99th
**Indian
Science
Congress**

3-7 January, 2012 - Bhubaneswar

99ᵗʰ Session of the Indian Science Congress

SECTION OF

MATHEMATICAL SCIENCES
(including Statistics)

President
Prof. Ashis Sen Gupta

The Indian Science Congress Association

PROCEEDINGS

OF THE

NINETY NINTH SESSION OF THE

INDIAN SCIENCE CONGRESS

Bhubaneswar, 2012

PART II

SECTION OF MATHEMATICAL SCIENCES

(including Statistics)

President: **Prof. Ashis Sen Gupta**

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99th Indian Science Congress
January 3-7, 2012, Bhubaneswar

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PRESIDENTIAL ADDRESS

President
Prof. Ashis Sen Gupta

DIRECTIONAL STATISTICS: MEETING CHALLENGES FROM MULTIDISCIPLINARY RESEARCH

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SECTION OF MATHEMATICAL SCIENCES (INCLUDING STATISTICS)

In this era of emerging complex problems, multidisciplinary research in mathematical sciences has become indispensable. The existence of multiple paradigms, while lending flexibility and freedom of choice of tools, demands knowledge on their shortcomings. Indiscriminate use of not only existing software but also of statistical methodologies have become alarming and are leading to completely misleading inferences. Notwithstanding such pitfalls, ideas from several disciplines do enrich the contribution of the research work. Directional data (DD) refer to observation on angular propagation, orientation, displacement, etc. Data on periodic occurrences can also be cast in the arena of DD. Analysis of such data sets differs markedly from those for linear ones due to the disparate topologies between the line and the circle. First, methods of construction of probability distributions for such data are presented. Then it is shown how statistical procedures can be developed to meet challenges of drawing sensible inference for such data arising in a variety of applied sciences. Applications to real-life problems enhance such work for the usefulness of our society.

99th Indian Science Congress
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II

ABSTRACT OF

PLATINUM JUBILEE LECTURE

PROBABILITY MATCHING PRIORS FOR EMPIRICAL AND RELATED LIKELIHOODS

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SECTION OF MATHEMATICAL SCIENCES (INCLUDING STATISTICS)

ABSTRACT

Probability matching priors have been of significant interest over the last two decades. They are appealing to Bayesians as objective priors and to frequentists as a means of obtaining accurate frequentist confidence sets with Bayesian interpretation. Much of the existing literature on probability matching priors centers around parametric likelihood based on the true density. Only in recent years such priors have been investigated also with reference to semi parametric likelihoods, such as empirical or related likelihoods, which avoid specific model assumptions. The present talk aims at reviewing the latter development with special emphasis on the role of data-dependent priors in this context.

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III

ABSTRACTS OF

YOUNG SCIENTIST AWARD PROGRAMME

THWAY MODEL AND ITS APPLICATION IN REACTION RATE THEORY IN ASTROPHYSICS AND APPLIED ANALYSIS

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ABSTRACT

The pathway model introduce by Mathai in 2005[Linear algebra and its application, 396,317-328] is used to extend the slandered non resonant thermonuclear function. A brief review of the development of the extended non-resonant thermonuclear reaction rate probability integral in the Maxwell-Boltzmann case and cut-off case is given. The closed form of the reaction rate probability integral is obtained via Meijer's G-Function. The fusion Energy integral is evaluated by integrating the extended thermonuclear function over the temperature. An interpretation for the pathway parameter is given in physical terms and illustrated by using graphs. A new integral transform called P-transform is obtain through the pathway idea as another application of pathway model. The behavior of the kernel functions of the p-transform is also studied.

ESTIMATING ENTROPY OF SEVERAL EXPONENTIAL POPULATIONS WITH COMMON LOCATION AND UNKNOWN SCALES

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ABSTRACT

We consider the problem of estimating the entropy of several exponential populations when parameters are common and scale parameters are unknown and unequal. The uniformly minimum variance unbiased estimator is derived. A general inadmissibility result for the affine equivalent estimators is proved.

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IV

ABSTRACTS OF

SYMPOSIUM/ INVITED LECTURE

MODELLING - AN INTEGRAL INPUT FOR INFERENCEING

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Models are simplified (sometimes simplistic) versions of real-life phenomena in the perceptual world which facilitate understanding the underlying mechanisms (laws) , predicting future states of the associated system and controlling the system at a desired state. Models coupled with evidences relating to the system enable inferences about the underlying phenomena. Mathematical models – deterministic and probabilistic—are developed or selected, tested for appropriateness and finally solved analytically or numerically to study diverse systems. Model-based inferences about the underlying systems) are only as good or bad as the models are for representing the systems. Some models provide an insight into the system and its behavior over time or space, while there are models which seek some optima and are prescriptive in nature. Development of a comprehensive model based on knowledge and experience about a system is not always easy and one usually goes to select one out of a basket of existing models, based on some criteria and supported by some tests. Solutions too many probabilistic models are deterministic in character without involving any data. In some cases, we adopt a wait-and-see approach to solve a stochastic optimization model where the final solution is data-dependent.

BOUNDS FOR RELIABILITY AND MEAN LIFE OF COHERENT SYSTEMS OF POSITIVELY AGEING COMPONENTS

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Coherent systems are composed of components. The system operates as long as a particular subset(s) of the components operates. The components have random failure times; so does the system. The Reliability of the system is the probability that the system does not fail before its mission time and its mean life. Let the component life times be independent random variables. The reliability function of coherent systems is an increasing function of the survival functions of the component life times. Various partial orders among distributions are used to define classes of positive ageing distributions. We obtain bounds for the reliability and the mean life of coherent systems in terms of the reliability and mean life of similar coherent systems composed of components with exponentially distributed life times. The partial orders considered include the convex order, the star order, the failure rate average order, stochastic dominance order, etc. The bounds are seen to be useful in devising systems with required reliability and mean life by choosing components with certain means or quintiles of a fixed order.

HISTORY OF SET THEORY AND ITS EXTENSIONS IN THE CONTEXT OF SOFT COMPUTING

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The arithmetization programs of mathematicians in later half of nineteenth century showed that it is necessary to rebuild analysis. Riemann's attempt to find necessary and sufficient conditions for representation of a function by its Fourier series led to the reorganization of different types of infinite sets. This fact motivated Georg Cantor to develop unified theory of sets. In fact Cantor's interest in set theory stemmed from his researches on trigonometric series in general and Fourier series in particular. Nowadays, theory of sets and functions forms the foundation upon which the structure of modern mathematics is built.

Special Invited Lectures (IL-2)

STOCHASTIC PROCESSES WITH ALMOST PERIODIC STRUCTURE

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A class of non-stationary process with almost periodic mean function and almost periodic covariance function is considered for modeling and estimation. Such a process has its spectral mass concentrated on lines parallel to the diagonal line of the spectral plane. Methods based on spectral estimation are used to estimate the support of the spectral lines. When the mean function is modeled by a trigonometric series regression, consistent estimates for frequencies, amplitudes and phases of the regression are obtained when the noise process is non-stationary but with periodic covariance function. Similar problem is considered for a class of non-homogeneous Poisson point process with almost periodic

intensity function. These models can be used to facilitate the prediction of future events.

OPTIMIZATION OF ENTROPY IN MATRIX-VARIATE CASE AND PATHWAY IDEA

A.M. Mathai

Director, Centre for Mathematical Sciences and Emeritus
Professor of Mathematics and Statistics, McGill University, Canada

Generalized entropy involving matrix-variant functions is optimized and a generalized matrix-variant density is obtained. A switching mechanism is introduced in the model so that the model can cover a wide range of matrix-variant functions including matrix-variant statistical densities. The scalar versions are shown to extend the most popular Tsallis statistics and super statistics in the area of non-extensive statistical mechanics, versatile integrals and Kratzel function in applied analysis, and many other functions and statistical models.

Special Invited Lectures (IL-3)

DIGITAL GOVERNANCE AND SURVEILLANCE HOTSPOT GEO-INFORMATICS FOR MONITORING, ETIOLOGY, EARLY WARNING AND SUSTAINABLE DEVELOPMENT WITH APPLICATIONS TO NATURAL AND ENVIRONMENTAL RESOURCES

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Geo-informatics surveillance for spatial and temporal hotspot detection and prioritization is a critical need for the 21st century Digital Government. A hot spot can mean an unusual phenomenon, anomaly, aberration, outbreak, elevated cluster, or critical area. The declared need may be for monitoring, etiology, management, or early warning. The responsible factors may be natural, accidental or

intentional. This lecture will describe multidisciplinary research based on novel methods and tools for hot spot detection and prioritization, driven by a wide variety of case studies. These case studies deal with critical societal issues, such as water resources, ecosystem health, public health, persistent poverty, remote sensor networks, and early warning. The geosurveillance provides an excellent opportunity, challenge, and vehicle for synergistic collaboration of statistical, computational, technical, and social scientists. Our methodology involves an innovation of the popular circle-based spatial scan statistic methodology. In particular, it employs the notion of an upper level set and is accordingly called the upper level set scan statistic, pointing to the next generation of a sophisticated analytical and computational system, effective for the detection of arbitrarily shaped hot spots along spatio-temporal dimensions. We also propose a novel prioritization scheme based on multiple indicator and stakeholder criteria, using revealing Hasse diagrams and partially ordered sets.

The complexity of the present data-centric world finds its expression in the increasing number of multi-indicator systems. Partial order helps reveal why an object of interest holds a certain ranking position and how much it is subject to change if a composite indicator is upgraded. The methodological toolbox and the software toolkit will support and leverage core missions for hot spot detection and prioritization.

MODEL DIAGNOSTICS IN THE PRESENCE OF INCOMPLETE OBSERVATIONS

Hira L. Koul
Michigan State University, U.S.A.

Often in practice one comes across data that is either not completely observable or missing. In this talk we will briefly review some such models and the use of imputing and calibration for making inference in these models. In particular, we will review some tests of lack-of-_t of a parametric regression model and goodness-of-_t of a parametric family of distributions functions, when data is incomplete or missing. We will give an example of a model where a

lack-of-fit test for fitting a regression model is the same as a goodness of fit test for fitting a distribution function. The domain of applications of these inference procedures includes agricultural, environmental and health sciences.

Special Invited Lectures (IL-4)

"RECENT PERSPECTIVES IN BIOINFORMATICS"
T. Madhan Mohan

TBA

LINEAR MODELS IN GENOMIC STUDIES

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Key Words: Genome-wide Association, Linear models, Ridge Regression, Lasso, GFLasso

With the help of molecular markers, genome-wide association studies (GWAS) are conducted to identify genes associated with diseases. Association mapping uses unrelated individuals from the same population that has undergone recombination in many generations since the inception of the mutant gene and is the basis for detection of causal genes. The data that forms the basis for computational detection of causal genes are of three kinds, phenotypic values- single trait or several traits-, genotypes of hundreds of thousands of SNP markers, and data on gene expression- a sort of intermediate phenotypes that are used to associate genes with disease phenotypes. Most of the studies except a few, however, consider single trait at a time and take either phenotypes and marker genotypes only or considers phenotypes, genotypes and gene expression all together. MULTI-MODEL ENVIRONMENT \ \ \ \ In actual situations, on the other hand, the problem is multivariate since many complex disease syndromes

consist of a large number of highly related clinical or molecular phenotypes. For instance, asthma is influenced by as many as 33 clinical traits that can be represented as a quantitative trait network (QTN).

Invited Lectures in Mathematics

Invited Session (IS M1): Space Dynamics

NONLINEAR STABILITY IN GENERALIZED PHOTOGRAVITAIONAL RESTRICTED THREE BODY PROBLEM

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Keywords: Non linear stability/Triangular Point/Generalized Photogravitaional/RTBP.

We have discussed the nonlinear stability of triangular equilibrium points in generalized Photogravitational restricted three body problem. The problem is generalized in the sense that both primaries are taken as oblate spheroid. We have performed first and second normalization of the Hamiltonian of the problem. We have applied Arnold's theorem to examine the condition of non-linear stability. We have found three critical mass ratios where this theorem fails. The stability condition is deferent from the classical case due to radiation and oblateness of the primaries.

PERIODIC ORBITS IN THE PHOTOGRAVITAIONAL CHERMNYKH-LIKE PROBLEM

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Keywords: Periodic orbits/Photogravitaional/Chermnykh-Like problem/Disk/RTBP

The restricted three body problem is modified by including the gravitational potential of the uniform disk and when the effect of radiation pressure from bigger finite massive body (hereafter bigger primary) is considered. The equations of motion are derived for the proposed model and the periodic orbits are determined using analytical continuation method. We apply the bifurcation theory to outline the dependence of equilibrium points and periodic solutions on the values of parameters. Lastly, we conclude that the equilibrium points and periodic orbits are affected by the radiation pressure and the mass of the disk.

A FRACTAL / PRIMARY-CENTRIC VIEW OF THE UNIVERSE- A POST COPERNICAN CONJECTURE

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Keywords: galaxies, clusters, super clusters, hyper cluster, and fractal design

Till 1920, we had a static vision of the Universe. Even in the Copernican Vision, Universe was a static system though Tycho Brahe stood a witness to a remarkable Supernova Explosion. Only in 1920 with the discovery of the "Expanding Universe" by Edwin Hubble that this Static Universe molds was broken. In 1930 the proposition of Neutron Star and in 1939 the proposition of Black

holes was put forward. 1967-72 Apollo Program allowed the scientists to make mathematical analysis of the Moon's recession and thereby make a theoretical formulation of Earth-Moon System. In 60s and 70s advancement in Electronics and Instrumentations heralded the astronomy of the entire spectrum –Radio Astronomy , Microwave Astronomy, IR Astronomy, Optical Astronomy, UV Astronomy, X-Ray astronomy and γ-Ray Astronomy. NASA and ESA heralded the Space Observation Program. Among the ground observatories, higher diameter Telescopes and Very Long Baseline Interferometer (VLBI) based Telescopes in Radio Wave Range were established. This in quick succession led to the discovery of Neutron Stars, Black Holes and Dark Matter. 90s established that all galaxies grow around Super Massive Black Holes and are regulated by SMBH. By 2000 the Search for Extra-terrestrial Intelligence (SETI) and its natural corollary the hunt for extra-solar Earths within the habitable zone of Planet Hosting Stars (PHS) had begun in real earnest. 2002 saw the complete theoretical formulation of Earth-Moon System and discovery of the two geo-synchronous orbits, inner being unstable and outer being stable. 2004 the new perspective on the birth and evolution of the Solar System was presented which claimed that the planets are born at the inner Clarke's Orbit and migrate to outer Clarke's Orbit or get trapped in the death spiral and are eventually engulfed/vaporized or part of both by the PHS.

PISTON-DRIVEN CYLINDRICAL SHOCK WAVE IN SELF-GRAVITATING AND ROTATING ATMOSPHERES WITH HEAT TRANSFER EFFECTS

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Propagation of a cylindrical shock wave in self-gravitating and rotating perfect gas with heat conduction and radiation heat-flux is studied. The shock wave is assumed to be driven out by a piston moving with time- dependent velocity. The azimuthal and axial fluid velocities and the density of the ambient medium are assumed to be varying and obeying power laws. The angular velocity of the

ambient medium also obeys a power law and decreases as the distance from the axis increases. Such an angular velocity is expected to occur in the atmospheres of rotating stars. The heat conduction is expressed in terms of Fourier's law and the radiation is considered to be of diffusion type for an optically thick grey gas model. The thermal conductivity and the absorption coefficient are assumed to vary with temperature and density. The shock wave moves with variable velocity and the total energy of the wave is non-constant. Similarity solutions are obtained and the effects of the variation of heat transfer parameters, the variation of initial density exponent (or piston velocity exponent), and the presence of self-gravitation and/or the rotation of the medium are investigated. The present self-similar model may be used to describe some of the overall features of a "driven" shock wave produced by intense, prolonged flare activity in a rotating star.

FULBRIGHT NEHRU FELLOWSHIP OPPORTUNITIES TO THE U.S

S. Dash
US India Education Foundation, New Delhi

IS-M2 Topics in Mathematics I

ON THREE DIMENSIONAL TRANS-SASAKIAN MANIFOLDS

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In 1985 J.A. Oubina introduced the trans-Sasakian manifolds. Trans-Sasakian structure consists of Sasakian, Kenmatsu and cosympletic structures. At first we explain the history of trans-Sasakian manifolds. Some geometric properties have been studied. Among others we study compact connected 3-dimentional trans-Sasakian manifolds of constant curvature. The existence of 3-dimensional trans-Sasakian manifolds have been proved by concrete examples. Some results have been verified by examples.

APPLICATION OF INTEGRAL VALUE TRANSFORMATION (IVT) IN A SPECIALIZED COMPUTER NETWORK DESIGN

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Keywords: Integral Value Transformation, Collatz Conjecture, Computer Networks, Routing.

Integral Value Transformation (IVT) is a family of transformations from N_0^k to N_0. An algebraic result has been established in p-adic IVT systems and an application of the result is described in this paper. The result in this paper provides the rule to find the pth pre image of a natural number for the Collatz like bijective functions in p-adic IVT systems. Using this result a routing algorithm is proposed. This proposed routing algorithm reduces number of address calculation.

