Title: Engel conditions in certain groups

Speaker: Quek Shio Gai (SHB120011)
Institute of Mathematical Sciences, University of Malaya.

Date: 6 Jan. 2015 (Tuesday)
Time: 3 - 4 PM
Venue: MM3, Institute of Mathematical Sciences

Abstract

Let G be a group. Let $x_1, x_2, \ldots, x_m \in G$. The commutator of $x_1$ and $x_2$ is $[x_1, x_2] = x_1^{-1}x_2^{-1}x_1x_2$, and a simple commutator of weight $n \geq 2$ is defined recursively as $[x_1, x_2, \ldots, x_m] = [[x_1, x_2], \ldots, [x_{m-1}, x_m]]$; where by convention $[x_1] = x_1$. Let $x, y \in G$. A useful shorthand notation is $[x_m y] = \left[ x, y, y, \ldots, y \right]_m$; where by convention $[x_0 y] = x$. An element $g \in G$ is called a left Engel element of $G$, if for each $x \in G$, there is a positive integer $n = n(g,x)$ such that $[x_n g] = 1$. The set of all left Engel elements is denoted by $L(G)$. An element $g \in G$ is called a left $m$-Engel element of $G$, if $[x_m g] = 1$ for all $x \in G$. The set of all left $m$-Engel elements is denoted by $L_m(G)$. Let $N$ be the set of all positive integers. The elements in $L(G) = \bigcup_{m \in N} L_m(G)$ are called bounded left Engel elements of $G$.

In this presentation, we define the set of all the $X$-relative left Engel elements $L(G:X)$ and the set of all the bounded $X$-relative left Engel elements $\overline{L}(G:X)$, where $X$ is a subset of $G$. When $X = G$, $L(G:X) = L(G)$ and $\overline{L}(G:X) = \overline{L}(G)$, where $L(G)$ is the set of all the usual left Engel elements and $\overline{L}(G)$ is the set of all the usual bounded left Engel elements. Next, we define the $X$-relative Hirsch-Plotkin radical $HP(G:X)$ and the $X$-relative Baer radical $B(G:X)$. When $X = G$, $HP(G:X) = HP(G)$ and $B(G:X) = B(G)$ where $HP(G)$ is the usual Hirsch-Plotkin radical and $B(G)$ is the usual Baer radical. We will discuss some classical results regarding $HP(G), B(G), L(G)$ and $\overline{L}(G)$; and their generalizations into terms of $HP(G:X), B(G:X), L(G:X)$ and $\overline{L}(G:X)$. Let $G$ be a group and $h, g \in G$. The 2-tuple $(h, g)$ is said to be an $n$-Engel pair, $n > 2$, if $h = [h_m g]; g = [g_n h]$ and $h \neq 1$. We will discuss our finding regarding the structure of the groups generated by such an $n$-Engel pair under certain conditions. We will also discuss some sufficient conditions that cause the existence of certain $n$-Engel pair among $SL(2, F)$, the special linear group of degree 2 over a field $F$.

