective. Results show that using ethos, pathos, and logos strategies in advertising has a positive impact on Gen Z consumers' decision to buy. This study also found that the impact's direction is consistent across both genders of Gen Z consumers. This study is the first of its kind to look at how advertisements' use of rhetoric affects Gen Z consumers' purchasing decisions, particularly in India. This study makes the case for the value of persuasion strategies in advertisements and opens up new avenues for research into how rhetorical strategies can be used to influence consumer brand preference.

AICMS 44

Interpretable and Ethical AI: A Review of Explainable Artificial Intelligence Techniques and Applications

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Explainable Artificial Intelligence (XAI) has become increasingly important as AI systems are being used in more complex and critical domains. The ability of an AI system to provide transparent and interpretable explanations of its decisions is a fundamental requirement for building trust and accountability in these systems. This study reviews the current state of XAI research and its applications, focusing on the various techniques and approaches that have been developed to make AI systems explainable. The paper examines the challenges of designing explainable AI systems and the methods that have been proposed to overcome these challenges. It also explores the ethical and social implications of XAI, including issues related to privacy, transparency, fairness, and bias. The study concludes that XAI is essential for ensuring that AI is used responsibly and ethically, and that further research is needed to improve the explainability of AI systems and address the challenges of implementing XAI in practice. The findings of this study can help researchers and practitioners in AI and related fields to better understand the importance of XAI and its potential applications.

AICMS 45

The Evolution of Number Systems and Their Impact on Mathematics-A Review

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This paper provides a comprehensive review of different number systems used in various cultures and civilizations. It covers the historical development and usage of the Decimal, Binary, Hexadecimal, Octal, Roman, Babylonian, and Egyptian number systems, and discusses their unique characteristics, advantages, and limitations. The literature review includes recent research studies and publications by various authors, which highlights the current understanding and ongoing research in each of these number systems. Additionally, a comparative analysis between these number systems is provided to identify their similarities and differences. Overall, this paper serves as a valuable resource for researchers, educators, and students interested in the history and evolution of number systems.

AICMS 46

Energy of Some Unicyclic Graphs and Omega Invariant

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A unicyclic graph is a graph which contains exactly one cycle. In a connected unicyclic graph, the number of edges must be equal to the number of vertices. Energy of a graph had been defined by Gutman nearly five decades ago as the sum of the absolute values of the eigenvalues of the adjacency matrix, which are the roots of the so-called characteristic polynomial, of the graph. In this paper, our aim is to obtain the characteristic polynomials corresponding to unicyclic graphs having the same given degree sequence using the concept of omega invariant $\Omega(G)$ of a graph G which was recently defined by Delen and Cangul. We also obtained some of the terms of the characteristic polynomials of these graphs. In particular, we deduce a formula for the specific unicyclic graphs Tr,1.

AICMS 47

The "Input-Impact" Approach in the Statistical Study of Health Care Development at the Regional Level

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In the study of healthcare development at the national and regional levels (as well as for other systemic multilevel and multifunctional socio-economic objects), the most important basic issue is the creation of an initial information base that allows the formation of an information-efficient system of indicators. Taking into account the multidimensional nature of the socio-economic results of healthcare development, the variety of financial and non-financial development resources, the availability of data on the development of medical infrastructure, the author proposes a system of statistical indicators that includes interrelated blocks: "Input" - "Output" - "Outcome" - "Impact". The principles for the formation of this system of indicators are based on the recommendations of Eurostat. In accordance with the subject and object of the study, the "Input" block includes indicators of the resource provision of health care, including employees, the available material base and funding from budget sources, compulsory and voluntary health insurance. The "Output" block is represented by indicators of the provision of the population with health services, the "Output" block includes indicators of the level of morbidity and mortality by disease classes, as well as an increase in the export of medical services, the "Impact" block contains indicators of life expectancy

(including healthy life, the life of the population older ages), as well as indicators of the Sustainable Development Goals related to public health. The development of this system of indicators of official statistics of the Russian Federation made it possible to conduct a statistical study, identify and evaluate multi-level quantitative patterns of the interdependence of indicators that determine the development of healthcare.

The developed econometric model is a valuable information basis for making decisions on the regulation of healthcare development in the country and regions.

AICMS 48

On the Quantum Simulation of Fractional Schrödinger Equation in a Strongly Correlated System

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We propose a new path integral simulation based on Feynman-Kac path integral method for space fractional Schrödinger equation with some application to Bose Einstein Condensation. Recently it has been theoretically shown that at the mean field level the strongly interacting many particle systems can be well described by fractional Gross-Pitaevskii equation (FGP). While a lot of work has been done in connecting these FGP equations arising in BEC to standard path integrals, not much work has been done in solving them numerically. Even though the relative motion of the strongly interacting particles can be described by FGP, the quantum effect in relative motion is not captured in this mean field approach. We found that to put a Quantum flavor to the calculations we need to apply a Quantum Monte Carlo technique based on Feynman-Kac path integral method.

As a matter of fact, the FGP equation can be mapped to a generalized fractional Schrödinger equation and the underlying stochastic processes are Le´vy stable distribution and Continuous Time Random Walk (CTRW) as opposed to usual Gaussian

random walk. This generalized Le´vy Schrödinger equation is applied to strongly interacting Bose-Einstein Condensate and simulated by Feynman-Kac path integration.

AICMS 49

Improving Model Selection Using Cross-Validation Error

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Cartesian grid search using K-fold cross-validation (CV, Stone, 1974; Allen, 1974) is a simple and popular method for tuning predictive models, $f(X; \theta)$, with hyper-parameters

$\theta = (\theta 1, \theta 2 \ldots)$. The CV prediction error (ErrCV) is computed for all combinations of preselected values of the model's hyper-parameters, called settings, and the setting that corresponds

to the lowest error is chosen as the most promising. Cross-validation is computed by partitioning the available data into K "folds" each of which in turns is used to compute the prediction error of the model trained on the remaining data. It is well known that due to the variability of ErrCV grid search results are not always trustworthy. Therefore, methods like Repeated CV (RCV) are used to increase the precision of ErrCV by averaging. We propose a method, that we call Blocked Cross-validation (BCV) which improves on RCV by blocking the computation of ErrCV. We will show, theoretically and with examples, how BCV reduces the variability of ErrCV, thus yielding a more reliable model selection criterion.

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Certain Subclasses of Univalent Functions Associated with Wanas Operator

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Making use of the Wanas operator, we define a subclass of uniformly convex functions and a corresponding subclass of starlike functions with negative coefficients and obtain coefficient estimates, extreme points, distortion and growth properties, square-root transformation, the radii of close to convexity, star likeness and convexity for the class

$$TS_{\alpha1,\beta1}^{k,\delta}(\alpha,\beta,\gamma)$$

In particular, we obtain integral means inequalities, inclusion relations, partial sums, subordination results, closure properties under integral transforms and weighted mean and arithmetic mean results for the function f belongs to the class
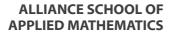
$$TS_{\alpha1,\beta1}^{k,\delta}(\alpha,\beta,\gamma)$$ in the unit disc.

About the Conference

This conference is to provide a platform for researchers with inclusiveness for all those who are associated with education and research in the fields of Mathematics, Statistics, and Data Science. This conference will develop professionalism among the students, and new concepts will be shared with the participants and delegates, which will enrich the departments and the participants. This conference promotes the original research of scholars in relevant fields, to discuss new approaches and techniques of applied mathematics for data science. This gives educationists, academics, technocrats, and other stakeholders a chance to help meet the needs of education.