SPECTRUM AND FINE SPECTRUM OF GENERALIZED SECOND ORDER DIFFERENCE OPERATOR $\Delta_{uvw}^2 \Delta_{uvw}^2 l_1$ l_1

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The purpose of this paper is to determine spectrum and fine spectrum of newly introduced operator $\Delta_{uvw}^2 \Delta_{uvw}^2 \, l_1 \, l_1 \Delta_{uvw}^2$ $\Delta_{uvw}^2 \, l_1 \, l_1 \Delta_{uvw} x \, \Delta_{uvw} x \, u_n x_n \, u_n x_n \, v_{n-1} x_{n-1} \, v_{n-1} x_{n-1}$ $w_1(n-2) \, x_1(n-2) \,)_{\downarrow}(n=0)^{\dagger} \infty \, w_1(n-2) \, x_1(n-2) \,)_{\downarrow}(n=0)^{\dagger} \infty$ $x_{-1} x_{-1} x_{-2} x_{-2} x_n x_n \in \in l_1 l_1$, u $= (u_k u_k$ is either constant or strictly increasing sequence of positive real numbers with $U = \lim_{k \to \infty} u_k \, U = \lim_{k \to \infty} u_k \, v = (v_1 k \, v = (v_1 k \, v_k \ne 0 \quad v_k \ne 0$ $k \in \aleph_o \, k \in \aleph_o \, V = \lim_{k \to \infty} v_k$

$$V = \lim_{k \to \infty} v_k \neq 0 \quad \neq 0 \quad w = (w_k) w = (w_k) \quad w_k \neq 0 \quad w_k \neq 0 \quad k \in \aleph_o$$

$$k \in \aleph_o \lim_{k \to \infty} w_k \neq 0 \lim_{k \to \infty} w_k \neq 0 \Delta_{uvw}^2 \Delta_{uvw}^2 \quad l_1 \quad l_1 \quad \sigma_c \left(\Delta_{uvw}^2, l_1 \right)$$

$$\sigma_c \left(\Delta_{uvw}^2, l_1 \right), \qquad \text{residual} \qquad \text{spectrum}$$

$$\sigma_r \left(\Delta_{uvw}^2, l_1 \right) \sigma_r \left(\Delta_{uvw}^2, l_1 \right) \Delta_{uvw}^2 \quad \Delta_{uvw}^2 \quad l_1 l_1.$$

IS-M3 Topics in Mathematics

STOCHASTIC INVENTORY MODELS WITH MIXTURE OF BACKORDERS INVOLVING REDUCIBLE LEAD TIME AND SETUP COST WITH BUDGET CONSTRAINT

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Key words: Controllable lead time and setup cost, Crashing Cost, Backorder Price Discount, and Budget Constraint

This paper deals with a stochastic inventory model involving mixture of backorder and lost sales with budget constraint. Here we have considered both lead time and set-up cost are controllable variable. In this study, we assume that only the first and second moments, of the probability distribution of lead time demand are known. Order quantify, backorder price discount and safety factor are considered as decision variable. After that we apply the minimax distribution free producer to find the minimum expected value of the annual cost with budget constraint. The random budget constraint is transform to crisp budget constraint by chance- constraint techniques. Finally, the model is solved using a gradient based non linear optimization technique (LINGO).

IMAGE COMPRESSION USING FOURIER COEFFICIENTS

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Image compression plays an important role in digital imaging technology. The advancement of imaging technology has been producing superior quality images that require large storage space and higher bandwidth for data transmission. By applying digital image compression techniques, the number of bits required to represent an image can be minimized primarily for achieving information transmission and storage efficiency. (Ghafourian, 1995).

Image compression techniques are generally classified into three categories, namely pixel coding, predictive coding, and transform coding. The Fourier Transform is an important image processing tool based on transform coding. The output of the transformation represents the image in the Fourier or <u>frequency domain</u>, while the input image is the <u>spatial domain</u> equivalent. In the Fourier domain image, each point represents a particular frequency contained in the spatial domain image. The Fourier Transform is used in a wide range of applications, such as image analysis, image filtering, image reconstruction and image compression.

Invited Lectures in Statistics

IS-S1 Financial Data Analysis

IS THE RELATIVE RISK AVERSION PARAMETER CONSTANT OVER TIME? A MULTI-COUNTRY STUDY
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In this paper, an information matrix (IM)-based test is developed for testing the hypo thesis of constant relative risk aversion parameter in

the GARCH-M setup. A detailed Monte Carlo study is then carried out to evaluate the performance of this test in terms of size and power. Further, a bootstrap technique is suggested to correct the over-size problem found in small samples. The proposed test is then applied to the time series of returns on stock markets of five important countries to examine whether this important hypothesis holds or not, and it is found that the relative risk aversion parameter is not time invariant for all the five time series.

ON AUTOREGRESSIVE PROCESSES AND FINANCIAL MODELLING: RECENT DEVELOPMENTS AND CHALLENGES

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Key words: Autoregressive processes, Gaussian models, Laplacian models

In this paper we review various autoregressive processes developed recently for modeling data from financial contexts. In particular, we consider different Laplacian models and their generalizations. A general framework for Gaussian and non-Gaussian autoregressive models and their extensions is also developed and studied in detail with respect to Normal-Laplace processes. Multivariate extensions are also considered. An illustration is made with respect to a real data on exchange rates of Indian rupee and U.S. dollar. Various issues and challenges are also discussed.

COPULA-BASED AUTOREGRESSIVE CONDITIONAL DURATION MODELS

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Keywords: Copula, conditional duration models, financial time series

Dependent bivariate recurrent or failure data over time can arise in biomedical, industrial and financial fields. The main feature of these types of data is that they are irregularly spaced over time. Engle and Lunde (2003) and Mosconi and Olivetti (2005) proposed bivariate autoregressive conditional duration (ACD) models to deal with the irregularly-spaced nature of financial time series of durations. The ACD models have been applied to the analysis of high frequency data in finance. In this talk we propose copula-based bivariate autoregressive conditional duration (CBACD) models. We discuss a two-stage method of estimation of the parameters with an application to data on foreign exchange rates.

TIME VARYING CONDITIONAL HETEROSCEDASTIC MODELS: SOME RECENT DEVELOPMENTS

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Keywords: ARCH/GARCH models, least squares, local polynomial estimation, volatility modeling

ARCH/GARCH models play a prominent role in financial time series analysis, as they are useful in modeling the volatility in the financial markets. The usual ARCH, GARCH and related conditional heteroskedastic models are assumed to be stationary. But, given the changing pace of economy and markets, stationary

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modeling of financial returns have become an obsolete idea and it turns out to be inappropriate in many occasions. Time varying parameter models are found to be useful in such situations. In this talk, we discuss some of the time varying conditional heteroskedastic models and the related inferential problems.

IS-S2 Management Science

ASSET-LIABILITY MANAGEMENT IN INDIAN BANKING: A BRIEF OVERVIEW

R. B. Barman
Ex-Executive Director, Reserve Bank of India, Mumbai

Banking business, being highly leveraged, is a fertile field for quantitative analysis. Asset-Liability management (ALM) lies in the core of this analysis, with each component of asset having its peculiar challenges on risk and return. The investment portfolio is dominated by interest rate risk. The loan portfolio has credit risk as the most dominating factor. The liability side is overwhelmingly based on deposits with its attendant peculiarities. The liquidity miss-match is a major concern of day-to-day treasury management. As safety and security of depositors' money is paramount in the regulation of banking industry, the central bank of a country imposes strict prudential norms on banking business. The entire business is thus a multi-constrained, multi-objective goal function. As the banking industry in India is poised for moving into knowledge driven decision support system, it is time for absorption of high level quantitative analysis for performance management, leading to more objective and transparent ALM. I will focus on this to highlight some of the challenges on implementation of ALM in Indian banking.

QUANTITATIVE EXPLORATIONS OF INDIAN STOCK MARKETS

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The Geometric Brownian Motion (GBM) process is commonly used to model stock market data.

In this paper we investigate whether this is a valid assumption for the Indian stock market data.

Working with the BSE-SENSEX data we show that the GBM process is not a good fit for the same. We then test for the presence of jumps in the dataset and find that indeed the dataset contained jumps. We then fit two jump-diffusion models to the dataset one with normally distributed jump sizes and the other with double exponentially distributed jump sizes. We also investigate the long range dependence behavior of some selected stocks in the National Stock Exchange (NSE) and found that several of them showed significant persistent behavior. We then attempted to fit a Fractional Brownian Motion (FBM) to the daily returns of one of these stocks and found that the FBM fits the data well.

APPLICATION OF INTELLIGENT TECHNIQUES TO MANAGEMENT SCIENCE

Ganapati Panda
Deputy Director and Dean
IIT, Bhubaneswar

Forecasting is a key element in financial and managerial decision making. It also reduces the risk of investment. The financial and sales data are complex in nature and hence difficult to predict by conventional statistical methods. The common financial and sales time series that need forecasting are stock prices, currency exchange rates, interest rates, sales volume etc. The conventional method assumes that these time series data are correlated, stationary and

linear in nature. This is however not true for real life data. Hence in the recent past, attempts have been made to employ soft and evolutionary computing (intelligent) techniques to efficiently predict these time series.

In the proposed talk, an attempt will be made to present a simple but efficient intelligent forecasting model for prediction purpose. The topic will deal with feature extraction, training of the model parameters and validation of the model with the actual data. Practical examples will be given to support the efficacy of the new models.

UNIT ROOTS AND STRUCTURAL BREAK POINTS IN INDIA'S FINANCE- GROWTH NEXUS

Rudra P. Pradhan
IIT, KharagPur

The paper examines the causality between financial development and economic growth in India in a structural break framework. Using the data set from 1994-2011, the empirical analysis finds most of the times series can be more accurately characterized as a segmented trend stationary process around the structural breaks as opposed to a stochastic unit root process. The findings have important policy implications for policy makers for formulating long run development strategy and short run stabilization policies and causality analysis between the finance-growth nexus in the Indian economy.

CAN THE BIG TRADER'S INUENCE STOCK MARKET ?

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We study the influence of big traders in the stock market in the presence of a fringe of marginal "noise traders". We formulate a trade model relating stock price to the demand strategies of these traders who wish to maximize their payoffs. Using the Nash equilibrium concept we compute the optimal value functions for the large traders and study the stability of the state process (log price) under equilibrium strategies of the large traders. In the process, we propose two measures. The rest one is to measure the big traders' total faith on the market's valuation (0) and the second one is to measure the big traders' interaction between themselves (1). We discuss what values of the measures might indicate a collusion of the big traders to corner the market for their benefit and illustrate this with examples.

SKEWED BIVARIATE VON MISES DISTRIBUTION

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The well known circular models in the literature such as Von Mises, Cardiod, wrapped Cauchy, wrapped Normal, etc. are symmetric. Some asymmetric models are also developed by various methods of construction. There are very few bivariate circular models in the literature which can be used to model correlation between paired angular observations. We propose a skew-bivariate circular model with skewed marginals by perturbing bivariate Von Mises circular

model. Shapes of the proposed model and its marginals for various values of parameters are studied. Conditions for unimodality are also derived.

A NOTE ON STEREOGRAPHIC WEIBULL MODEL

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Keywords: Circular model, Mobius transformation, inverse stereographic projection, trigonometric moments.

In many diverse scientific fields the observations are directions. Such directional data may be in two or three dimensions. In particular, directional data of two dimensions is called Circular Data which appear in various fields like Medicine, Biology, Geology etc. It is well known that linear statistical techniques when applied on such type of data will yield unreasonable/absurd results. In view of this, the standard circular models were constructed using well known procedures of wrapping or using characterization properties. Though it was mentioned in the literature that circular models can also be constructed by applying stereographic projection on any suitable linear models, it was paid scant attention.

Hence, in this note an attempt is made to construct a new circular model named by us as **STEREOGRAPHIC WEIBULL MODEL** which is obtained by applying stereographic projection on a well known life testing model called **Weibull distribution**. Also the population characteristics of the proposed model are evaluated numerically and are presented here.

ESTIMATION AND FORECASTING OF DYNAMIC CONDITIONAL COVARIANCE: A SEMIPARAMETRIC MULTIVARIATE MODEL

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We propose a semi-parametric conditional covariance (SCC) estimator that combines the first-stage parametric conditional covariance (PCC) estimator with the second-stage nonparametric correction estimator in a multiplicative way. We prove the asymptotic normality of our SCC estimator, propose a nonparametric test for the correct specification of PCC models, and study its asymptotic properties. We evaluate the finite sample performance of our test and SCC estimator and compare the latter with that of PCC estimator, purely nonparametric estimator, and Hafner, Dijk, and Franses's (2006) estimator in terms of mean squared error and Value-at-Risk losses via simulations and U.S. stock market data analyses.

IS-S4 Distributions: Characterizations and Inference

ON OPTIMAL TESTS FOR MULTI-PARAMETER HYPOTHESES IN POSSIBLY MULTI-COMPONENT MIXTURES

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A locally most mean power unbiased (LMMPU) test of SenGupta and Vermeire (1986, J. Amer. Statist. Assoc.) is derived for testing the hypothesis of `no mixture' in a general (k+1)-component mixture distribution. The test is applied to mixtures of univariate normal

distributions. A two component mixture of multivariate normal distributions is also considered.

TOTAL TIME ON TEST TRANSFORMS

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The total time on test transforms (TTT) is essentially a quantile-based concept developed in the early seventies. Apart from its applications in reliability theory and reliability engineering, it has been found useful in other areas like stochastic modeling, maintenance scheduling, risk assessment of strategies, energy sales etc. The definition and properties of the concept are discussed and the functional forms of TTT for several life distributions are exhibited. An interesting property of the TTT is that it determines the lifetime distribution. There have been several generalizations of the TTT. We discuss those extensions and their properties, with special reference to the TTT of order n. Relationships between the reliability functions of the baseline model and those of the TTT of order n (which is also a quantile function) are derived and they are based to describe the pattern of aging of the transformed distributions. Some life distributions are characterized. We also characterize ageing criteria like IFRA, NBU etc. in terms of TTT. We, then, utilize an iterated version to construct bathtub shaped failure rates and corresponding lifetime models

QUANTILE BASED ENTROPY FUNCTION

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Keywords: Shannon entropy, residual lifetime, quantile function, reliability measures, characterizations.

Quantile functions are efficient and equivalent alternatives to distribution functions in modeling and analysis of statistical data (see Gilchrist (2000); Nair and Sankaran (2009)). Motivated by this, in the present paper, we introduce a quantile based Shannon entropy function and study its properties and modeling some families of probability distributions. Unlike the residual entropy function due to Ebrahimi (1996), the residual quantile entropy determines the quantile density function uniquely through a simple relationship.

GOODNESS-OF-FİT TESTS FOR UNİVARİATE AND MULTİVARİATE DİSTRİBUTİONS

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Keywords: Goodness-of-fit; Univariate distributions; Multivariate distributions; Censoring

To test for univariate distributions coming from location-scale families, there are numerous goodness-of-fit tests proposed in the literature.   Among these, there is no test statistic which is the most powerful against all types of alternative distributions. In this work, we assess the performances of some known test statistics based on their power properties. We also show that some very well-known goodness-of-fit statistics are very inefficient against an important number of alternatives.

In the literature, many multivariate test procedures have also been proposed. While a number of works consider multivariate approaches to test for the related multivariate distribution, some tests have been constructed on the utilization of univariate test statistics. However, a majority of tests constructed on univariate goodness-of-fit tests do not take the correlation structure into consideration, which makes them inefficient. To evaluate the efficiencies of the well-known multivariate goodness-of-fit tests, we conduct a power study and examine their power properties. We also

consider some censored structures and show how a censored multivariate distribution can be tested.

A SYSTEMATIC APPROACH FOR UNEQUAL ALLOCATIONS UNDER RANKED SET SAMPLING WITH SKEW DISTRIBUTIONS

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Key words: ranked set sampling, relative precision, Neyman's allocation, positively skewed distributions, order statistics.

Ranked Set Sampling (RSS) is a useful technique for improving the estimates of mean and variance when the sampling units in a study can be more easily ranked than actually measured. Under equal allocation, RSS is found to be more precise than simple random sampling (SRS). Further gain in precision of the estimate may be obtained with appropriate use of unequal allocation. For skewed distributions, the optimum gain in precision is obtained through unequal allocation based on Neyman's approach, in which the sample size corresponding to each rank order is proportional to its standard deviation. However, the unavailability of the standard deviations of the rank orders makes the Neyman's approach impractical. The two models, viz.,'t-model' and '(s, t)-model' suggested by Kaur, Patil & Taillie (1997) are also impractical due to their dependence on population parameters of rank orders and complexities in finding the optimum values of 't' and '(s, t)'. In this article, we propose a simple and systematic approach for unequal allocation for RSS with skew distributions. The proposed approach performs better than SRS and RSS with equal allocation.

TRANSCENDING THE MULTICULTURAL INDIAN LANDSCAPE WITH TECHNOLOGY & MEASUREMENT SCIENCE

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TAM India Television audience measurement is a unique exercise in India. The genesis was the result of a vision by the Indian media and advertising industry to have a sophisticated specialized organization dedicated to tracking the viewership patterns of Indians. Since 1998, TAM has provided the country with valuable behavioral insights into dynamics behind television viewing. There are four arms to the engine behind TAM's progress in India. One is its deployment of a sophisticated piece of technology that tracks every second of television viewing in the household where it is installed. Second is the large amount of computing resource that processes millions of viewing statements across the country. Third is its scientific knowledge of the design and analysis of sample surveys using cutting-edge algorithms. Finally, apart from tracking viewership, TAM is also one of the largest content tracking organizations in the world tracking every minute of content across 300+ channels and 1000+ publications. Together these four arms have made TAM a reliable insight provider.

STATISTICAL INFORMATION SYSTEM DEVELOPED FOR LOCAL LEVEL PLANNING-WITH AN APPLICATION TO TWO BLOCKS IN THE DISTRICT OF HOWRAH, WEST BENGAL

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The 73rd and 74th Amendment to the constitution of India has given rise to acceptance of decentralized planning process. It speaks of the bottom up approach to planning. To the extent that new duties and responsibilities have been assigned to the local bodies in rural areas

by the 73rd Amendment, a speedy, timely and efficient Statistical Information System needs to be developed for smooth running of local Governance. In fact the System should have such major components as (1) computer hardware forming the container of Statistical Information, (2) computer software to process the information and (3) Statistical data, the actual content of the System. Such a System has been developed and deployed in the District of Howrah, West Bengal. On the basis of data created on the items of information as listed in the 12th schedule of the 73rd Amendment .Inter- and intra- regional variations in development towards health, education, drinking water facilities, rural electrification and other infrastructural facilities were brought out .Further statistical analysis has helped the local level planners identify the vulnerable areas which would need immediate attention. Here, in this paper, as illustrative examples, We have considered two blocks and identified most needy areas in each of the blocks. A comparative study on the status of development between the two blocks has also been made.