All are Welcome
Let $R$ be an associative ring with identity. Let $Id(R)$ and $U(R)$ denote the set of idempotents and the set of units in $R$, respectively. An element $x \in R$ is said to be weakly clean if $x$ can be written in the form $x = u + e$ or $x = u - e$ for some $u \in U(R)$ and $e \in Id(R)$. If $x$ is represented uniquely in this form, whether $x = u + e$ or $x = u - e$, then $x$ is said to be uniquely weakly clean. We say that $R$ is pseudo weakly clean if $x$ can be written in the form $x = u + e + (1 - e)rx$ or $x = u - e + (1 - e)rx$ for some $u \in U(R)$, $e \in Id(R)$ and $r \in R$. For any positive integer $n$, an element $x \in R$ is $n$-weakly clean if $x = u_{1} + \cdots + u_{n} + e$ or $x = u_{1} + \cdots + u_{n} - e$ for some $u_{i} \in U(R)$ $(i = 1, \ldots, n)$ and $e \in Id(R)$. The ring $R$ is said to be weakly clean (uniquely weakly clean, pseudo weakly clean, $n$-weakly clean) if all of its elements are weakly clean (uniquely weakly clean, pseudo weakly clean, $n$-weakly clean, respectively). Let $g(x)$ be a polynomial in $Z(R)[x]$ where $Z(R)$ denotes the centre of $R$. An element $r \in R$ is $g(x)$-clean if $r = u + s$ for some $u \in U(R)$ and $s \in R$ such that $g(s) = 0$ in $R$. The ring $R$ is said to be $g(x)$-clean if all of its elements are $g(x)$-clean. In this talk I will present an overview of weakly clean rings and their relations with other classes of rings. I will also discuss some characterisations and properties of weakly clean, pseudo weakly clean, uniquely weakly clean, $n$-weakly clean and $g(x)$-clean rings for certain types of $g(x) \in Z(R)[x]$. Some generalisations of results on clean and related rings will also be presented during the talk.

All are Welcome
INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITY OF MALAYA
SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : Robust Variable Selection in Regression Models
Speaker : ALSHQAQ SHOKRYA SALEH A
Date : 11-3-2015
Time : 3-4 PM
Venue : MM3, Institute of Mathematical Sciences

Abstract

This study looks at two problems related to the robust variable selection in regression model with six objectives in mind. The first three objectives are concerned with the problem of selection variables in small data sets in a linear regression model. The first is the investigation of the robustness of various best variable selection criteria in the presence of outliers and leverage points in the data set. The second derives the influence function of AIC, Cp, and SIC criteria and discussed the properties of these functions. The third is to explore the role of two robust methods for selecting the best variable in the regression. The first approach considered is a modified version of AIC, Cp, and SIC statistics by utilizing the high breakdown point estimators of the regression model. The other methods are based on diagnostic regression approach using outliers and leverage diagnostics in regression model procedures. For each method, the power of performance is compared with classical non-robust criteria and the existing criteria, based on M-estimation. In general, our findings show that these criteria are capable of selecting the appropriate models in the presence of outliers. The following three objectives look at the development of LASSO variable selection regression to solve the problem of multicollinearity and high dimensional data in variable selection procedure. The fourth is to investigate the sensitivity of non-robust LASSO (LASSO and adaptive-LASSO) and robust LASSO (LAD-LASSO and Huber-LASSO) toward the existence of outliers and leverage points in the data. The fifth looks at extending the Huber-LASSO to include more robust estimators. We present the GM-LASSO and MM-LASSO methods. If the multicollinearity does exist, we use the idea of the LASSO regression analysis to find the best variable in the model. The performance of these methods has also been compared with classical non-robust LASSO, and the existing robust LAD-LASSO and Huber-LASSO and are generally good. The final objective is to prepare a new LASSO method based on the diagnostic regression approach, then generalize this method to suit the logistic regression model. We demonstrate that the proposed procedure works well when implemented on simulated and real data sets.

All are Welcome
ABSTRACT

This study looks at three problems in such directional data. Firstly, we consider the problem of fitting a half-circular data. We propose a new half-circular distribution in the range using the inverse stereographic projection technique on a gamma distributed variable. Secondly, we focus on detecting outliers in circular data generated from a von Mises distribution. We propose a new test of discordancy based on spacings theory that can be extended to identify multiple outliers and a patch of outliers in data. Thirdly, we consider the problem of detecting outlier in spherical data generated from a Fisher distribution using the k-nearest neighbour distance theory. The application of the proposed distribution and tests are illustrated by using real data set. In summary, this study has considered three important problems in directional data. The possibility of finding the most appropriate distribution of a directional data set and proper treatment of outliers will lead to a better inferences and forecasting. These contributions have been shown to have practical values and have potential to be used widely in the future.

