CMU
CENTRAL MICHIGAN UNIVERSITY

ICOSDA 2016

International Conference on Statistical Distributions and Applications

October 14-16, 2016

Crowne Plaza Hotel, Niagara Falls, Canada

http://people.cst.cmich.edu/lee1c/icosda2016 /

Brock University

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INTERNATIONAL YEAR OF STATISTICS

ICOSDA 2016

Second International Conference on Statistical Distributions and Applications

October 14-16, 2016
Crowne Plaza
Niagara Falls – Fallsview Hotel

Welcome!

On behalf of the Mathematics Department at Central Michigan University, I am honored to welcome you to the second International Conference on Statistical Distributions and Applications (ICOSDA). The Department is fully committed to providing high quality undergraduate and graduate programs, and contributing to the advancement of mathematics, statistics and mathematics education through quality research, as well as serving as a resource of knowledge and pedagogy for the community. We strive to create an integrated teaching, research and outreach unit to enhance the visibility, linkages and impact of mathematics, statistics and mathematics education at Central Michigan University and in the community. With the conference's goals and scopes, I believe the organizing committee has chosen a venue that guarantees a successful conference and productive contributions to the research of statistical distributions and their applications. The Department is delighted to sponsor ICOSDA 2016.

I appreciate each of you taking the time to participate in this conference. I would also like to recognize the local organizing committee members who have all worked extremely hard in planning all aspects of the conference programs. I am certain that this is going to be a great conference and you will enjoy all the events during the conference.

Best Wishes,

Thomas Gilsdorf *Thomas Gilsdorf*

Professor and Chair
Department of Mathematics, Central Michigan University

Thank you for your participation and welcome!

We would like to extend a very warm welcome to each and every participant in the second International Conference on Statistical Distributions and Applications (ICOSDA) taking place in Niagara Falls, Canada. It is indeed a great honor for Central Michigan University (CMU) and Brock University, Canada to serve as the host of the conference.

Participants are from many parts of USA, Canada and around the world, for a total of more than 190 participants coming from twenty-eight different countries. The Conference will feature keynote sessions, plenary invited sessions, concurrent topic-invited and general-invited sessions, and poster sessions. The Conference will provide opportunity for participants to exchange ideas and facilitate discussions on recent developments in statistical distributions, applications and other related areas. It will provide ideal forum to stimulate ideas, initiate contact and establish collaborations. Also, ICOSDA 2016 aims to provide an avenue for original discussion and prompt future directions in the area.

Authors of the papers presented at the conference will be asked to submit their full papers to the journal on theory and applications of statistical distributions, *Journal of Statistical Distributions and Applications (JSDA)*, for peer review. The accepted papers after the peer-review process will be published in a special issue of JSDA. More information on how to submit the papers are detailed in the program brochure and/or the conference website.

A large number of people have helped and worked hard for a successful ICOSDA 2016. First, we would like to thank all the topic-invited session organizers, who also serve as the scientific program committee members, and all the authors for submitting their papers for oral and poster presentations. Unfortunately, not all papers could be accepted. We would like to express our sincere appreciation to our keynote speakers and plenary invited speakers for accepting our invitation. We would like to thank members of the Organizing Committee for making excellent local arrangements and members of the Scientific Program Committee for the technical arrangements and organizing the topic-invited sessions. Sincere thanks go to the Mathematics Department graduate students and Statistics Club student members who generously volunteered their valuable time to organizing the conference. Our thanks go to various organizations and establishments for their generous donations in an effort to provide for every attendee the best conference possible. Finally, we would like to give special thanks to the Canadian Statistical Sciences Institute (CANSSI) and Mathematics Department at CMU for their financial support of the conference.

We hope you will find the conference fruitful and have a most enjoyable stay in Niagara Falls, Canada.