ANTHROPOMETRIC STUDY OF A TRIBAL POPULATION IN KALIMPONG

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The present study, among the Lepchas, an indigenous tribal population inhabiting Kalimpong subdivision of the district of Darjeeling, West Bengal has been conducted in order to examine effects of sociocultural factors (viz. rural-urban residence, religion) on age related changes in body size and shape indicating child growth and adult body dimensions. It further makes an attempt to assess nutritional status of the study population utilizing anthropometric data. In all, 890 children (aged below 20 years) and 1288 adult (aged 20 years and above) Lepcha individuals of both sexes participated in the study. Selected anthropometric measurements were taken by a single measurer following standard techniques. The results generally demonstrate that while urban-rural residence remains a significant predictor of anthropometric dimensions irrespective of age, religion doesn't show significant

effect, as revealed through inferential statistical methods used. Malnutrition is not a major health problem in the study community.

GANGA WATER QUALITY IN VARANASI: WATER QUALITY INDEX AND ARIMA MODEL

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From time immemorial Hindus regard the Ganga as the holiest of all the rivers with spiritual power of purifying not only body but redeeming soul of all sins if ever committed. However, the fast growing urbanization, industrialization, green revolution with chemical fertilizers & pesticides, and armament race and related factors have rendered the water of sacred Ganga unfit even for bathing, though drinking it is still a part of worship. Clean Ganga movement was launched in Varanasi in early 1980's whereas; the Govt. of India initiated Ganga Action Plan in 1985 to clean the holy river, which was scheduled to be completed by December 2001, with no apparent improvement, according to some experts. Continuous monitoring of Ganga water quality parameters is undertaken at Govt. level by Central Water Commission (CWC) along with many other water bodies also. Central region Office of CWC at Varanasi maintains this data for Varanasi apart from some voluntary Organizations, such as Swatcha Ganga Research Lab. Reports are published with this data but without proper statistical analysis and interpretation. Secondary data on 21 parameters have been collected from CWC Varanasi office, for the last 20 years with the objective of an in depth analysis to find out an effective way of expressing water quality level. A water quality index for river Ganga has been obtained based on rating curves on five parameters. Moreover, using CWC data, this paper attempts to provide an ARIMA model of the Ganga river water quality and to predict its status on the basis of this model.

GENDER INEQUALITY IN THE AVERAGE
CONSUMPTION OF CALORIES IN INDIA

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National Sample Survey Organization (NSSO) collects data on consumption of commodities at household level at regular time intervals called 'rounds'. A round corresponds to a year and hence collection of data is uniformly spread over the year to eliminate seasonal variation. Moreover, the sample size is increased substantially at about every five year interval of time so that the estimates can be obtained relatively more reliably and at more disaggregate levels. These are known as 'quinquennial rounds'. The latest quinquennial round data on consumption is the 61st round data, collected during July 2004 – June 2005.

It is not possible to find the intra-household disparity in the consumption pattern among the members of the households, because the data on consumption are available only at household level. But if we are interested in the estimation of a certain aspects of consumption at the aggregate level, say mean calorie consumption of each of the different groups of members in the households, taking all households into consideration, then it is possible to estimate the same using Generalized Linear Regression Model (GLRM) after some modifications.

We have used the 61st round NSSO data on consumption to see whether mean consumption of calories varies among male and female members of the households. When these estimates are compared to the Food and Agricultural Organization (FAO) and Indian Council for Medical Research (ICMR) norms, it is found that there is no indication of discrimination against the female members in the households.

ESTIMATION OF RESTRICTED PARAMETERS IN NORMAL AND EXPONENTIAL DISTRIBUTIONS

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Problems of estimating parameters under restrictions occur naturally in many physical, industrial and biological experiments. These restrictions arise due to some prior information about the range of parameters under consideration. Incorporating this prior knowledge in a decision theoretic estimation set up leads to inadmissibility of the standard estimators. In this paper we discuss in detail estimation of the parameters of normal and exponential populations under various inequality constraints. New estimators improving upon the usual estimators are proposed. Desirable properties such as minimaxity and admissibility are discussed. A detailed comparison of the risk performance of the proposed estimators is also carried out.

ESTIMATION OF THE HAZARD RATES FROM EXPONENTIAL POPULATIONS

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Let   be k populations with being exponential with an unknown common location parameter μ and unknown scale parameters. Suppose independent random samples $(X_{i1}, \ldots, X_{in})$, $i = 1, \ldots, k$. be drawn from these populations. We consider the problem of estimating simultaneously the hazard rates of these populations. The UMVUE and some other basic estimators are derived. It is shown that the analogue of the best scale equivariant estimator is best among these estimators under mean squared error criterion. An estimator improving this estimator is obtained using a differential inequality approach. The risks functions of these two estimator are numerically compared.

ESTIMATING THE COMMON MEAN AND QUANTILES OF TWO NORMAL POPULATIONS

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Keywords: Common mean, equivariant estimators, inadmissibility, minimaxity, quantile estimation, risk comparison.

Let $X = (X_1, X_2,\ldots,X_m)$ and $Y = (Y_1, Y_2,\ldots, Y_n)$ be independent random samples from two normal populations with a common unknown mean and possibly different variances. We consider the estimation of the common mean and the quantile with respect to a quadratic loss function. For estimating the common mean sufficient conditions for the inadmissibility of estimators equivariant under location, scale and affine groups of transformations have been derived. For estimation of the quantiles, some new estimators are proposed using previously known estimators of a common mean. Inadmissibility results are proved for estimators which are equivariant under the affine and the location groups of transformations. Finally, a simulation study has been done in order to compare various estimators and specific recommendations are made.

ESTIMATION OF A RESTRICTED LOCATION PARAMETER OF AN EXPONENTIAL DISTRIBUTION

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The problem of estimating unknown location parameter of an exponential distribution is taken up under the additional information that it is bounded above by a known constant. The cases where scale parameter is known or unknown are considered and the loss function is quadratic. Maximum likelihood estimator and its several variants are proposed. Some improving estimators are also obtained using Rao-Blackwellization. Classes of estimators dominating the best affine equivariant estimator are proposed using the integral expression of risk difference method of Kubokawa. A general inadmissibility result for scale equivariant estimators is also established. Finally, risk performance of all estimators is compared numerically and some specific comments are made.

IS-S7 Environmental Statistics

SOME IMPORTANT ENVIRONMENTAL ISSUES AND RECENT GOVERNMENTAL INITIATIVES IN INDIA

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Although Environment plays a crucial role in sustainability of socio-economic development of a country, it did not get the importance it deserved in mainstreaming environment issues by various stakeholders including Policy Planners in past. Of late, environment has drawn added 24attention, taken centre stage in public discourse. The activism of environmentalists, NGOs has given impetus in putting forward environmental issues to the centre stage.

Government has taken some important initiatives on environment issues recently. The present paper revisits status and trends of environment in the country along with these initiatives. The paper would like to bring out areas which needed further attention by different stakeholders including government.

HOTSPOT DETECTION USING DIFFERENT SAMPLING DESIGNS: A COMPARATIVE STUDY OF EFFICIENCY

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Hotspot detection is an important issue in environmental protection and conservation efforts. Ahotspot is usually defined as a spot having the highest level of pollution, highest concentration of pollutant, highest number of occurrences of alarming incidences or something similar in nature. Statistically speaking, a hotspot is the sampling unit that returns the highest value for the variable of interest. The problem is non-trivial because hotspots are rarely visible and hence it takes careful and smart sampling effort to locate a hotspot. After locating or identifying a hotspot, the next challenge is to assess the seriousness of the hotspot. This generally requires predicting the value of the variable of interest at the hotspot if an observation is not made at the hotspot location and accurate measurement at the hotspot location if sample material is collected from the hotspot location. This paper attempts to compare different sampling designs that can help in hotspot detection without exhaustive testing of sample material over the domain of investigation. Simple random sampling, grid random sampling, grid systematic sampling and stratified random sampling are the classical sampling designs compared in this paper with ranked set sampling, the modern environmental cost-efficient sampling design. A case study is also presented to illustrate the results of the paper and also to demonstrate the difficulties in applying classical sampling designs, originally developed for estimating the population means, to non-classical situations where the requirement is to estimate the

population maximum and also locate the sampling unit having the maximum value.

HUMAN ENVIRONMENT INDEX

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The human environment index (HEI) is a composite index based on three leading outcomes indicators to capture the human progress towards the environmental protection goal in a unified way. These indicators consist of forested land (land indicator), the emissions of carbon dioxide per capita (air indicator) and the average of the percentages of access to improved water sources and to improved sanitation facilities (water indicator). The indicators are uncorrelated, adequate and mutually reinforcing. They represent the three basic dimensions of the human environment that include green land, blue sky and clean water respectively, which together constitute a sustainable environment for the survival of mankind and its surroundings. This index, in turn, reveals the average contribution a country makes to the three leading indicators. On comparing it with the human development index (HDI) and the gross domestic product index (GDPI), it reveals a stronger association with the former than with the latter.

SPATIAL STATISTICAL METHODS IN ENVIRONMENTAL EPIDEMIOLOGY

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Keywords: M-Statistic, Generalized Additive Model, spatial scan statistic, Environmental Epidemiology, Simulated and real data sets

Three spatial statistical methods have been examined here to assess their usefulness in ascertaining the degree and/or the location of spatial clustering of disease cases where environmental variations can lead to significant differences in simulated and real data sets. Three chosen methods used for examining spatial disease patterns are (i) M-statistic of Bonetti and Pagano; (ii) Generalized Additive Model (GAM) method as applied by Webster; and (iii) Kulldorff's spatial scan statistic. It is hoped that a comparative analyses of real data sets by different statistical methods would provide insight into directions for further examination designed around utilizing real data sets to guide focused investigation of relevant features using simulated data. The findings could also be used for interpreting statistical methods applied to environmental epidemiological data with a significant spatial component.

IS-S8: Sample Surveys

SEMI PARAMETRIC BLOCK BOOTSTRAP APPROACH FOR MULTILEVEL DATA

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Keywords: Differentiation formula, function, logarithmic form, exponential form

Random effects models for hierarchically dependent data, e.g. clustered data, are widely used in small area estimation. A popular bootstrap method for such data is the parametric bootstrap based on the same random effects model as that used in inference. However, it is hard to justify this type of bootstrap when this model is known to be an approximation. In this presentation I describe a semi parametric block bootstrap approach for clustered data that is simple to implement, free of both the distribution and the dependence assumptions of the parametric bootstrap and is consistent when the mixed model assumptions are valid. Results based on Monte Carlo simulation show that the proposed method seems robust to failure of the dependence assumptions of the assumed mixed model. An

application to a realistic environmental data set indicates that the method produces sensible results.

ANALYZING OPTIONAL RANDOMIZED RESPONSE ON QUALITATIVE & QUANTITATIVE VARIABLES BEARING SOCIAL STIGMA

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We illustrate a few popular Randomized Response to elicit responses to sensitive items. Both qualitative and quantitative characteristics are covered. General Sampling Schemes even without replacement are permitted. Also allowed is an undisclosed option to respond directly instead. Certain relevant procedures are critically examined.

EMPIRICAL LIKELIHOOD FOR SMALL AREA ESTIMATION

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Keywords: Small area Estimation; empirical likelihood.

Current methodologies in small area estimation are mostly either parametric or are heavily dependent on the assumed linearity of the estimators of the small area means. We discuss an alternative empirical likelihood based Bayesian approach. This approach neither requires a parametric likelihood nor needs to assume any linearity of the estimators. Moreover, the proposed method can handle both discrete and continuous data in a unified manner. Empirical likelihood for both area and unit level models are introduced, but the emphasis will be more on the unit level models. Performance of our method is illustrated through real datasets.

ESTIMATION OF THE SIZE OF A FINITE POPULATION

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The problem of estimation of the size (N) of a finite closed population is known to be of great importance. There are essentially two different types of populations – those with directly identifiable population units and those without this property. The first kind refers to what are called 'mobile' or 'dynamic' populations such as fish population in a lake, wild animals in a forest etc. Several authors have already considered the problem in the past and suggested different methods of sampling along with associated estimation procedures (viz., Boswell, M. T., Burnham, K. P., Patil, G. P. (1988): Role and use of composite sampling and capture-recapture sampling in ecological studies, Handbook of Statistics, Vol. 6, Eds. P. R. Krishnaiah and C. R. Rao, North Holland, Amsterdam, 469-488. AND Seber, G. A. F. (1982): The Estimation of Animal Abundance and Related Parameters, 2nd edition, Macmillan, New York). Some recent references are De and SenGupta (1997, Sankhya, Series B), De and SenGupta (2003, Sequential Analysis).

AUTOREGRESSIVE PROCESS USING LAPLACE VARIABLES

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In the last three decades, several time series models with non-Gaussian marginal distribution have been introduced and studied by various authors. The need for such models arises from the fact that many naturally occurring time series are clearly non-Gaussian. One class of non-Gaussian linear time series models that appears to be particularly useful is the first order autoregressive process. The first order autoregressive process with is properly defined only if is a proper characteristic function, where and are characteristic functions of stationary process and innovation sequence respectively.

ESTIMATING CALORIE-POVERTY RATES THROUGH REGRESSION

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Keywords: Calorie-Poverty Rate, Linear Regression, Trivariate normal distribution, Nutrition norms, National Sample Survey Organization

In this paper we assume a tri-variate normal distribution of the nutrient intake (y), say calorie intake, the income (x) and the nutrient norm (z) of the households. Nutrient norm takes care of age-sex composition of a household. This allows us to take y as a linear function of x and z. The probability that the household consumes less than the prescribed norm can be computed from the regression result. This probability can be regarded as the estimated value of the calorie-poverty rate when taken in aggregate. In practice, since income data are not available, the per-capita total expenditure of the

household is taken as a proxy to per-capita income and regression is run for different expenditure groups. We have applied this technique to the 61st round data collected by National Sample Survey Organization (NSSO), India, on calorie intakes. The estimates of the poverty rates found by this method are unbelievably high and call for further investigations on the assumptions of the models and the data. The reasons for getting such high estimates are discussed and modifications of the estimates are suggested in the paper. The modifications lead to reasonable estimates of the poverty rates.

EXTENT OF INVISIBILITY OF WOMEN IN INDIA IN THE OFFICIAL WORK-FORCE ESTIMATES

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Keywords: Differentiation formula, function, logarithmic form, exponential form

Two important sources of labor force data in India are Indian Population Censuses and quinquennial employment – unemployment surveys of National Sample Survey Organization (NSSO). When the gender break-up of the employment situation in the country is studied then women's participation in economic activities is found to be much lower as compared to the males. As per the NSSO's surveys in 1999-2000 and 2004-2005, the WPRs for females were 25.4% and 25.3% as compared to 52.7% and 51% for males. Some of the experts are of the opinion that women's work has not been captured properly, even in NSSO, in spite of the deployment of skilled and trained investigators for collection of data resulting in lower WPR for females. Some authors like Jain (1985) and Vishwanathan (2001), through their research have illustrated that a significant proportion of women who were identified as non-worker as per NSSO's methodology were actually workers. In India, a pilot Time Survey (TUS) was conducted by Central Statistical Organization (CSO) during July 1998 to June, 1999 with the main objective of estimating the contribution of women in the Indian

economy and to study the gender discrimination in household activities. It is possible to derive the WPR from the data of TUS. In

This paper, an attempt has been made to examine the data on WPR for females from the NSSO survey as per the general approach as well as that resulting from the canvassing of the probing questions to the women engaged in domestic duties and from TUS to find out whether the WPR for females estimated by NSSO is underestimated.

MATHEMATICAL MODELS IN NATIONAL POLICY FORMULATIONS

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In this talk, author will present work on dynamical models that are being developed for various health issues in the country for the period 2012-2017. Model building and stability analysis and the role of such models in scientific policy making in the country in which the speaker has been involved will be highlighted. Outline of mathematical modeling using ODE and PDE will be briefed.

BRAND TRUST INDEX – A MEASURE OF TRUST OF BRANDS

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"Brand trust" can be defined as a "soul of the primary bond of engagement" between the consumer and owner. It is believed that it influences the consumer behavior. Brand Trust can be defined as a combination of 61 primary trust components and overall trust. A questionnaire was designed and survey was conducted in 9 cities of India. Based on the occurrence of a brand, its suitability against each 61 components and overall trust, an index was developed. In this paper we will discuss the rationale of creating the index and the impact of "Brand Trust Index" in corporate sector.

APPLICATIONS OF SIGNAL PROCESSING TECHNIQUES TO BIOINFORMATICS

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In this talk we will focus on the applications of Signal Processing tools like Discrete Fourier Transform, Fast Fourier Transform, Spectrum Analysis as well as soft computing techniques for localization of proteins, classification of cancer data and identification of hot spots.

SYSTEMS BIOLOGY: A MULTIDISCIPLINARY APPROACH

R. C. Sobti
Vice-Chancellor, Punjab University,
Chandigarh

The technological advancements which on one hand enabled us to better understand the intricate biological processes, have, on other hand, opened newer vistas to comprehend a biological problem through, a rather, multidisciplinary approach. As a result, new high-throughput technologies are evolving for studying the biological interactions, through a systems biology approach. These scientific methods seek to explain the events of nature in a reproducible fashion and to use these findings to make useful predictions. These are achieved partly through natural phenomena but also through experimentation that rely upon simulating the natural events under controlled conditions. These have given a tremendous impetus to bench-to-bedside research and created novel strategies for a sustainable development. Thus as systems biology evolves, it is anticipated to have profound impacts on translational research. Not only does systems biology deliver scientific discoveries and analytical tools for application based research, it also challenges several shared barriers which also impact translational research.

ON TESTING THE TRANSITION PROBABILITY MATRIX OF A MULTI-STATE SURVIVAL MODEL

H J Vaman
Central University of Rajasthan

We propose a test for the k-sample problem for transition probabilities in a multi-state survival problem assuming a non-homogeneous Markov process mode which leads to a generalization of log-rank, Tarone-Ware and Harrington-Fleming tests of the two-state survival analysis

IS- S11 AstroStatistics

MULTIVARIATE MIXED LINEAR-CIRCULAR GALAXY DATA

Atanu Biswas, Asis Chattopadhyay and Tanuka Chattopadhyay
Indian Statistical Institute, Kolkata

We consider some galaxy data with three variables in each data point, one linear and two circular measurements. We first provide a modeling for such a Trivariate data, an in general for multivariate linear-circular data. Then we discuss the estimation of the associated parameters. We then discuss appropriate clustering technique for such mixed data and use the data to carry out some classification problem as well. The work is still ongoing.