All are Welcome
Numerical Methods for Nonlinear Optimal Control Problems Using Haar Wavelet Operational Matrices

WALEEDA SWAIDAN ALI

29-4-2015 (Wednesday)

3 - 4 PM

MM3, Institute of Mathematical Sciences

Many computational methods have been proposed to solve optimal control problems. These methods are classified either as direct or indirect methods. This thesis is based on solving optimal control problems by using both direct and indirect methods, a novel feedback control method that uses only linear systems to solve affine nonlinear control system with quadratic cost functional and infinite time horizon is proposed. This method is based on the combination of Haar wavelet operational matrices and successive Generalized Hamilton-Jacobi-Bellman (GHJB) equation. This method improves the closed-loop performance of stabilizing controls and reduces the problem of solving a nonlinear Hamilton-Jacobi-Bellman HJB equation to solve the corresponding GHJB equation. When the process of improving the controls and solving the GHJB equation are iterated, the solution to the GHJB equation converges uniformly to the solution of the HJB equation which is in the form of the gradient of the Lyapunov function $V(x)$. The Lyapunov function $V(x)$ can be determined by integrating it parallel to the axes. In the process of establishing the method we have to define new operational matrices of integration for a chosen stabilizing domain $[-\tau, \tau]$ and new operational matrix for the product of two dimensions Haar wavelet functions. For a direct method, an efficient new algorithm is proposed to solve nonlinear optimal control problems with finite time horizon under inequality constraints. In this technique we parameterize both the states and the controls using Haar wavelet functions and Haar wavelet operational matrix. The nonlinear optimal control problem is converted into a quadratic programming problem through the quasilinearization iterative technique. The inequality constraints for trajectory variables are transformed into quadratic programming constraints using the Haar wavelet collocation method. The quadratic programming problem with linear inequality constraints is then solved using a standard QP solver. Both proposed numerical methods have been applied to several examples and give better or comparable results compared with other established methods. Moreover, the methods are attractive, stable, convergent and easily coded.

All are Welcome
Title: Statistical Modelling of Time Series of Counts for A New Class of Mixture Distribution

Speaker: Khoo Wooi Chen (SHB 100009), ISM, UM

Date: 06 - 5 - 2015 (Wednesday)

Time: 3 - 4 PM

Venue: MM3, Institute of Mathematical Sciences

ABSTRACT

Integer-valued correlated stochastic processes, which we often meet in real world, are of major concern in many natural and social sciences. The classical continuous time series models which contain scalar multiplication, are not able to represent count data since the integer nature of the data is not preserved. Therefore, the formulations of discrete-valued time series models for count data are apparently of significance. Much effort has been expended in the past few decades to construct discrete-valued time series models. Nevertheless, the hunt for better models is still ongoing due to the need to improve or sharpen the statistical analysis.

This thesis proposes a new mixture model, the mixture of Pegram and thinning integer-valued autoregressive (MPT) processes, which is the combination of current discrete-valued time series operators. The statistical and regression properties, parameter estimation, forecasting, and graphical analysis for the new model have been examined. Model selection based upon the Akaike Information Criterion has been performed. Extensions to the moving average (MA) and autoregressive moving average (ARMA) models have also been considered. The important properties such as reversibility and regression are then discussed. The extension to the pth-order MPT process has also been investigated in the study. Previous studies have emphasized the Poisson sequence as it is an infinitely divisible distribution. In this thesis, it is shown that proposed model is able to deal with infinitely and non-infinitely divisible distributions with simpler expressions. Furthermore, the proposed MPT model is able to handle multimodality and has better performance than the current discrete-valued time series models.

The available forecasting method based on the conditional expectation may not be appropriate for integer-valued time series models. Thus coherent forecasting, which is based upon the k-step ahead conditional mean, median, mode and distribution, is considered. For low count series the k-step ahead conditional distribution of the MPT model practically exhibits better performance than the other models. The score functions and information matrix have been derived to measure the asymptotic standard errors and to analyze the variance-covariance relationship among the parameters. Parameter estimation with the maximum likelihood estimation via the Expectation-Maximization algorithm is discussed and compared with the conditional least squares method. Finally, some real life data sets from different disciplines have been applied to illustrate the analyses. The thesis is concluded with some recommendations for future work.