INDEPENDENT COMPONENT ANALYSIS AND CLUSTERING RELATED TO ASTRONOMICAL DATA

Asis Kumar Chattopadhyay[1], Tanuka Chattopadhyay[2] and Saptarshi Mandal[3]

[1]Department of Statistics, Calcutta University, Kolkata
[2]Department of Applied mathematics, Calcutta University, Kolkata
[3]Department of Statistics, Calcutta University, Kolkata

Independent Component Analysis (ICA) is closely related to Principal Component Analysis (PCA).Whereas ICA finds a set of source data that are mutually independent; PCA finds a set of data that are mutually uncorrelated. The assumption that data from different physical processes are uncorrelated does not always imply the reverse case that uncorrelated data are coming from different physical processes. This is because lack of correlation is a weaker property than independence. In the present case an objective classification of the globular clusters of NGC 5128 has been carried out. Components responsible for significant variation have been obtained through both Principal Component Analysis (PCA) and Independent Component Analysis (ICA) and the classification has been done by K-Means clustering. The set of observable parameter includes structural parameters, spectroscopically determined Lick indices and radial velocities from the literature.

STUDY OF INITIAL MASS FUNCTION THROUGH MARKOV CHAIN MONTE CARLO SIMULATION

Tanuka Chattopadhyay[1], Asis Kumar Chattopadhyay[2] and Abisa Sinha[3]

[1]Department of Applied Mathematics
Calcutta University, [2]Department of Statistics, Calcutta University,
[3]Department of Statistics, Calcutta University

Stellar Initial Mass Function (IMF) is an important aspect for delineating a clear picture of star formation scenario in a broad spectrum of environments from star clusters, associations, field stars to much bigger ones like dwarf galaxies, giant galaxies, cluster of

galaxies etc. Whether the stellar initial mass function is universal or sensitive to environment is of crucial importance. The present study deals with the simulation of stellar IMF using Markov Chain Monte Carlo Simulation in young star clusters under various theoretical considerations and compared with the existing observations available so far to check for universality and mass segregation if any.

THE NEED FOR ADVANCED STATISTICAL METHODS FOR ASTRONOMICAL TIME SERIES ANALYSIS

Ranjeev Misra
IUCAA, Pune

While standard statistical techniques are being extensively used in astronomical data analysis, there is a growing need for more advanced and astronomy specific statistical methods. Astronomy data are unique in being voluminous but with large measurement errors. Since the statistics of the measurement errors are usually known, robust information from the data can be obtained only with sophisticated statistical tools, which correctly incorporate the measurement uncertainties. As an example, the speaker will introduce astronomical X-ray time series analysis and highlight the amazing potential of these data to provide deep insight into the foundations of physics like Einstein's General theory of Relativity. However, apart from physical modeling, one of the major stumbling blocks for such analysis is the absence of reliable and numerically efficient statistical techniques.

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99th Indian Science Congress
January 3-7, 2012, Bhubaneswar

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ABSTRACT OF

ORAL/ POSTER PRESANTATION

PROCEEDINGS
OF THE
NINETY EIGHTH SESSION OF THE
INDIAN SCIENCE CONGRESS
BHUBANESHWAR, 2012

PART II (Oral/Poster Presentation)

SECTION OF MATHEMATICAL SCIENCES (including STATISTICS)

Contributed Papers: Mathematics

1. DEGREE OF APPROXIMATION BY ITERATES OF POST-WIDDER OPERATORS

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Key Words: Post-Widder operators; Iterative combination; Modulus of continuity; Degree of approximation.

Following Siddiqui and Agrawal (2011), the Post-Widder operators have been investigated for real valued bounded functions on R+ but we note that these operators are defined over a bigger class of functions namely B_: It turns out that the above operators are saturated with $O(n^{-1})$: So, in order to improve the rate of convergence by these operators, we apply the iterative combination technique (2010). We establish an asymptotic formula and obtain the estimate of error in terms of the modulus of continuity of 2k th order. Our results show that $O(n^{-k})$ order can be achieved for functions in B_ that are 2k times continuously differentiable.

2. LINEAR OSCILLATION OF THE INTER-CONNECTED SATELLITE UNDER THE PERTURBATIVE FORCES ABOUT THE POSITION OF EQUILIBRIUM FOR SMALL ECCENTRICITY NEAR THE PARAMETRIC

Bhawani Rani Das

Reader, Department of Mathematics M.D.D.M College (B.R.A. Bihar University), Muzaffarpur-842001(Bihar)

The paper aims at studying the linear oscillation of inter-connected satellite under force of oblate Earth Atmospheric resistance about the position of equilibrium for small eccentricity near the parametric resonance. His examination of the zone of stability of the system has also been undertaken with the half of the Bogoliulov-Krilov-Mitropolosky method.

3. SATELLITE DATA CLASSIFICATION USING FUZZY MEANS CLUSTERING COMBINED WITH FUZZY SUPERVISED CLASSIFICATION
Sumanta Kumar Das

In this paper, an optimal method of remote sensing data classification has been proposed by hybridizing the well known fuzzy c-means clustering (FCM) algorithm and the fuzzy supervised classification (FSC) via fuzzy cluster space representations (FCSR). A noble FCSR method is proposed in this paper as a means for combining FCM clustered information with fuzzy training data. Although FCM is widely used fuzzy clustering algorithm. It cannot identify the information classes on ground with its spectral classes. On the other hand the FCS is simple and easy to implement on the remote sensing data but it require sufficient number of fuzzy training data which is not easily available. An attempt has been made to integrate these two techniques via FCSR efficient method of satellite data classification.

4. METHOD OF INFINITE ASCENT APPLIED ON $A^4 \pm NB^3 = C^2$

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Key words: Method of infinite ascent, Diophantine equations,
Diophantine equation
$A^4 \pm nB^3 = C^2$.

Each of the Diophantine equations $A^4 \pm nB^3 = C^2$ has an infinite number of integral solutions for (A;B;C) for any positive integer n. In this paper, we will show how the Method of Infinite Ascent would be applied to generate these solutions. Again, we will see the conditions when A, B and C would be pair-wise co-prime. As a side result of this investigation, we will show the method of generating an infinite number of co-prime integral solutions for (A;B;C) of the Diophantine equation $aA^3 + cB^3 = C^2$ for any co-prime integer pair (a ; c).

6. RE-FORMULATION OF LOGIC BASED GENERALIZED DISJUNCTIVE PROGRAMMING PROBLEM

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In this paper we address the solution of Generalized Disjunctive Programming (GDP) Problems that involve disjunctions and convex hull of nonlinear disjunctions with multiple terms. We describe a new convex nonlinear relaxation of the nonlinear GDP problem that relies on the use of the convex hull of each of the disjunctions involving nonlinear inequalities. The proposed nonlinear relaxation is used to reformulate the GDP problem as a tight MINLP problem, and for deriving a branch and bound method. Generalized Disjunctive Programming(GDP) has been introduced recently as an

alternative model to MINLP for representing discrete/continuous optimization problems.GDP model includes Boolean variables(Y_{jk}),Continuous variables(C_k) disjunction and logic propositions. The basic idea of GDP consists of representing discrete decisions in the continuous space with disjunctions, and constraints in the discrete space with logic propositions.

7. THERMAL INSTABILITY OF WALTERS' (MODEL B') FLUID PERMEATED WITH SUSPENDED PARTICLES IN POROUS MEDIUM WITH VARIABLE GRAVITY

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Keywords: Principle of exchange of stabilities, Walters' (model B') fluid, Porous, Positive operator and Variable gravity.

The principle of exchange of stabilities (PES), which is demonstrated physically as convection occurring initially as a stationary convection. In the present paper, the problem of thermal convection of a Walters' (model B') fluid permeated with suspended particles in porous medium heated from below with variable gravity is analyzed by the method of positive operator. For the case of stress-free boundary conditions, it is established that PES is valid for this general problem, when variable gravity g(z) is positive throughout the fluid layer and $(P_1 H + \varepsilon \Gamma - \varepsilon F)^2 > \Gamma \varepsilon (P_1 - \varepsilon F)$. The proof is based on the idea of a positive operator and uses the positivity properties of Green's function.

8. STUDY OF GRAVITATIONAL LENSING CONSTRAINTS ON THE CARDASSIAN MODEL BASED ON THE FRIEDMANN EQUATION

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The Cardassian Model for the dark energy, dark matter and unified theory, which have usually, be invoked as the most plausible way to explain the recent observational result, have been studied. In this paper we mainly focus our attention to investigate some observational consequences of a flat, matter dominated and accelerating scenario, on the constraints, the parameters n and q which fully characterize the Cardassian Model. The dependence of the acceleration red-shift that is the red-shift at which the Universe begins to accelerate, with the parameters n & q are briefly discussed.

9. BIANCHI TYPE V FALSE VACUUM COSMOLOGICAL MODEL IN SCALE INVARIANT THEORY

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Key words: Scale invariant, Space-time, Gauge function, False vacuum

Intention of this paper is to study the perfect fluid distribution in scale invariant theory of gravity when the space-time described by Bianchi type V metric with a time dependent gauge function (Dirac gauge). In this theory the false vacuum model of the universe is constructed and some physical behaviors of the model are discussed.

10. NUMERICAL STUDY OF GRAVITATIONAL LENSING FOCUSING ON THE DIFFERENTIAL PROBABILITY, TOTAL OPTICAL DEPTH AND DISTRIBUTION OF IMAGE ANGULAR SEPARATIONS

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Keywords: Critical angular radius, Gravitational lensing, Differential probability, Optical depth, SIS model, Redshift, Image angular separation.

In this paper we analytically as well as numerically calculate the differential probability and total optical depth that light from a distant quasar at red shift will be lensed by objects in redshift range. The average separation produced by an isothermal object is typically close to the bend angle, measured in its own frame. This result is independent of the quasar redshift. The reasons for choosing image angular separation and lens redshift for study of several separations can be calculated in a simple and reliable way for any particular lens model. Both separation and lens redshift distributions can be determined relatively for observed lens cases.

11. ANALYTICAL AND NUMERICAL ANALYSIS OF COUNTERCURRENT EXCHANGE MECHANISM IN RENAL VASA RECTA SYSTEM

Nilam[1] and Manoj Kumar[2]

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In countercurrent exchange mechanism, blood enters and leaves the medulla by way of the vasa recta at the boundary of the cortex and renal medulla. Large amount of solutes would be lost from the renal medulla without the U - shape of the vasa recta capillaries. Owing to the importance of the countercurrent mechanism, an endeavor is made to look into some features of renal vasa recta system using U - tube model. In the present study, a mathematical model has been proposed to analyze the behavior of concentration of the external solute (i) in steady and unsteady cases at different time intervals using analytical method and (ii) in steady case numerically by Finite Element method. From the physiological viewpoint, the proposed model, with a highly idealized geometry suggested by other researchers also, explains the behavior of concentration of external solute in both steady and unsteady cases having different nature of flux in the limbs of the U - tube model.

12. ON A NEW CLASS OF K-UNIFORMLY CONVEX FUNCTIONS WITH NEGATIVE COEFFICIENTS ASSOCIATED WITH FRACTIONAL OPERATOR

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By using the fractional calculus operator for functions, which are analytic in the open unit disc, U we investigate and study a new class of k-uniformly convex functions. Also we obtain coefficient bounds, distortion theorem and many other useful results.

13. NON-NEWTONIAN SQUEEZE FILM LUBRICATION OF JOURNAL BEARING WITH TEMPERATURE EFFECT

Dhaneshwar Prasad[1], S.S. Panda[2] and S.V. Subrahmanyam[3]
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Thermal effect in hydrodynamic lubrication of journal bearing is studied. It describes a qualitative analysis of system with non-Newtonian incompressible power law lubricants where the consistency of the lubricant varies with pressure and temperature. The governing equation such as equation of motion with continuity and energy equations are solved simultaneously and various bearing characteristics have been discussed and elaborated through figures. It is found that there is   significant change in pressure and temperature while non-Newtonian fluid is considered**.** The important of this paper is highlighted due to non dimensional scheme for

pressure and temperature and consistency with regard to the flow behavior index n of the power law lubricant.

14. SCG-CLOSED, SC*G-CLOSED, SC(S)G-CLOSED SETS IN TOPOLOGICAL SPACES

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Key words: scg-closed, sc*g-closed, sc(s) g-closed sets.

In this paper, we have introduced three new classes of closed sets, as weaker forms of closed sets namely scg-closed, sc*g-closed, sc(s) g-closed Sets in topological space.

15. RECONSTRUCTION OF THE FUNCTIONS ON THE CYLINDER FROM SCATTERED DATA WITH NOISE

Manasa Dash[1] and Swadheenanda Patnaik[2]
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Andharua, Bhubaneswar.
Keywords: Scattered data, noise, mean &variance.

We analyze the reconstruction of a function on the cylinder from scattered data with noise. We show that when a noise is a white noise then its mean value of the scattered data mixed with noise reproduces the function but its variance is significant.

16. MATHEMATICAL MODELS IN MEDICINES FOR DIABETES PATIENTS IN TERMS OF DIFFERENTIAL EQUATIONS

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Mathematical modelling essentially consists of translating real world problems in to mathematical problems, solving the mathematical problems and interpreting these solutions in the language of the real world. This is expressed figuratively by saying that we catch hold of the real world problem in our teeth, derive in the mathematical ocean, drive in to the mathematical ocean, swim there for some time and we come out to the surface with the solution of the real world problem with us. Alternatively, we may say that we soar into the mathematical atmosphere along with the problem, fly these for some time and come down to the earth to with the solutions.

7. SOME OBSERVATIONS ON VISIBILITY OF LATTICE POINT

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Two lattice points *x*, *y* are *visible* from each other if there is no other lattice points between them on the segment $\overline{xy}$. A lattice vector is said to be primitive if it is not the multiple of any other lattice vector, that is, if the greatest common divisor of its coordinates is one. Thus, the primitive lattice vectors are precisely those lattice points that are visible from 0.

18. ANALYSIS OF PRIORITY QUEUE MODELS OF DISCRETE SYSTEM IN QUEUING THEORY

Rudraman
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In this paper, we propose and analyze non preemptive and primitive resume queues. A group of messages that arrive in a slot consists of messages from several priority classes and that the number of messages from each cans depend on each other. Such on arrival process corresponds to the structured priority batch arrival model in continuous time system present an analysis for the waiting time of an arbitrary message of each class.

19. FIXED POINT THEOREM FOR COMPATIBLE MAPPING

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In this paper we introduce the concept of compatible mapping and improve jungck's[1] and park and Base's[2] fixed point theorem let x be a matrix space. Then a function p: $X * X[0,\infty]$ is called a w-distance on X if the following are satisfied. $P(x,z) \leq p(x, y) + p(z,Y)$ for any $x,y \in X$,.....(a') for any $x \in X$ $P(x...):X \to [o,\infty]$ is lower semi continuous,... (b') and for $\epsilon > 0$, there exist > 0 such that $p(z,x) \leq$ and $p(z,y) \leq => d(x,y) \leq \epsilon$.....(c')

20. FINITE DIFFERENCE ANALYSIS OF DEAN'S STABILITY PROBLEM

Ashwani Kumar Sinha
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The stability of the flow of a viscous fluid in a curved channel, due to a transverse pressure gradient, is studied by finite-difference method. Ax symmetric disturbance in a narrow-gap case are considered. Our results agree well with earlier results.

21. CLASSIFICATION OF RANDOM DOPPLER-RADAR TARGETS DURING THE SURVEILLANCE OPERATIONS

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Keywords: Radar Target, FFT, Principal Component Analysis, Eigenvector, Octave-notes, DSP

During the surveillance operations at war or peace time, the radar operator gets a scatter of targets over the screen. This may be a tracked vehicle like tank vis-à-vis T72, BMP etc, or it may be a wheeled vehicle like ALS, TATRA, 2.5Tonne, Shaktiman or moving army, moving convoys etc. The radar operator selects one of the promising targets into Single Target Tracking (STT) mode. Once the target is locked, the operator gets a typical audible signal into his headphones. With reference to the gained experience and training over the time, the operator then identifies the random target. But this process is cumbersome and is solely dependent on the skills of the operator, thus may lead to misclassification of the object. In this paper we present a technique using mathematical and statistical methods like Fast Fourier Transformation (FFT) and Principal Component Analysis (PCA) to identify the random objects. The process of classification is based on transforming the audible signature of target into music octave-notes. The whole methodology

is then automated by developing suitable software. This automation increases the efficiency of identification of the random target by reducing the chances of misclassification. This whole study is based on live data.

Contributed Papers: Statistics

1. EFFECTS OF METEOROLOGICAL PARAMETERS ON AMBIENT AIR QUALITY NOISE IN AND AROUND A CHROMITES MINING COMPLEX – A STATISTICAL APPROACH

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Systematic monitoring of noise levels was carried out at different stations during the summer of 2008 and the winter of 2009 between 07:00-22:00 hours in and around a chromites mining complex. The Student's t-test revealed that the equivalent noise levels (L_{eq}) are not identical with respect to the test values at the different stations at 1% level of significance. Also, the Analysis of Variance (ANOVA) revealed that the L_{eq} are different depending on the time of day and the types of locations at 1% level of significance. The meteorological parameters influence the noise levels with respect to the time of day and also to the type of locations The corresponding linear multiple regression models are obtained. The wind (speed and direction) strongly affects the noise levels at industrial area, commercial area and residential area and attributed to altering of sound propagation by the mechanism of refraction.

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2. ENTROPY MEASUREMENT OF SOME CIRCULAR PROBABILITY DISTRIBUTIONS AND STUDY OF THE INFERENCE PROBLEMS FOR THESE MEASUREMENTS

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Keywords: information, entropy, directional data, Shannon's entropy, variational techniques, classic inverse problem, circular probability distribution, circular normal, wrapped Cauchy, cardioid distribution, decision theoretic properties, entropy based testing.

The concept of information, equivalently of negative entropy, is commonly used in statistics. The probability distribution can be characterized, and hence constructed, for directional data by invoking the criterion of maximization of certain entropy measure. While Shannon's entropy has been the most popular one for such purposes, it is observed that maximization of certain other such functional also leads to useful probability distributions on the circle. Solutions (Ochoa and Delgado-Gonzalez,1990) through variational techniques may be obtained to the classic inverse problem arising out of characterizing a density function $D(\Theta)$ which under isoperimetric constraints minimizes (maximizes) a relevant combination of some integral measure Ψ of D or a functional (an entropy in most cases) for various such functional.
  $D(\Theta)$ is obtained by minimizing a fairly general functional, $\Psi=\int [FD+ \{ \lambda 0+ \lambda 1 cos\Theta+ \lambda 2 sin\Theta+ \lambda 3 cos2\Theta+ \lambda 4 sin2\Theta\}D(\Theta)]d\Theta$ and our constraints corresponding to specifying the first two harmonics of D(first two trigonometric moments of Θ). Unimodal versions of the solutions to various choices of F(D) yield various circular probability distributions. For example, $F(D) = -lnD$ yields the Wrapped Cauchy density (Lygre and Krogstad,1986); $F(D) = -D$ lnD yields the Circular Normal or von Mises density (Burg, 1975); $F(D) = D^2$ yields the cardioid density (Long and Hasselmann,1979) ,etc. Here, we find out the entropy for cardioid, Wrapped Cauchy and circular Normal distribution for their corresponding characterizing entropy measurement and formulate some inference

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problems for these measurements. For example, we suggest estimates for the entropies and study the decision theoretic properties of the suggested estimators with the improvement over the estimator where it is possible. We also consider the entropy-based testing problem in our course of study.

3. ON POSBIST RELIABILITY THEORY

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Conventional reliability theory, i.e., probist reliability is based on the probability assumption and the binary-state assumption. Due to the necessity of applying fuzzy concepts to the reliability analysis, recently a fuzzy reliability theory, for instance, posbist reliability theory is developed. In this work, we focus on the reliability analysis of posbist system (or component) in which the probability assumption is replaced by the possibility assumption and the binary state assumption is reserved. We derive the possibility distribution functions of k-out-of-n ($1 \leq k \leq n$) and n-out-of-n systems. The reliability behavior of these systems with component lifetimes following normal or Cauchy, or exponential fuzzy variables is studied. The results developed here generalize the results of [Cai, K.Y et al. (1991), Fuzzy Sets and Systems, 42, 145-171]. The possibility distribution functions of 1-out-of-2 and 2-out-of-2 systems (given in Cai, K.Y et al. (1991)) can be obtained (as special cases of the present work) from the possibility distribution functions of k-out-of-n and n-out-of-n systems by substituting $k = 1$ and $n = 2$, respectively. In posbist reliability theory, the possibility distribution function and hence the reliability function of a series system i.e., n-out-of-n system cannot be obtained from the possibility distribution function of a k-out-of-n system by substituting $k = n$, whereas in conventional reliability theory, the reliability function of an n-out-of-n system can be obtained as a special case from the reliability function of a k-out-of-n system. We

find that the possibility distribution and hence reliability function of a k-out-of-n system is greater than that of $(k+1)$-out-of-n system, i.e., $\mu_{(k+1):n}(x) \leq \mu_{(k):n}(x)$ for all $x \in R^+$ where $\mu_{(k):n}(x)$ represents the possibility distribution of a k-out-of-n system evaluated at x. The same trend is also true for reliability functions which match with the result of conventional reliability theory.

4. ON THE CHARACTERIZATION OF MAXENT DENSITY FUNCTIONS UNDER NON SHANNON ENTROPIES AND SOME RELATED PROBLEMS

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Keywords: Maxent density functions, exponential family

Though it is well established that under Shannon entropy, the maxent density functions usually turn out to be members of the exponential family, the prospect of working with other forms of entropy remains relatively unexplored. The present paper centers around this and also attempts to find suitable constraints that need to be imposed to obtain maxent marginals in a desirable form under different entropies.

5. SNAKES AND LADDERS: THE MARKOV WAY

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In this paper, we try to estimate the number of throw within which which a game of "Snakes and ladders" is expected to get over using Markov Chains. We divide the board into several states and takes the help of a Transition Matrix, denoting the transition probabilities of inter-state movements, to computer the probability of finishing the game within "n" trials for varying values of "n" (from 5 to 100).

Here, we multiply the transition matrix "n" times and find the probability of transition we multiply the transition matrix "n" times and find the probability of transition from the first state to the last. We finally note how the probability of the termination of the game is almost certain for a sufficient large value of "n".

6. ON MODIFIED EXPONENTIAL ESTIMATORS FOR FINITE POPULATION MEAN IN DOUBLE SAMPLING

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Key words : Double sampling, auxiliary information, exponential estimator, Bias, Mean square error

In the current paper, we have proposed a class of modified exponential estimators for the population mean under double sampling plan. Its bias and mean square error are studied. It has been compared empirically with some well known competitive estimators suggested by Srivastava's (1971), Sisodia and Dwivedi (1981), Bhal and Tuteja (1991), Singh and Tailor (2003), Singh and Espejo (2007), Singh et. el. (2007) by using ten different populations available in the literature. It has been observed that the proposed estimator performs better than all these estimators as evidenced by its higher PRE (Percent relative Efficiency).

7. A STATISTICAL ANALYSIS OF WOMEN AWARENESS

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Key words: Differentiation formula, function, logarithmic form, exponential form

Long before independence, the theme on which Gandhiji and then Nehru wrote repeatedly was the need to improve the development of Indian women. India is one of the few countries where selective sex gender bias exists till today. Much developmental news regularly are published in all newspapers on various aspects of women, but some statistics show the deplorable condition of them till now. Mere cramming of these figures will lead the women nowhere. According to Woman and Child Welfare Department, the urban girl child is still at a disadvantage; her rural counterpart has some ray of hope. Worldwide, 774 million adults (64% of them are women) lack basic literacy skills. According to UNDP, in developing countries, 85 % of girls are enrolled in primary and 51 % in secondary school. International research consistently finds that women are more likely to be beaten, raped, or killed by a current or former partner than by any other person, with most studies estimating that 20 to 50% of women experience partner violence. Also 72% of the world's 33 million refugees are women and children. Every 42 minutes a sexual harassment incident occurs. Every 43 minutes a woman is kidnapped and every 93 minutes a woman is burnt to death over dowry. One-quarter of the reported rapes involve girls under the age of 16 but never reported. As per the recent estimates, 28.7 % of women as against 54.7 % of men participated in workforce. Only 40-50 % women get antenatal care. An estimated 529,000 women die a year - at least one woman every minute - from complications related to pregnancy or childbirth, leaving behind children who are more likely to die because they are motherless. But on the other hand there is an upsurge of women voters and their turnouts also. In Bihar, Madhya Pradesh, Uttar Pradesh, Maharashtra, Orissa and Gujarat the registration for health services for mother and child are low (5-22% in rural) and (21-51% in urban) areas. Out of the 15 million baby girls born in the country, every year nearly 25% of them do not reach their 15th birthday. There is malnutrition, poverty, high illiteracy and infant mortality ailing the society today in India.

8. PRICE -WEIGHTED APPORTIONMENT INDEX AND RELATED INFERENCE

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Keywords: Target Matrix, Output Matrix, Price Matrix, Apportionment Index (AI), Price-Weighted Version of Apportionment Index (AIw), Lower Tolerance Limit

Price-Weighted Apportionment Index measures the fit between log demand distribution and log output distribution. We present the asymptotic sampling distribution of Price-Weighted Apportionment Index by assuming a multinomial distribution for the outcome variables. Our results are based mainly on large-sample normal approximation.

9. STATUS OF WOMEN IN NORTH EASTERN STATES OF INDIA: A COMPARATIVE STATISTICAL ANALYSIS

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The status of women plays a vital role in our society, particularly for controlling the growth of population. In this paper, an attempt is made to study and asses the status and privilege of women and also to analyze and examine the extent to which the status of women particularly in the North Eastern part of India related to the awareness and practice of family planning, methods & techniques.

10. A CLASS OF STATISTICAL MODELS TO STUDY UNMET NEED FOR FAMILY PLANNING PROGRAMME IN ORISSA, INDIA

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Key words: Differentiation formula, function, logarithmic form, exponential form

Objectives of the Study
Assessment of Unmet according to background situations
Regional Variation of the Unmet need

Source of data
The study is based on the data from NFHS-1, 2 and 3 of 1992-93, 1998-99 where 4461 and 4425 eligible women were interviewed

Methodology
The unmet need is assessed based on fourteen selected variables chosen as per the background situation of Orissa. The unmet need (dependant variable) is studied by the uni-variate analysis and multinomial logit regression (m-log) models controlling different variables using SPSS. The regional variations of the above factors have been studied by using the technique of GIS.

Main Findings
The study reveals that 64 percent of the currently married women have a need either met or unmet for family planning and 16 percent of the currently married women have an unmet need i.e.7 percent for limiting and 9 percent of spacing. The study also reveals that the unmet need decreases with increase in age and number of living children. The study reveals that the programme should look more towards the unmet need for women who are young, of lower **parity** (1-2 parity), from rural areas, illiterate, from other backward class, non-working and from lower standard of living, and those women who have never discussed about family planning with their partners in order to address the unmet need for family planning.

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11. MATHEMATICAL METHODS IN MEDICAL IMAGE PROCESSING

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In this paper, we describe some central mathematical problems in medical imaging. The subject has been undergoing rapid changes driven by better hardware and software. Much of the software is based on novel methods utilizing geometric partial differential equations in conjuction with standard signal/image processing techniques. As part of this enterprise, researchers have been trying to base to base biomedical engineering principles on rigorous mathematical foundations.

12. WIND MILL SYSTEM HAVING ONE UNIT & THREE ASSOCIATIVE UNITS

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Dhamtari, Chhattisgarh

This paper is prepared with a view to mitigate the effect of global warming as the wind mills system do not contribute green house gases into the atmosphere and also on account of it being less expensive

13. COMPARATIVE PERFORMANCE OF OBLIQUE AXES, *K*-TH NEAREST NEIGHBOUR, LINEAR AND QUADRATIC DISCRIMINATE PROCEDURES UNDER MULTIVARIATE SKEW-NORMAL SITUATIONS

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The four classification techniques, namely Linear Discriminant Analysis (LDA), Quadratic Discriminant Analysis (QDA), *k*-th Nearest Neighbor (KNN) and Oblique Axes Method (OAM) are considered in this study for classification into multi-groups based on the multivariate skew-normal data. To assess the performance of the above techniques under non-normality caused by skewness, which is introduced in the rice-bean data by using multivariate skew-normal distribution through simulation. Apparent Error Rate (APER) is used to measure the classification performance of these techniques. The result of this study can be used for choosing the best method for Skewed-normal situation. The results indicate that KNN followed by OAM and LDA perform better in skew-normal situations than normal condition and QDA performs better in normal data. For maximum consistency and accuracy of classification of skew-normal data, KNN is best among the above four classification techniques.

14. APPLICATION OF RATIO-TYPE ESTIMATORS FOR SMALL AREA IN REPEATED SURVEY

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Key Words: Ratio-type estimators; Small area; Repeated surveys; Mean square errors.

The present paper deals with the application of ratio type estimator to estimate population mean for small area on current occasion in repeated surveys. The estimation of population mean for small area on current occasion has been proposed using separate ratio-type estimator and combined ratio-type estimator. The mean square errors (MSE) of proposed estimators have also been derived and show that the estimate based on combined ratio-type estimator is more efficient than separate ratio-type estimator, under certain conditions. In addition, this theoretical result is supported by an empirical study.

Poster Presentations: Mathematics
1. ON CHARACTERIZATION OF DUALLY FLAT FINSLER METRICS

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Our main purpose is to investigate geometric properties of flat Finsler matrices .We show here that the geometric structure of a family of probability distributions gives rise to a new structure as a special class of Finsler geometry known as information geometry. We derive here necessary and sufficient condition for dually flat Finsler metrics.

2. FUZZY INFERENCE IN MEDICAL DIAGNOSIS: A CASE STUDY

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Keywords: Medical diagnosis, Fuzz sets

Zadeh's Fuzzy set theory is a potential tool for dealing with uncertainty and imprecision. Since uncertainty is inherent in the diagnosis od a disease fuzzy set is considered as suitable formalism in this regard. In this paper we have proposed a method fro medical diagnosing under partial information and given fuzzy rules. The method is illustrated with a case study where diagnosis of a patient for different forms of anemia is done

3. SPACE TIME DEPENDENCE OF BIS INDEX NUMBERS THEIR USES IN ESTIMATING THE FUTURE OF OUR EARTH GALAXY AND UNIVERSE

M.M. Bajaj[1], Ashwani Kumar Sinha[2], Rashmi Sinha[3] andV.R.Sinha[4]

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The main objective of this paper is to highlight the importance and significance of gender-related development indicators, for accessing relative levels of progress and backwardness of women's status, across the districts of west Bengal, Here in this paper. I attempt to evaluate the degree of gender inequality that has been created and reproduced in the households, markets and societies in West Bengal. In many district of this state, the women are grounded in both poverty and patriarchy. Women's mobility in West Bengal Is constrained due to their limitation to ownership and control of property and other economic resources The paper is organized as

follows: Section 1 Introduces the topic. Section 2 presents the literature review. Sections 3 speak about the objectives of the paper. Sections 4 examine the data and methodology. Section 5 studies the gender related indices. Section 6 offers some concluding remark and further research agenda. West Bengal, which is the 4th most popular state and 7th most populous sub-national entity of the world, portrays a remarkable issue of gender inequality in India. Though I have started on quite a pessimistic mote, it should also be mentioned that the winds of change have already started blowing.

4. SEISMIC INTERPRETATION USING WAVELET ATTRIBUTES

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In exploration seismology, a seismic attribute is any quantity derived from seismic data using measured time, amplitude, frequency, attenuation or any combination of these. It intends to output a subset of the data that quantifies rock and fluid properties and/or allows the recognition of geological patterns and features. The study and interpretation of seismic attributes provide us with some qualitative information of the geometry and the physical parameters of the subsurface. The amplitude content of seismic data is the principal factor for the determination of physical parameters, such as the acoustic impedance, reflection coefficients, velocities, absorption, etc. The phase component is the principal factor in determining the shapes of the reflectors, their geometrical configurations etc. One point that must be brought out is that we define all seismically-driven parameters as Seismic Attributes. They can be velocity, amplitude, frequency, and the rate of change of any of these with respect to time or space. The principal objectives of the attributes are to provide accurate and detailed information to the interpreter on structural, stratigraphic and lithological parameters of the seismic prospect. Wavelet analysis, known as a mathematical

microscope, has scope to cope with non stationary, nonlinear signal to delve deep into geophysical seismic signal processing and interpretation for oil and gas exploration and production,petrophysical imaging for oil and gas reservoir ,advanced Seismic stratigraphy -high resolution subsurface imaging. Non-Stationary statistical Geophysical Seismic Signal Processing (GSSP) is of paramount importance for imaging underground geological structures and is being used all over the world to search for petroleum deposits and to probe the deeper portions of the earth. Seismic interpretation has been traditionally based on reflections or amplitudes.

5. A STUDY OF REFLECTING AND ABSORBING IN MODERNIZING MATHEMATICS TEACHING

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Mathematics is a way to settle in the mind a habit of reasoning. The reasoning in mathematics possesses a number of characteristics such as simplicity, Criginality, attitude of discovery, self-reliance etc. the characteristics and qualities of mathematical reasoning in working out any mathematical problem constitute Bhattacharya's model this model suggests that two processes- absorption and reflection are vitally important for solving any new problem in mathematics. In the present research paper an experiment has been conducted on the efficacy of the model on two group of secondary school student in a particular class. The experiment finding showed, remarkable, than that of the control group. The Bhattacharya's model helps the teacher to secure interest and attention of his pupils to any new idea and afford immense pleasure to those who wants to learn mathematics with understanding.

6. OBLATENESS EFFECT OF SATURN ON PERIODIC ORBITS IN THE SATURN TITAN RESTRICTED THREE-BODY PROBLEM

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We explore the effect of oblateness of Saturn (more massive primary) on the periodic orbits and the regions of quasi-periodic motion around both the primaries in the Saturn-titan system in the framework of planar circular restricted three-body problem. Various orders of interior and exterior resonances are located. The effect of oblateness is studied on the location, nature and sie of periodic and orbits, using the numerical techniques of Poincare surface of sections. Some of the periodic orbits change to quasi-periodic orbits due to the effect of oblateness. The stability of the orbits and Saturn, Titan and both varies with the inclusion of oblateness. The centers of the periodic orbits around Titan move towards Saturn, whereas those around Saturn move towards Titan. For the orbit around Titan at C=2.9992, x=0.959494, the apocener becomes pericenter. By incorporating oblateness effect, the orbit a round Titan at C=2.99345, x=0.924938 is captured by Saturn, remains in various trajectories around Saturn, and as time progresses it spirals away around both the primaries.

7. EFFECT OF GRAVITY AND POROSITY IN PROPAGATION OF LOVE WAVES IN FIBER REINFORCED LAYER

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The propagation of Love waves in fiber reinforced anisotropic layer lying over gravitating porous anisotropic porous half space has been considered. The dispersion equation has been derived for the propagation of Love waves in terms of Whittaker function and its derivative, which are expended asymptotically and the terms retain up to second degree. The frequency equation shows that the gravity and porosity of the porous half space and transverse as well as longitudinal rigidity due to reinforced material have significant effect on the propagation of Love waves. It is observed that for fixed value of gravity the phase velocity decreases with increase in width of reinforced layer. Porosity leads to increase in phase velocity whereas it decreases with increase in gravity for certain width of the layer.

8. THEORETICAL DETERMINATION OF ELECTRICAL RESISTIVITY AND KNIGHT SHIFT OF SOME BIVALENT METALS IN LIQUID PHASE

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Keywords : Electrical resistivity, Knight shift, HFP technique**,** OPW method, Bivalent liquid metals, Pseudopotential.