All are Welcome
Title : Modified inequalities of warped product submanifolds in almost contact manifolds

Speaker : Abdulqader Mustafa  
Institute of Mathematical Sciences, University of Malaya

Date : 12 - 8 - 2015 (Wednesday)  
Time : 3 - 4 PM  
Venue : MM3, Institute of Mathematical Sciences

ABSTRACT

In this talk, a basic inequality for the second fundamental form and the warping function is discussed. We consider warped products submanifolds in nearly trans-Sasakian manifolds. Recently, we proved the following

**Theorem 1.** Let $M = N_T \times_f N_\perp$ be a contact CR-warped product submanifold of a nearly trans Sasakian manifold $\tilde{M}$, such that $\xi$ is tangent to the first factor, where $N_T$ and $N_\perp$ are invariant and anti-invariant submanifolds, of dimensions $n_1$ and $n_2$, respectively. Then, we have

1. $||h||^2 \geq 2n_2[||\nabla \ln f||^2 + \alpha^2 - \beta^2]$;
2. If the equality sign in (i) holds, then $N_T$, $N_\perp$ and $M$ are respectively totally geodesic, totally umbilical and minimal submanifolds in $\tilde{M}$

Here, we modify part (ii) of the above theorem by providing the necessary and sufficient conditions for the inequality of part (i) to be hold. Precisely, we state the following:

**Theorem 2.** Let $M = N_T \times_f N_\perp$ be a contact CR-warped product submanifold of a nearly trans Sasakian manifold $\tilde{M}$, such that $\xi$ is tangent to the first factor, where $N_T$ and $N_\perp$ are invariant and anti-invariant submanifolds, of dimensions $n_1$ and $n_2$, respectively. Then, we have

1. $||h||^2 \geq 2n_2[||\nabla \ln f||^2 + \alpha^2 - \beta^2]$;
2. The equality sign in (i) holds if and only if $N_T$, $N_\perp$ and $M$ are respectively totally geodesic, totally umbilical and minimal submanifolds in $\tilde{M}$, and

$$n_2\Delta(\ln f) = \tilde{\tau}(T_xM) - \tilde{\tau}(T_xN_T) - \tilde{\tau}(T_xN_\perp).$$

*All are Welcome*
Title: Development and Improvement of Statistical Techniques in Solving Some Medical Problems

Speaker: Ms Lim Fong Peng (PhD student)
Institute of Mathematical Sciences
Faculty of Science
University of Malaya

Date: 9 September 2015 (Wednesday)
Time: 3:00 pm – 4:00 pm
Venue: MM3, Institute of Mathematical Sciences

Abstract

Interest in some medical problems has raised the need for the development of appropriate statistical techniques in order to provide reliable solutions. We look at two local medical scenarios which are of current interest; firstly, identifying the optimal number of lymph nodes removed for maximizing the survival and adequate nodal staging of local breast cancer patients, and secondly, studying the outlier detection in cross-over design for a kinesiology study. In this thesis, we will discuss alternative and new methods to provide the solution to the scenarios above.

For the breast cancer study, we investigate the influence of the number of lymph nodes removed (LNR) on survival of breast cancer patients using Chi-square test of independence and Wilcoxon test. We proceed to find the best-fitted logistic and Cox’s regression models using forward selection and Bayesian model averaging procedures. The models are then used to assess the prognostic values of independent factors of survival at all thresholds of the number of LNR. For both types of regression models, we use not only the Wald statistic but also introduce the use of the Akaike Information Criterion to determine the optimal number of LNR that give maximum differential in survival of the
breast cancer patients. Similar procedure will be extended to the case of finding the
dependence of number of LNR to the adequate nodal staging of the patients.