One of the important physical properties of a metal is its electrical resistivity. It is really a matter of interest to study the resistivity of a metal when it melts. In the present work we have considered two bivalent liquid metals i.e. magnesium and zinc and tried to determine their electrical resistivity by Harrison's first principle pseudo potential technique which an orthogonalised plane wave method is basically. Side by side the magnetic property viz. Knight shift of them has also been calculated on using Knight's formula. The computed results for have been compared with the experimental data and an overall reasonable agreement is found.

9. ABSOLUTE (N, P, Q) SUMMABILITY OF CONJUGATE SERIES OF A FOURIER SERIES

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Key words: Almost(N,p,q), summability, conjugate Fourier Series

In this paper we have proved a theorem on almost (N,p,q) Summability of conjugate series of a Fourier, which generalizes various known result. However, our theorem is as follow.

10. EXAMPLE OF KAEHLERIAN MANIFOLDS

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Key words: Kaehlerian manifold, Hermitian metric tensor, the Christoffel symbols**.**

In this paper, we consider a Kaehlerian manifold M of complex dimension. The purpose of the paper is to give an example of Kaehlerian manifold of complex dimension two.

11. EXTREME MODERN MATHEMATICS

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Key words: Modernism, Geometries, Mathematics Analysis, Algebraic Logic, pure and applied mathematics

In this Article, Attempt has been made to discuss some important points of modern mathematics and its bounds. As the time passes on , extends of mathematical bounds have been increasingly day by day, So Discussions have been confirmed within the period of last quarter of 20th century. Contribution of eminent mathematics has been highlighted during the discussion.

12. THE UNSTEADY FLOW OF VISCO-ELASTIC OLDROYD FLUID OF FIRST ORDER DUE TO A PERIODIC PRESSURE GRADIENT THROUGH A RECTANGULAR DUCT

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Key words: Visco-elastic, oldroyd fluid, periodic pressure gradient, ordinary viscous fluid, rectangular duct, Rheology of continua.

The main object of this research paper is to investigate the unsteady flow of visco-elastic oldroyd fluid of first order due to a periodic pressure gradient through a non conducting rectangular duct. Firstly the general investigations have been presented methodically to Consider the unsteady flow of the fluid in presence of a periodic pressure gradient. Secondly two important deduction have been made for Maxwell fluid of first order and ordinary viscous fluid respectively. Finally the author investigates the aforesaid problem numerically through table and graphs. It is also noted that final forms of the result are in fair agreement with the corresponding

classic result. It is belief of the author that the titled problem has not been investigated numerically earlier.

13. *Gαo-COMPACT SPACES

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In this paper e introduce *gα-complete accumulation points and utilizing the same, we derive some characterizations of *GαO-compact spaces. By introducing the notion of 1-lower(rep. 1-upper) *gα-continuous, we investigate some of the properties of *GαO-compact spaces. We also derive the properties of *GαO-compact spaces by utilizing 1-lower(resp. 1-upper) *gα-continuous multifunctions.

14. ON THE CLASS OF DIFFERENCE SEQUENCE SPACES GENERATED BY INFINITE MATRICES

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Keywords: Difference operator, statistical convergence, modulus function.

The main purpose of the present paper is to derive some inclusion relations and other interesting properties of of certain difference sequence spaces $(C, 1)(A\hat{},\Delta^v_r), [C, 1](A\hat{},\Delta^v_r)$, $(V, \lambda)(A\hat{},\_\Delta^v_r)$ and $[(V, \lambda](A\hat{},\Delta^v_r)$ generated by infinite matrices, where $\upsilon= (\upsilon_k)$ is a fixed sequence of non zero complex numbers and r 2 N. Also we introduce the concept of _A-statistical convergence and derive many interesting results on these spaces by introducing Orlicz functions.

15. COMMON FIXED POINT THEOREM IN PROBABILISTIC METRIC SPACE THROUGH VACUOUSLY COMPATIBLE

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Key word: Fixed point, common fixed point, compatible maps

In this paper, a fixed point theorem of self maps has been proved using the concept of reciprocal continuity and vacuously compatible of pair of self maps on PM-space. In probabilistic metric fixed point theory, fixed points and common fixed points theorems for contractive maps require the continuity of maps and compactness of the space. Vasuki [15] generalized the result of Schweizer and Sklar [7] for a sequence of maps satisfying a new contraction type condition in manger space and proved common fixed point theorems for a sequence of self maps. A contraction mapping on a complete PM-space possesses a unique fixed point. The principle as well as other fixed point theorems was published by Sehgal and Bharucha-Reid [8] in 1972.

16. THE ORETICAL AND APPLIED MECHANICS

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Fluid mechanics is the part of the Mechanics which is the combination of the static's and Dynamics i.e MECHANICS=CTATICS+DYNAMICS When fluid (Which is a substance which has finite(definite) mass and volume but has indefinite shape and can not sustain a shear stress under the equilibrium(sum of magnitudes of forces coming and going at the point of equilibrium(sum of magnitudes of forces coming and going at the point of equilibrium is equal to zero) conditions.

17. METHOD OF INFINITE ASCENT APPLIED ON $mA^3 + nB^3 = 3C^2$

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Key words : Method of infinite ascent, Diophantine equations,
Diophantine equation mA3 + nB3 = 3C2.

In this paper, we present a technique of generating infinitely many
co-prime parametric solutions for (A;B ;C) in the Diophantine
equation mA3 + nB3 = 3C2 for any pair of co-prime integers (m; n)
where (m2   n2) = 3k, and 3 is not a factor of k. We show how each
of these parametric solutions breeds infinitely many co-prime
integral solutions for (A;B ;C) linked with this Diophantine
equation.

18. RIESZ BASES CONSTRUCTED FROM MULTIRESOLUTION ANALYSIS OF POLYNOMIAL B-SPLINES

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Keywords: Trigonometric B-Spline, Multiresolution Analysis,
Wavelet, Euler-Frobenius Polynomial, Riesz basis

In this paper we study Riesz bases of the Multiresolution Analysis
(MRA) generated from the polynomial B-splines. It is shown that
both the scaling function and the wavelet generate Riesz bases of
their corresponding spaces.

19. VON NEUMANN REGULARITY AND ALGEBRA

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Keywords: algebra, semi group, semi simple group.

Villamayor and Connell have the necessary and sufficient condition for group algebra to be regular. The regularity of semi group has been discussed by Weiss glass. The main objective here is to find the condition for semi group algebra to be periodic. It will be proved here each periodic inverse semi group is completely semi simple.

20. ANALYTICAL SOLUTION METHOD FOR FUZZY LINEAR OPTIMIZATION PROBLEM

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Keywords: Fuzzy relation equations and basic and non basic variable

In this paper I present a fuzzy linear optimization problem and propose a procedure for separating the decision variable into basic and non-basic variables. The complimentary problem of the original problem is defined; clearly none of the variable gets increased over its maximum and gets decreased below zero (i.e. assumed minimum). These Boundary values can be assigned to the variable in order to improve the value of objective function and to satisfy the functional constraint.

21. EINSTEIN ROSEN UNIVERSE WITH MAGNETIZED ANISOTROPIC DARK ENERGY

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Keywords: Dark Energy, Magnetism.

In this paper, we have studied the solutions of cylindrically symmetric Einstein Rosen universe with variable ω in the presence and absence of magnetic field of energy density ρ_B. A special law of variation for Hubble's parameter proposed by Berman [8] has been utilized to solve the field equations. Some physical and kinematical properties of the model are also discussed.

22. AN ALTERNATE DIFFERENTIATION FORMULA OF THE EQUATION HAVING f(x)$^{g(x)}$ FORM

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Key words: Hydromagnetic flow; Magnetic parameter, Suction; Porous-wall; Oscillation.

The behaviour of steady-state two-dimensional flow of a solution of viscous, incompressible and electrically conducting fluid in the vicinity of an oscillating infinite porous flat wall is examined for the case of suction subject to a magnetic field fixed relative to the wall. Velocity curves for different values of suction as well as magnetic parameter are represented through graphs. The results obtained have, so far, been discussed and well-interpreted

23. STUDIES ON THE ARYABHATA -I'S METHODS AND MODERN METHODS FOR SQUARE ROOT

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Keywords: Square root, Whole Number, Decimal number.

The different Steps of the method given by Aryabhata-1for extracting a square root of a whole number and to extend the method extracting the root of a decimal number. It is also explained by Bhaskara-1 and other ancient scholars. The history of mankind shows different thoughts about human nature at their beginning on the earth, putting the name of Hobbs, Roussace etc. for their thought about the state of nature in this line. As the history of mathematics is a history of mankind because it consist the intellectuality of the human race or of a society for their development. The study of history of mathematics reveals the modern and ancient methods are comparatively quite useful. But it is found for few cases that modem method have not yet elaborated or generalized the method of extracting square root of a whole number given by the ancient Indian mathematics. This Method is very popular for extracting the square root of a number.

24. COMPARISON BETWEEN RAMANUJAN'S HIDDEN THEOREMS AND SOME FAMOUS THEOREMS

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Keywords: Polynomials, Transformation, Partitions

Srinivasa Ramanujan's (1887-1920) many of theorem were hidden from the world for many years, because his lost notebook, which was found by George Andrew in the library at trinity college Cambridge in 1976. It was natural that other mathematician would unknowingly rediscover some of his unpublished theorems. The

purpose of this paper is to provide few examples for which other shave received credit for theorem, but unknown to them. Their discoveries were not original with them but they were first unearthed by S. Ramanujan. For example Riemann Zeta functions, Bell Numbers and Polynomial, Koshliakov's formula and Dickman's function. Ramanujan hence proved these theorems in his lost notebook which was written in the last year of his life 1919-1920.

25. APPLICATION OF DIFFERENTIAL TRANSFORMS METHOD IN VIBRATION ANALYSIS OF ISOTROPIC RECTANGULAR PLATES RESTING ON WINKLER FOUNDATION

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Free transverse vibrations of isotropic rectangular plates resting on Winkler foundation are presented here using differential transform method on the basis of classical plate theory. Two opposite edges of the plate are simply supported. Effect of aspect ratio together with foundation parameter on the natural frequencies has been illustrated for the first three modes of vibration for three different combinations of clamped, simply supported and free edges correct to four decimal places on other two edges. Results in special cases have also been compared.

26. THERMAL INSTABILITY OF RIVLIN-ERICKSEN FLUID PERMEATED WITH SUSPENDED PARTICLES IN POROUS MEDIUM WITH VARIABLE GRAVITY

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Key words : Principle of exchange of stabilities, Rivlin-Ericksen fluid, Porous, Positive operator and Variable gravity

The principle of exchange of stabilities (PES), which is demonstrated as "all non decaying disturbances are non oscillatory in time". Alternatively, it can be stated as "the first unstable eigenvalues of the linearized system has imaginary part equal to zero". In the present paper, the problem of thermal convection of a Rivlin-Ericksen fluid permeated with suspended particles in porous medium heated from below with variable gravity is analyzed by the method of positive operator. For the case of stress-free boundary conditions, it is established that PES is valid for this general problem, when variable gravity g(z) is positive throughout the fluid layer and $(P_1 H + \varepsilon \Gamma + \varepsilon F)^2 > \Gamma \varepsilon (P_1 + \varepsilon F)$. The proof is based on the idea of a positive operator and uses the positivity properties of Green's function.

27. DERIVATION OF POWER CARRIED BY A PLANE WAVE WITH THE HELP OF THE POYNTING THEOREM

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The electro magnetic theory of light is based on Maxwell's Equations of electromagnetic field. The Molecules of electric Substances are composed of atomic, nuclei and electrons, Faraday's law of electromagnetic induction state that the induced e.m.f. around closed circuit is negative times the rates of charge total flux of the

magnetic induction. The present paper is designed for derivation of the power carried by a plane wave by using pointing theorem under electromagnetic field equation of Maxwell. In This paper we first present the proof of poynting theorem and then with the help of poynting theorem electromagnetic wave equation and electro magnetic potential, derivation of power carried by plane waves is determined.

28. STABILITY OF A VISCOUS FLOW IN POROUS MEDIUM

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Keywords: Circular cylinder, magnetic Field, porous medium, viscous flow

The present paper is the study of linear stability of viscous flow between long concentric rotating porous cylinders having a narrow gap. The numerical values of the critical wave number and the critical taylor number are listed in the table for different values of suction/injection parameter and the ratio of the outer angular velocity to the inner angular velocity of the two cylinders.

29. CYCLE MULTIPLICITY OF MIDDLE GRAPH OF K_n,

$K_{m,n}$, P_n AND C_n
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Keywords: Cycle multiplicity, middle graph, complete graph, complete bigraph, path and cycle

In this paper we study the basic results on cycle multiplicity and a brief review of the cycle decomposition of complete graph into the cycles of minimum length. Then we derive cycle multiplictiy of middle graph of Kn, Km,n, Cn and Pn.

30. ON THE STABILITY OF TRIANGULAR POINTS IN THE GENERALIZED RESTRICTED THREE BODY PROBLEM

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We have investigated the stability of triangular points in the generalized restricted three body problem. The problem id generalized in the sense that the smaller primary is taken as an oblate spheroid. The effect of oblateness of the smaller primary appears as an oblate spheroid. The effect of oblateness of the smaller primary appears as an additional term in the potential as a result the location of triangu8lar points and the roots of the characteristics equation at these points depend only upon the mass parameter but also on the oblateness coefficient. We have established a condition under which triangular points from isosceles triangular with the primaries. We have also found that these points are stable in the linear sense for a limited range. The stability condition is in the suitable from for quantitative analysis in space dynamics.

31. SOME APPLICATIONS OF FRACTIONAL CALCULUS

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A significantly large number of earlier works on the subject of fractional calculus give interesting accounts of the theory and applications of fractional calculus operations in many different areas of mathematical analysis(such as ordinary and partial differential

equations, integral equations, special functions, summation of series, etc).The main object of the present paper is to examine rather systematically (and extensively) some of the most recent contributions on the applications of fractional calculus operators in finding the sums of an interesting family of infinite series. Various further generalizations, relevant to the present investigation, are also given.

32. APPLICATION OF VERTEX COLORING IN CASE OF GAUSSIAN & LAPLACIAN IMAGE PYRAMID

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Key words: Vertex coloring, Gaussian Pyramid, Laplacian Pyramid, Fractal Image

In this paper the performance of the Gaussian & Laplacian image pyramid with vertex coloring application in case of a definite triangular closed path structure obtained from the front view of a pyramidal structure has been explained. The vertex colored nodes are then considered as the color code elements and the compression and the reconstruction of that definite triangular structure is possible with the proper location of color code information. The generalized algorithm is formed to analyze the total performance of Vertex coloring.

33. Effect Of Rotation On Unsteady Mhd Free Convection Flow Past An Impulsively Moving Vertical Plate With Ramped Temperature In A Porous Medium With Thermal Diffusion And Heat Absorption

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Keywords: Hydromagnetic free convection, rotation, thermal diffusion, heat absorption, porous medium, ramped temperature.

Effect of rotation on unsteady MHD free convection flow of a viscous incompressible electrically conducting fluid past an impulsively moving vertical plate with ramped temperature in a porous medium with thermal diffusion and heat absorption is investigated. Exact solution of the momentum and energy equations, under Boussinesq approximation, is obtained in closed form by Laplace transform technique. To compare the results obtained in this case with that of isothermal plate, exact solution of the governing equations is also obtained for isothermal plate. The expressions for primary and secondary skin frictions and Nusselt numbers are also derived. It is found that, for both ramped temperature and isothermal plates, rotation has tendency to retard fluid flow in the primary flow direction and to accelerate it in the secondary flow direction.

34. ACCELERATED MOVEMENT OF ONE OF THE PLATES OF THE CHANNEL IN THE PRESENCE OF AN INCLINED MAGNETIC FIELD

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Key words: Hydromagnetic Couette flow, Hall current, inclined magnetic field, modified
Ekman-Hartmann boundary layer, Rayleigh boundary layer, spatial oscillations.

Effects of Hall current on unsteady hydromagnetic Couette flow, induced due to an accelerated movement of the lower plate of the channel in a rotating system when the fluid flow is permeated by an inclined magnetic field is studied. Exact solution for the fluid

velocity is obtained by Laplace transform technique. The expression for the shear stress at the moving plate is also derived. Asymptotic behavior of the solution is analyzed for small and large values of time *t* to gain some physical insight into the flow-pattern. It is found that Hall current, rotation and angle of inclination of magnetic field tend to accelerate fluid flow in both the primary and secondary flow directions whereas magnetic field has tendency to retard fluid flow in both the primary and secondary flow directions.

35. TO STUDY THE VELOCITY DISTRIBUTION OF STRATIFIED FLUID IN PRESENCE OF VARIATIONAL MAGNETIC FIELD THROUGH A POROUS MEDIUM

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The motion of viscous stratified fluid largely depends on the magnitude of stratification factor, porosity factor, slip parameter and Hartman number, so they must have effect on the boundary layer also. The aim of the present paper is to study the effect of magnetic field and porosity factor on the velocity of an electrical conducting viscous incompressible fluid of variable viscosity and density between a fixed permeable bed and a moving impermeable bed under the pressure gradient.

36. THE 108 SACRED NUMBER SERIES AND 3D MANIFESTATION & EARTH AND MOON INFORMATION QUANTIZATION

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The 108 number series is represented graphically with the y-axis as the log values of base 10, has been to be in the x-axis range from 1 to 22 only, since my Acer laptop windows vista premium sets the infinity limit at n=23 for the 108 sacred number series. More

powerful computers may set this limit to higher than n=22 but I point out that the exponential growth of the log10 base values would persist even at higher x range values. This is an important finding of this research. It would be a play to polynomial fit the data of log10 values to a variety of functions. They are all listed in this article. About 10 different functions, such as Lorentz fit etc, have been used to fit the graphical curve obtaining their relevant parameters. The data is given explicitly.

37. BINARY OPERATION ON A SET

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An operation which combines two elements of a set to give another element of the same set is called a binary operation or binary compositions. Let G be a non-empty set. Then G×G={(a,b):aεG ,bεG}.If f:G×G→G then f is said to be a binary operation on the set G. The image of the ordered pair (a,b) under the function f if denoted by a f b. Generally the symbols '+','x','.','0','*' etc are used to denoted binary operation on a set. The operations of algebraic additions, subtraction, multiplication and division can now be looked upon in this reference over the set of numbers.

38. EXISTENCE OF POSITIVE SOLUTIONS FOR P-LAPLACIAN SINGULAR BOUNDARY VALUE PROBLEMS ON TIME SCALES

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Key words: P-Laplacian, singular Boundary value problem, time scale,positive solution, Leray-Schauder degree.

This paper is concerned with establishing the existence of positive solutions of P-Laplacian singular boundary value problem on time scale, $(\acute{A}p(y\rlap{/}c(t)))r + q(t)f(t; y(t); y\rlap{/}c(t)) = 0;$ t 2 [0; 1]T $y(0) = 0 = y\rlap{/}c(1);$ where $\acute{A}p(y) = jyjp_{\textrm{¡}}2y;$ $p > 1$ and $f : [0; 1]T$ $\pounds R2 \, ! \, R$ is continuous and may be singular at $y\rlap{/}c = 0$ but not $y = 0$. We establish the existence of at least one positive solution for the P-Laplacian singular boundary value problem on time scales by using the Leray-Schauder degree theory.

39. BILATERAL TRANSFORMATION AND ROGERS-RAMANUJAN TYPE OF IDENTITIES

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Key words: Basic hypergeometric functions / bilateral series

In this paper, we have used two of the general transformations of Verma and Jain to derive certain bilateral transformations. These have been used to find identities of the Rogers-Ramanujan type related to different moduli. The advantage of writing down Verma & Jain's transformations as a bilateral series is to introduce one more parameter and thus obtain an
Entire infinite family of Rogers-Ramanujan type of results.

40. STUDIES ON DOUBLY WEIGHTED FUZZY GRAPH

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Keywords: Fuzzy graph, cluster, edge connectivity, cohesiveness.

Fuzzy graph definition by Rosenfeld (1975), Yeh & Bang concerns with weighted graphs with vertices and edges associated with weights or degrees of membership value lying in between '0' and '1'. Thereafter, several interesting results have been developed related to the graph theory. In cluster analysis fuzzy graph approach is used extensively as it is more powerful than the usual graph theoretic approach. Fuzzy graphs with each edge associated with two weights have been studied by the authors. With the introduction of some related terminologies clustering procedures have been developed for doubly weighted fuzzy graph.

41. AN ALTERNATE DIFFERENTIATION FORMULA OF THE EQUATION HAVING $F(X)^{G(X)}$ FORM

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Key words: Differentiation formula, function, logarithmic form, exponential form

Differentiation of any function having $f(x)^{g(x)}$ form can be done by many ways including the most common logarithmic form and the exponential form. But an attempt has been made to evaluate the differentiation of any function having $f(x)^{g(x)}$ form by a new method i.e., the summation of the differentiation of the equation in a^x and x^n form, which is easier to be worked out and also less time consuming.

42. ON WEAKLY GENERALIZED RECURRENT MANIFOLDS

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Key words: Weakly generalized Riemannian manifold, recurrent manifold, generalized recurrent manifold, Ricci recurrent manifold, generalized Ricci recurrent manifold, scalar curvature.

The object of the present paper is to introduce a non-flat Riemannian manifold called *weakly generalized recurrent manifold* and study its various geometric properties. If such a manifold is Einstein with vanishing scalar curvature, then it reduces to a recurrent manifold and if the manifold is Einstein with non-vanishing scalar curvature, then it turns into a generalized recurrent manifold. Again, if a weakly generalized recurrent manifold is non-Einstein, then it is neither recurrent nor a generalized recurrent manifold and the existence of such a manifold is given by a proper example

43. CURVATURE PROPERTIES OF GÖDEL METRIC

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Key words: Gödel metric, Einstein field equation, cosmological constant, pseudo symmetric space, pseudo symmetric type space, Riemann curvature tensor, Ricci tensor, scalar curvature.

In 1949 K. Gödel (Reviews Modern Physics, 21(3) (1949), 447-450) published an exact solution of Einstein field equation with a non-zero cosmological constant corresponding to a universe in rotation and with an incoherent matter distribution. In that paper he described a metric known Gödel metric as exact and stationary

solution of Einstein field equation, which describe a rotating, homogeneous but non-isotropic space time. Possessing a series of interesting properties, it remains still today quite interesting both mathematically and physically. The object of the present paper is to study the curvature properties of Gödel metric. It is shown that Gödel metric satisfy various pseudosymmetric type conditions.

44. ON DECOMPOSABLE WEAKLY PSEUDO QUASI-CONFORMALLY SYMMETRIC MANIFOLDS

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Keywords: weakly pseudo quasi-conformally symmetric manifold, pseudo quasi-conformal curvature tensor, decomposable manifold, scalar curvature.

A transformation of a Riemannian manifold *M*, which transforms every geodesic circle of *M* into a geodesic circle is called concircular transformation. A transformation under which the lengths of the curves are changed but the angles made by curves remain same is called conformal transformation. Yano and Sawaki (J. Diff. Geom., 1968) defined a tensor field, which includes both the conformal curvature tensor and the concircular curvature tensor as special cases and is called the quasi-conformal curvature tensor. A transformation of a Riemannian manifold under which every geodesic of a Riemannian manifold corresponds to a straight line in the Euclidean space is called projective transformation. Recently, Shaikh and Jana (South East Asian J. Math. Sci., 2005) introduced the notion of pseudo quasi-conformal curvature tensor on a Riemannian manifold of dimension greater than three which includes the conformal, concircular and projective curvature tensor as special cases.

45. COMMON FIXED POINT THEOREM OF MAPPINGS WITHOUT CONTINUITY IN INTUITIONIST FUZZY METRIC SPACE

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Since the concept of the introduction of fuzzy sets by Zadeh in 1965, many authors have investigated and generalized the result of fuzzy metric in different ways . . Many authors obtained common fixed point theorems for weakly commuting map and R-weakly commuting mappings. Alaca, Turkoglu and Yildiz defined the notion of intuitionist fuzzy metric space as Park with the help of continuous t-norm and continuous t-conorm as a generalization of fuzzy metric spaces due to kramosil and Michalek .Further they introduced the notion of Cauchy sequences in intuitionist fuzzy metric spaces. We want to generalize the results for multi-valued mappings .

We prove the following theorems.
T
heorem 1 : Let (X, M, N, *, ◊) be a complete intuitionistic fuzzy metric space and F, G : X→X be mappings satisfying the following conditions:
(1.1) G (X) ⊆ F (X);

46. THE EFFECT OF SHAPE FACTOR AND ENDOTHELIAL GLYCOCALYX LAYER ON THE MAGNETIC TARGETING IN MICROVESSEL

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Key words : Differentiation formula, function, logarithmic form, exponential form

The objective of the current study was to investigate the effect of the shape factor and endothelial glycocalyx layer on the magnetic drug targeting in a microvessel of radius $5\,\mu$m. The micro vessel is divided into the endothelial glycocalyx layer where in the blood obeys Newtonian character and a core region where in the blood obeys the non-Newtonian Casson fluid character. Brinkman model is used to characterize the permeable nature of the inner wall of the microvessel. Key factors that influence the magnetic targeting such as the size and shape of the carrier particle, the volume fraction of embedded magnetic nanoparticles, and the distance of separation of the magnet from the axis of the micro-vessel are considered.

47. L$_P$-APPROXIMATION BY A LINEAR COMBINATION OF SUMMATION INTEGRAL TYPE OPERATORS

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Gupta and Mohapatra (2006) considered a sequence of hybrid type operators by combining the weights of Szasz and Baskakov operators in to approximate Lebesgue integrable functions on the interval$[0,\infty)$.It turns out that the order of approximation by these operators is at best $O(n^{-1})$, however smooth the function may be. In order to-speed up the rate of convergence by these operators we have considered a linear combination of these operators and estimated the error in the L$_p$-approximation in terms of the higher order integral modulus of smoothness using some properties of the Steklov means.

48. VISCOUS DISSIPATION EFFECT ON HEAT TRANSFER IN FLOW PAT A CONTINUOUSLY MOVING POROUS PALATE

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An Analysis of the effect of viscous dissipative heat on the temperature and rate of heat transfer in the flow past of a continuously moving flat porous plate has been carried out. It has been observed that greater viscous dissipative heat causes a rise in the temperature and a fall in the rate of heat transfer for both suction and injection.

49. ERROR ESTIMATE FOR MODIFIED SCHURER OPERATORS

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Key Words: Linear combinations; Absolutly continuity function; Hardy-Littlewood majorant.

In this paper, we have studied approximation in L_p- norm by linear combinations of modified Schurer operators Sn;q(f; x) =1R+q0W(n; q; x; t)f(t) dt: We note that fSn;q(f; x)gn_1 are L_p- bounded. We have shown that linear combinations of Sn;q(f; x) yield improved order of convergence for sufficiently smooth functions. We use the properties of Hardy-Littlewood majorant for f(2k+2) to obtain error in approximation in terms of highest derivative of function.

50. APPLICATION OF STOCHASTIC CALCULUS

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The earliest work on SDEs was done to describe Brownian motion, latter the work was followed upon by Langevin. In physical science, SDEs are usually written as Langevin equations. These consist of an ordinary differential equation containing a part and additional random white noise terms. Another form also planck equation, these are partial differential equation that describe the time evolution of probability distribution function. Another form of SDE is used most frequently in mathematics and quantitative finance, which is similar to the Langevin form, but it is usually written in differential form. A SDEs is a differential equation in which one more of the terms is a stochastic process, thus resulting in a solution which is itself a stochastic process.

51. WEAK SOLUTION IN ODE AND PDE

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In mathematics, a weak solution also called generalized solution to an ODE and PDE is a function for which the derivatives appearing in the equations may not all exit but which is nonetheless deemed to satisfy the equation in some precisely defined sense. Weak solution are important because a great many differential equations encountered in modeling real world phenomena do not admit sufficiently smooth solutions and then the only way of solving such equation does have differential solutions, it is often convenient to go for the existence of weak solutions and later show that those solutions are in fact.

52. ON THE USE OF DIFFERENTIAL INEQUALITIES IN THREE-POINT BOUNDARY VALUE PROBLEMS ON TIME SCALES BY SOLUTION MATCHING

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Key words: Differential inequalities, Generalized zero, Solution matching.

We consider the third order boundary value problem associated with the differential equation on time scales $y^{\Delta\Delta\Delta} = f(t; y; y^{\Delta}; y^{\Delta\Delta})$; $t \in [t1; t3]$ on time scales satisfying the conditions $y(t1) = y1$; $y(t2) = y2$; $y(\sigma^3 (t3)) = t3$: We establish the solution of the three point boundary value problem on time scales on $[t1; t3]$ by matching solutions on $[t1; t2]$ with solutions on $[t2; t3]$:

53. ON THE DEGREE OF APPROXIMATION OF CONJUGATE OF ALMOST LIPSCHITZ FUNCTION BY (N, P, Q)(C,1) MEANS OF CONJUGATE SERIES OF A FOURIER SERIES

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In this paper a theorem on the degree of approximation of conjugate of almost Lipschitz function by (N,p,q) (C,1) means of conjugate series has been established.

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54. UNSTEADY FREE CONVECTION HEAT AND MASS TRANSFER IN A WALTERS-B VISCO-ELASTIC FLOW PAST AN IMPULSIVELY STARTED VERTICAL PLATE WITH UNIFORM HEAT AND MASS FLUX: A NUMERICAL STUDY

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Key words : Unsteady viscoelastic flow; impulsively started vertical plate; Walters-B short-memory model; Finite difference method; Mass Transfer; Schmidt number; heat and mass flux.

A numerical solution for the free convective, unsteady, free convective heat and mass transfer in a viscoelastic fluid along an impulsively started vertical plate with uniform heat and mass flux is presented. The Walters-B liquid model is employed to simulate medical creams and other rheological liquids encountered in biotechnology and chemical engineering. This rheological model introduces supplementary terms into the momentum conservation equation. The dimensionless unsteady, coupled and non-linear partial differential conservation equations for the boundary layer regime are solved by an efficient, accurate and unconditionally stable finite difference scheme of the Crank-Nicolson type. The

velocity, temperature and concentration fields have been studied for the effect of Prandtl number (Pr), viscoelasticity parameter (🏛), Schmidt number (Sc), thermal Grashof number (Gr) and species Grashof number (Gm). The local skin-friction Nusselt number and Sherwood number are also presented and analyzed graphically. It is observed that, when the viscoelasticity parameter (🏛) increases, the velocity increases close to the plate surface. An increase in Schmidt number is observed to significantly decrease both velocity and concentration.

55. RESPONSE OF A SMART COMPOSITE STRUCTURE TO ACOUSTIC AND ULTRASONIC WAVES

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Piezoelectric materials are members of the class of smart materials. Composite piezoelectric materials are widely used in smart structures. Ceramics are one type of piezoelectric materials which can be modeled as porous piezoelectric materials. A mathematical model of a smart composite structure is presented in the form of layered piezoceramics immersed in fluid half-spaces. The technique of Transfer Matrix is applied to study the reflection and transmission from porous piezoelectric layered structure immersed in an elastic fluid. The layered structure is assumed to be made of porous piezoelectric materials having 6mm symmetry. An elastic wave is assumed to be incident on the layered structure which results into reflected wave in upper fluid half space and transmitted wave in lower fluid half space. The analytical expressions of the reflection and transmission coefficients are obtained. The response of the layered structure is studied in terms of effects of angle of incidence, porosity, material properties, and thickness of layer on the reflection

and transmission losses. Both the spectra of acoustic and ultrasonic waves are considered for numerical computation.

56. FREE VIBRATIONS OF POROUS PIEZOELECTRIC PLATE

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Key words: porous piezoelectric, vibration, variational method, eigen value problem

Piezo-ceramics have been of interest for a long time because of its applications in resonators. Keeping in mind the applications that piezoelectric resonators find in commercial and military electronics for frequency control and for selection of precise timing and synchronization, the free vibrations of a finite porous piezoelectric plate are studied in the present paper. An eigen value problem associated with free vibrations of porous piezoelectric plate is undertaken by making use of formulation. Theorems involving properties of operators, involved, are proved in the paper. Both the methods, variational method and perturbation method, are employed to study the frequency shift problem associated with piezoelectric plate. Conservation laws for linear porous piezoelectric materials by using Nother's theorem in conjunction with four variational formulation of quasi-static linear piezoelectricity are also established.

57. SOME RESULTS ON SPECIAL TYPE OF POSITIVE LINEAR OPERATORS

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Key words: Positive linear operators, modulus of continuity, exponential type.

In the present paper, we define a special type of positive linear operator and prove some approximation results and deduce some results on the corresponding operator also.

58. GENERALIZATION OF CHAIN U_s- COMPLEX

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Keywords: complex, exact sequence, U_s- complex, U_s- homology, chain(Us,U's) map, Superfluous(small)

Extending modules and there generalizations have been studied by many authors. In this paper will give introducing to homological algebra. Our aims are to introduction a generalization of some notion in homological algebra and add a new condition in definition of chain u-complex. We generalize the concepts of U_s- complex, , U_s- homology, chain(Us,U's) map, chain (Us,U's) –homotopy pth – Us- homotopy of modules with strictly.

Poster Presentations: Statistics

1. STATISTICAL PACKAGE FOR AGRICULTURAL RESEARCH VERSION 3.0 (SPAR 3.0)

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Statistical Package for Agricultural Research (SPAR) had been primarily developed for the statistical analysis of experimental research data in Plant Breeding and Genetics. It was developed at IASRI using the FORTRAN language under DOS environment and had some limitations like Dynamic Memory Allocation, Graphic User Interface etc. The package was not able to handle large data sets. SPAR 2.0 was a Windows based version which overcame all the above mentioned problems and was been developed using Microsoft Visual C++. Since, most of the software systems in current scenario are web enabled, there was a need to develop the web based version of SPAR 2.0 i.e. SPAR 3.0 through which one can globally access the various modules irrespective of the geographical area. SPAR (Statistical Package for Agricultural Research) has both the National and International Status also. Almost all the agricultural universities, regional stations, regional centers and industry in India and abroad are using the various versions of SPAR. SPAR 3.0 has been developed using Microsoft .NET (ASP.NET with C#) technology. It consists of all the modules of data analysis which are available in SPAR 2.0. It is user friendly, web enabled and menu-driven package. SPAR 3.0 consists of various modules viz., Descriptive Statistics Module (Measures of Central Tendency, Measures and Coefficients of Dispersion, Generation of Moments, Measures & Coefficients of Skewness and Measures of Kurtosis), Estimation of Breeding Values Module(General Mean and Scaling Tests), Correlation and Regression Analysis Module (Correlation Analysis, Regression

Analysis and Path Analysis), Variance and Covariance Components Estimation Module, Stability Analysis Module, Multivariate Analysis Module viz., Cluster Analysis, Discriminant Analysis and Principal Component Analysis. Mating Design Analysis Module viz., Complete Diallel, Partial Diallel Line x Tester (with parents) , Line x Tester (without parents), Three way cross, Double cross and North Carolina Designs I, II, III, Double Cross Analysis and Complete Online Help with Contents, Index, Search and Favourites facilities. The package is also useful for illustration purposes in the classroom teaching as well as for the researchers in Statistics with interest in experimental analysis particularly in Plant Breeding and Genetics.

2. DIFFUSIVE LIMITS FOR ADAPTIVE MCMC

G.K. Basak and Arunangshu Biswas
ISI Kolkata

Adaptive Markov Chain Monte Carlo (AMCMC) is a class of algorithms that have been recently proposed in MCMC literature. The main difference between MCMC and AMCMC is that, the tuning parameter, which determines how fast the simulation converges to the desired distribution ψ (.), is a function of the previous sample paths. This destroys the Markovian character of the chain. However it can be shown that, under some conditions, the adaptive chain converges to the target distribution ψ. In this paper we use a diffusion approximation technique on a discrete time AMCMC. The resulting diffusion, which is a two-dimensional degenerate one, gives some idea of the dynamics of the chain. We establish the existence of invariant distribution of the diffusion by showing tightness of the diffusion for the particular case when the target distribution is Normal. Next by extensive simulation, for various target distributions (both heavy and light tailed, symmetric and asymmetric), we show that the marginal of the invariant distribution is, indeed, the target distribution. Using simulation methods the speed of the convergence is also compared with that of random-walk Metropolis Hastings sampler.