For the kinesiology study, we employ both non-Bayesian and Bayesian framework to
detect outliers in a $2 \times 2$ cross-over design. We consider the mixed model with different
factors representing subject, period, treatment and carry-over effects. In non-Bayesian
framework, we consider the classical studentized residual and propose a new studentized
residual using median absolute deviation to identify possible outlying subjects. The
performances of both procedures in detecting subject outliers are compared via
simulation. On the other hand, in Bayesian framework, we assume that the random
subject effect and the errors to be generated from normal distributions. However, the
outlying subjects come from normal distribution with different variance. Due to the
complexity of the resulting joint posterior distribution, we obtain the information on the
posterior distribution from samples by using Markov Chain Monte Carlo method.

We use two real data sets, the Malaysian Breast Cancer data and kinesiology data,
obtained from the University of Malaya Medical Centre (UMMC). This study is able to
provide solutions to the problems which are very beneficial to the local medical
practitioners. The findings are very important as guidelines in the surgical management
of breast cancer patients and in the usage of kinesiotapes in sports.

Everyone is welcome
Title : An Analytical Solution Of The Time-Independent Schrödinger Equation For The Woods-Saxon Potential For Arbitrary Angular Momentum / States with some application

Speaker : P. Rajesh Kumar (Ph.D Student)
Institute of Mathematical Sciences
University of Malaya

Date : 16 - 12 - 2015 (Wednesday)

Time : 3 - 4 PM

Venue : MM3, Institute of Mathematical Sciences

ABSTRACT

Since the advent of quantum mechanics in 1926, considerable effort has been expanded to finding exact analytical solutions to the Schrodinger equation for the bound state problem. However, only a select few problems in quantum mechanics provide exact analytical solutions. The Woods-Saxon potential is probably the most studied and widely used short range potential in all of nuclear physics. For the angular momentum \( l = 0 \) case, Flügge had devised a method to obtain an exact analytical expression for the bound state energies of the radial time-independent Schrödinger equation for a neutron confined in a Woods-Saxon potential well. In this seminar, we extend Flügge’s method to solve the radial Schrödinger equation for a neutron bound in the Woods-Saxon potential and the centrifugal potential for arbitrary values of \( l \). Here, the Pekeris method will be used for the centrifugal term to make the radial Schrödinger equation amenable to an analytic solution. We obtain an analytical expression for the bound states, valid for arbitrary angular momentum, and show that our expression reduces to that of Flügge, which applies to the \( l = 0 \) case. Some application of this result will be considered.
Title: Soret and Dufour effects on doubly diffusive convection of nanofluid over a wedge in the presence of thermal radiation and suction

Speaker: Ruhaila Md Kasmani  
(Ph.D Student – SHB120009)  
Institute of Mathematical Sciences  
University of Malaya

Date: 23 - 12 - 2015 (Wednesday)

Time: 3 - 4 PM

Venue: MM3, Institute of Mathematical Sciences

ABSTRACT

Fluid flow and heat transfer characteristics of nanofluid have received considerable attention due to the wide range of engineering applications such as engine cooling, solar water heating, cooling of electronics and nuclear reactor. In present work, the mathematical nanofluid model proposed by Buongiorno is used to study the boundary layer flow of nanofluid past a wedge under the influence of thermal radiation, suction, Soret and Dufour effects. The governing system of nonlinear partial differential equations is transformed to nonlinear ordinary differential equations using similarity transformation. The resulting system is solved numerically using fourth-order Runge-Kutta-Gill method with shooting technique and Newton Raphson method. The solutions are expressed in terms of velocity, temperature, solutal concentration and nano-particle volume fraction profiles. The effects of pertinent parameters entering into the problem such as wedge angle, thermal radiation, Brownian motion, thermophoresis, Soret and Dufour numbers on the skin friction coefficient, local Nusselt number and local Sherwood number are discussed in detail.

All are Welcome