3. AN INTERPRETATION OF COMPLETE STATISTICS-SOMETHING MORE THAN MERE EXPECTATIONS

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In this paper we give an alternative proof of Basu's theorem, which states that if a statistic T is a complete-sufficient statistic, then T is independent of every ancillary statistic S(say).Our proof is based on the very definition of complete statistics which states that if a statistic T is complete, then any non-null function of T, h(T) will always contain information on θ, the parameter of interest. Next we try to give an interpretation of complete statistics on the basis of a few examples. An ancillary statistic is one whose distribution does not depend on the parameter of interest θ. In other words, an ancillary statistic can in no way contain any information about θ. Thus the more we deviate away from ancillarity and move towards non-ancillarity, the better a statistic is n terms of containing information on θ.

4. ENHANCING A RANDOMIZED RESPONSE MODEL TO ESTIMATE THE SENSITIVE QUANTITATIVE POPULATION MEAN

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Key words: Efficiency in estimation; Sensitive quantitative variable; varying probability sampling; Scrambling variable.

In this paper, we consider Gjestvang and Singh (2009)'s randomized response model to estimate the sensitive quantitative population mean based on selecting the respondents by simple random sampling with replacement scheme. The specific advantage of this

model over usual models like Himmelfarb and Edgell (1980), Eichorn and Hayre (1983), and others, is that unlike the usual models, for Gjestvang and Singh (2009)'s model, the estimator and the variance estimator are free from the known parameters of scrambling variable. Here, we have modified Gjestvang and Singh (2009)'s randomized response technique and considering the general varying probability sampling design for selecting the respondents, we have obtained the unbiased estimator of population mean and unbiased variance estimator. Additionally, we have shown that, whatever be the sampling design, our modified estimator performs uniformly better than the usual estimator. Finally, we illustrate our findings through a numerical exercise.

5. CONSTRUCTION FOR NEW FAMILY OF LINEAR AND CIRCULAR PROBABILITY DISTRIBUTIONS

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KeyWords: univariate circular probability distributions, Inverse stereographic projections, Regular stereographic projections, linear to circular transformation, circular to linear transformation.

In this paper, we show the new type of probability distributions by the Mobius transformation and Stereographic projection from the line to the circle and reverse. A general result exposing the relationship between these two methods is explored. Several new distributions for directional data are derived exploring these methods. The existence of non-trivial sufficient statistics for inference, make these distributions appealing for their use in modelling directional data in real-life situations. We get the linear density $f(x)$ on $(-\infty, +\infty)$ corresponding from circular density $f(\theta) = k_{n,\eta}(1+\rho\cos\theta)^n$ where $-1 < \rho < 1$ and $k_{n,\eta}$ is normalizing constant on $(-\pi, \pi)$ depending upon the ρ and n. we get new type of distribution functions, unimodal and bimodal whereas ρ is positive and negative.

6. CLASSIC NEWSBOY PROBLEM -AN EXTENSION OF THE SITUATION OF RANDOM SUPPLY

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Key words: optimal order quantity, random supply, exponential demand, method of bisection

In this paper we have considered a classical newsboy problem. In this problem, we assume that a newspaper vendor start his day with 'q' newspaper in his hand. The demand being random at the end of the day he either faces shortages or is left with some excess newspapers in his hand. Accordingly he has to incur shortage or excess cost. This problem is to find the optimal values of 'q' that minimizes the total cost of vendor. However, there may be some situations where whatever is ordered is not what is received. The actual supply may be random fraction of the quantity ordered. In this situation, along with demand, supply also is a random variable. Here we have worked out the optimal order quantity in the situation of random supply.

7. SMALL AREA ESTIMATION FOR SPATIAL POPULATION-HIERARCHICAL BAYES APPROACH

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Library Avenue, Pusa Campus, New Delhi-12

Keywords: SAR model; Prior sensitivity; Hierarchical Bayes; Gibbs sampling

In small area estimation, small area models are widely used to obtain efficient model-based estimators for small areas. The random area effects are customarily assumed to be independent in this small area model. Chandra *et.al.* (2007) considered the model with correlated random effects between the neighboring areas using SAR

model to account for spatial dependence between the small areas. In this paper, this spatial model is studied under Hierarchical Bayes (HB) framework and small area HB estimators are obtained using Gibbs sampling. Small area mean is estimated by its posterior mean and posterior variance of the small area mean is used as a measure of precision of the estimate. It automatically takes into account the extra uncertainty associated with the hyper-parameters in the model. Further, the effects of incorporating spatial information through three spatial weighting procedures are compared along with sensitivity analysis.

8. CIRCULAR REGRESSION; A BAYESIAN APPROACH

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Abhirup Mallik
Department of Mathematics, Indian Institute of Technology, Kharagpur

Key words: Circular regression, Bayesian statistics.

We present here a Bayesian study of regression involving circular random variables. We consider separate cases of circular-circular, and circular linear models and present the posterior densities of the parameters in regression model. For the instances where the posteriors could not be derived, we show the density with an MCMC implementation. We also devise prediction and validation of our models. Further we propose several applications of our analysis, one of them being modelling and predicting the nuclear radiation levels in neighbouring countries after the Fukushima accident, where we take into account of the wind profile as the circular random variable.

9. QUEUEING ANALYSIS OF NON-EXHAUSTIVE SERVICE SYSTEMS WITH SERVER VACATIONS

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In this paper, we present an analysis for nonexhaustive service systems with multiple server vacations, where the length of each vacation is independent and identically distributed. We have examined a gated service system, pure limited service system and G-limited service systems. These service disciplines are defined individually later. We deal only with steady-state processes. The PGFs of waiting time is also derived based on the independence between the arrival process and the waiting time.

10. CLASSIFICATION OF MINERAL WATER USING VOLTAMETRIC ANALYSIS BY E- TONGUE

Palash Kundu[1] and Ashis SenGupta[2]
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[2]A. S. U., Indian Statistical Institute, Kolkata

Recently the Electronic Tongue (E-Tongue) System is being employed for qualitative and quantitive analysis of multi-components in liquid using various types of ISE (Ion selective electrodes) electrodes materials (e.g. silver, gold platinum and glossy carbon). Using E-Tongue armed with an adequate number of electrodes step-wise decreasing impulses of electrical signal is applied to the liquid. The current responses obtained from different electrodes are considered as the representative signature of the pollutants in a liquid under test. Such signature curves could be characteristic of the liquid. Once the signature curves are derived from known liquid , classification technique can be used for

discriminating and identifying a sample as to come from one of the calibrated curves and hence its corresponding liquid .

In case of modeling of physical characteristics of mineral water , it has been established that response obtained from E-Tongue is represented by sum of exponential terms with two time constants having different values .

11. GENDER SENSITIVE SOCIAL SECTOR INDICES IN THE DISTRICTS OF WEST BENGAL

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Key words: Controllable lead time and setup cost, Crashing Cost, Backorder Price Discount, and Budget Constraint

The main objective of this paper is to highlight the importance and significance of gender-related development indicators, for accessing relative levels of progress and backwardness of women's status, across the districts of west Bengal, Here in this paper. I attempt to evaluate the degree of gender inequality that has been created and reproduced in the households, markets and societies in West Bengal. In many district of this state, the women are grounded in both poverty and patriarchy. Women's mobility in West Bengal Is constrained due to their limitation to ownership and control of property and other economic resources The paper is organized as follows: Section 1 Introduces the topic. Section 2 presents the literature review. Sections 3 speak about the objectives of the paper. Sections 4 examine the data and methodology. Section 5 studies the gender related indices. Section 6 offers some concluding remark and further research agenda. West Bengal , which is the 4th most popular state and 7th most populous sub-national entity of the world, portrays a remarkable issue of gender inequality in India. Though I have started on quite a pessimistic mote, it should also be mentioned that the winds of change have already started blowing.

12. A NON-PARAMETRIC TEST FOR LIFR DISTRIBUTIONS

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Keywords: exponential distribution, LIFR, empirical Laplace transform, U statistic.

In this paper a non-parametric test is proposed for the class of LIFR (Linearly Increasing Failure Rate) distributions. The empirical Laplace transform is utilized to construct test for the null hypothesis. The proposed test is based on the weighted integrals. The consistency of the test as well as its asymptotic distribution under the null hypothesis are investigated. As a particular case, it is shown that as the decay of the weight function tends to infinity the test statistic approaches to a limit value.

13. AN EFFICIENT PREDICTIVE APPROACH TO ESTIMATION IN TWO-PHASE SAMPLING

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Keywords: Efficient predictive estimator in two-phase sampling; ratio, ratio-type and regression estimators in two-phase

Agrawal and Jain(1988) employed a predictive framework to examine the predictive character of ratio , ratio-type and regression estimators in two-phase sampling .In this paper, an efficient predictive estimator, which is the fountainhead of a family of widely used estimators in two-phase sampling ,is proposed. The newly proposed estimator has been shown to excel its competing estimators provided a weighting factor is appropriately chosen. In the absence of the knowledge of the optimum weighting factor, performance-sensitivity of the proposed estimator.

14.

V.K. Pathak[1] and Hemant Kumar Saw[2] PROFIT ANALYSIS OF A WIND MILL WITH TWO STANDBY UNITS

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[2]Dept of Applied Mathematics, MPCCET Bhilai CG

Keywords: MTFS, Means Sojourn time, regenerative process, preventing maintenance, Laplace transformation and cost analysis.

This paper analysis a wind mill system involving four essential component viz. three main units (two unit are standby units), one associate unit. Only one repairman is used for repairing the failed components of all the units. Taking failure rates a exponential and arbitrary repair rates, a semi markov process and regenerative point technique have been used to derive various system effectiveness measure such as transition probabilities, mean time to system failure, availability, busy period of repairman are calculated. At last profit analysis is done on the basis of above measures.

15. MODEL BUILDING, MODEL ADEQUACY CHECKING AND VARIABLE SELECTION IN LINEAR REGRESSION ANALYSIS

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This paper considers modeling of multifactor data by using multiple linear regression models, where the explanatory variable may be quantitative and/or qualitative in nature. This Suitability of the proposed regression model is judged through various hypothesis tests and model adequacy checks. Problem where violation of the basic regression assumptions occur are resolved . the influence of leverage points in prediction the response is also discussed. Multicollinearity problem are addressed and resolved by the use of Ridge regression. A data set related to gasoline mileage performance for different automobile is analyzed to draw fruitful conclusions

regarding selection of a subset of significant regressors from among a pool of candidate regressors.

16. A BAYESIAN MAKEOVER OF THE DRAKE EQUATION

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In this paper we try to obtain a rational estimate of the number of communication civilization in the galaxy by applying Bayesian Estimation on drake equation. We have used the values given by frank Drake, as our prior information and the later values proposed by several meteorological organizations have been used to refine these previous estimates through the use of Bayesian estimator theories.

17. THE EFFECT OF NON-NORMALITY AND MARKOFF'S MODEL ON UPPER AND LOWER CONTROL LIMITS FOR MEANS

R. Sankle[1] and J.R. Singh[2]
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Key words: Non-Normal distribution, Markoff's Model, Control Limits for Mean Charts.

In this present paper ,we have studied the problem of setting control chart in non-normal situation and first order autoregressive AR(1)model by representing the probability density function of the variates by the first four terms of the Edgeworth series. Limits are seriously affected by non-normality as well as for AR(1) model. AR(1) model is more serious with respect to the non-normality assumption over the control limits of the mean charts.

18. NEW MODEL ON THE DEVELOPMENT OF MATHEMATICS REASONING

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Umes Chandra College University of Calcutta

Mathematics is a way to settle in mind a habit of reasoning where the result are developed through a process of reasoning and the conclusion are drawn from the given facts. The reasoning is mathematics has the following characteristics such as similarity to the reasoning of life , and verification. Mathematics in the making is intuitively, experiment and inductive, where mathematics generalize their theories from particular example.

19. EXTENSION OF THE KR¨ATZEL FUNCTION AND ASSOCIATED STATISTICAL DENSITIES

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This paper examine a density associated with the kernel of the Kr¨atzel integral. We define this density and it extend this density by using the Pathway model of Mathai (Linear algebra Appl 396:317-328, 2005). Some basic statistical aspects associated with this density function such as the Mellin transform, the moment generating function etc are also obtained. The Laplace transform of some related densities such as generalized gamma, inverse Gaussian etc are also obtained by using the related integral.

20. STATISTICAL ANALYSIS ON THE MICROARRAY DATA OF *LEISHMANIA donavani*

Ashis SenGupta[1], Neeloo Singh[2], Suman Sarkar[1] and Megha Varshney[1]
[1]Indian Statistical Institute, Kolkata
[2]CDRI, Lucknow

A Protozaon Parasite *Leishmania donavani* is the causative agent of visceral leishmaniasis. This protozoan parasite displays immense adaptability to survive under extremely harsh conditions. This real life data set is collected from CDRI, Lucknow, and it was observed in their laboratory that anti-cancer drug monastrol shows potential for therapeutic application against visceral leishmaniasis. Data set of consists 54,675 genes, and for each of these genes there are 6 observations - 3 patients marked as diseased persons treated with drug Manastrol, and the other 3 patients marked as diseased persons without being treated with drug Manastrol.

After normalization of all the values, we got 12,006 genes on which we conducted paired t-test to find those genes which are significantly expressed ($p < 0.05$). This operation yields 94 genes. These 94 genes were taken up for further analysis.

We then took the approach of clustering using the 'k-means clustering' algorithm, and validated our result of clustering which yielded 3 clusters for diseased persons without treatment by drug Manastro (silhouette index 0.39), and 2 clusters for diseased persons treated with drug Manastrol (with silhouette index 0.53). Pathway analysis on the (statistically significant) differentially expressed genes is currently being undertaken.

21. STATISTICAL ANALYSIS OF HUMAN miRNA

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Megha Varshney, Rinkle Mohapatra and Mohua Chakraborty[1],
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The miRNA are small non-coding, single stranded RNA play an important role in the gene expression. In Man, studies have discovered more than 1000 miRNA that target innumerable number of genes. With the increasing number of miRNA, there have been problems of classification and identification of its target genes and these are addressed at the computational and bioinformatics level. In this context, statistical methods are of useful tools to investigate the similarities and differences of miRNA that can help in addressing biological issues and its evolutionary implications. Here we have attempted to identify, classify and characterize human miRNAs into certain groups based on various parameters viz length of the precursor miRNA, chromosomal distribution of miRNA, length of the mature miRNA, target genes and function of target genes. Statistical techniques such as, Principle Component Analysis , Pair wise Distance Analysis, etc are used to observe and understand the pattern of distribution of these parameters in the entire human miRNA dataset derived from miR-Base and biological significance of the variation of these parameters within different human miRNA. The results indicate that the statistical methods help in inferring the patterns of miRNA and help us to corroborate with the biological issues.

22. NON-LINEAR STABILITY OF TRIANGULAR LIBRATION POINTS RESTRICTED THREE-BODY PROBLEMS

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The non-linear stability of the triangular points $L_{4,5}$ of the restricted three-body problems are studies the presence of third and fourth order for the following cases:(1) when more massive primary is an oblate body, (ii) when more massive primary is a triaxial rigid body, (iii) when both the primaries are triaxial rigid bodies, In is found, with the help of Markeev's theorems for case (i) that the stability of the triangular librarian points are unstable in third order and fourth order they are stable for all the values of oblateness factor A_1.It is further observed for cases (ii) and (iii) that stability of the triangular libration points are unstable in third order.

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PAST SECTIONAL PRESIDENTS

PAST SECTIONAL PRESIDENTS
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Satya Deo	(2011)	V Singh	(1982)
A K Agarwal	(2010)	B K Lahiri	(1981)
B K Das	(2009)	B R Bhonsle	(1980)
M R Adhikari	(2008)	Dilip Kumar Sinha	(1979)
J C Misra	(2007)	K M Saksena	(1978)
Bhola Ishwar	(2006)	M K Singal	(1977)
M A Pathan	(2005)	M C Chaki	(1976)
Shashi Prabha Arya	(2004)	Sri Rama Sinha	(1975)
T Parthasarathy	(2003)	R S Kushwaha	(1974)
Mathematics		R P Bambah	(1973)
C M Joshi	(2002)	T Pati	(1972)
S K Malik	(2001)	Ram Ballabh	(1971)
P V Arunachalam	(2000)	S D Chopra	(1970)
I B S Passi	(1999)	Brij Mohan	(1969)
Karmeshu	(1998)	Jagat Narain Kapur	(1968)
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H P Dikshit	(1996)	R S Mishra	(1966)
P R Sengupta	(1995)	Hansraj Gupta	(1965-1964)
V Kannan	(1994)	C T Rajagopal	(1963)
A M Vaidya	(1993)	P L Bhatnagar	(1962)
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P K Bhatia	(1991)	V G Iyer	(1960)
V M Shah	(1990)	M Ray	(1959)
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P C Vaidya	(1988)	K Chandrasekaran	(1957)
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S K Trehan	(1984)	V V Narlikar	(1953)
R P Agarwal	(1983)	B B Sen	(1952)

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C Racine	(1951)	E P Metcalfe	(1925)
N M Basu	(1950)	C V Raman	(1924)
S Chowla	(1949)	T P Bhaskara Shastri	(1922)
R Vaidyanathaswamy	(1948)	J M Field	(1921)
D D Kosambi	(1947)	N A F Moos	(1920)
Ram Behari	(1946)	D N Mallik	(1919)

Mathematics & Statistics

Wali Mohammad (1918)

Rev D Mackichan (1917)

B N Prasad	(1945)
B M Sen	(1944)
S C Dhar	(1943)

Mathematics

B R Seth	(1942)

Mathematics & Statistics

M R Siddiqi	(1941)

Mathematics

A C Banerji	(1940)

Mathematics & Physics

K R Ramanathan	(1939)
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S Datta	(1937)
T Royds	(1936)
N R Sen	(1935)
S K Mitra	(1934)
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Ganesh Prasad	(1932)
C W B Normand	(1931)
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D M Bose	(1927)
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