Sincerely yours,

Ejaz Ahmed, Felix Famoye and Carl Lee
The Organizing Committee Co-Chairs

Thank you to our sponsors

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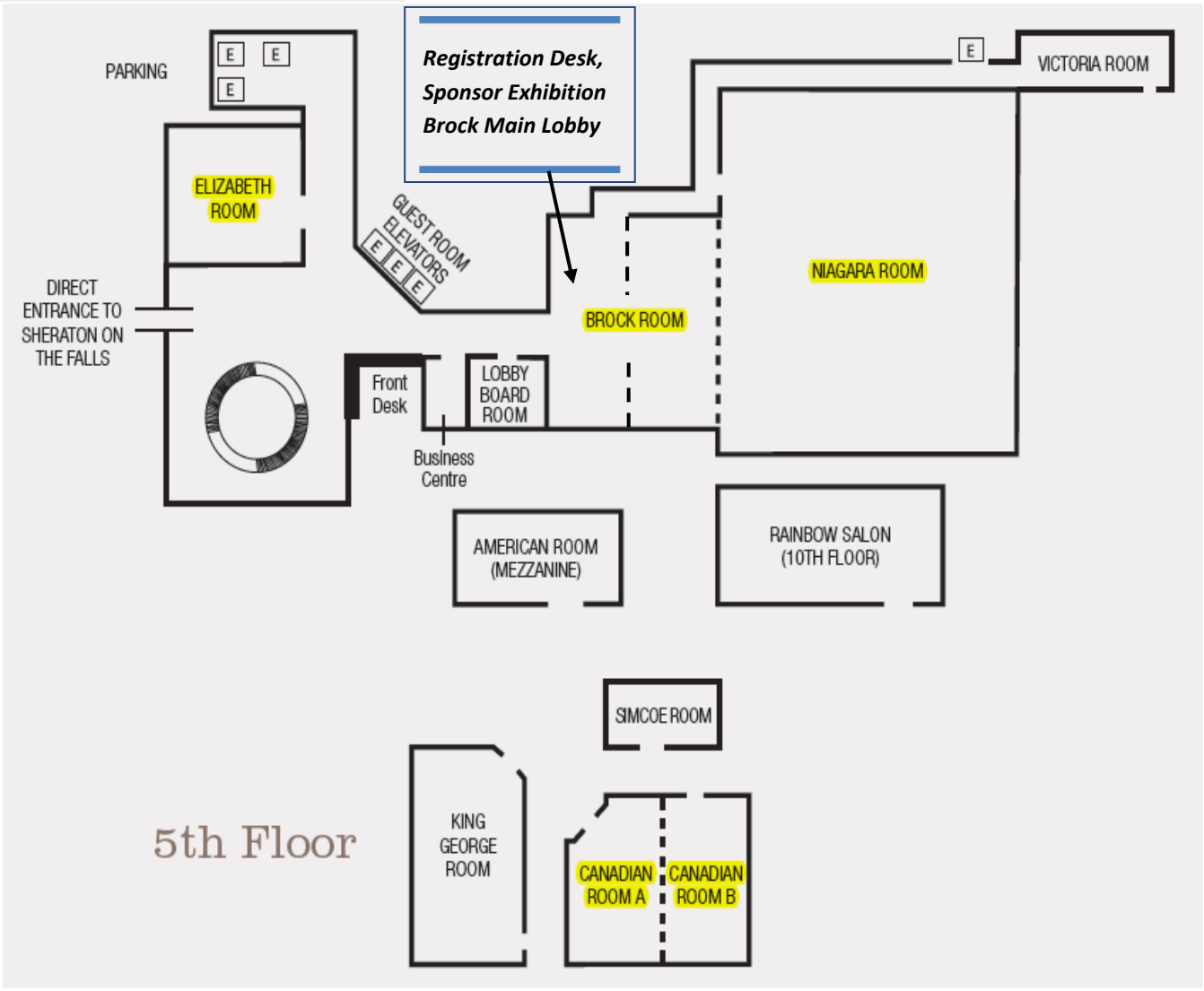

Important Conference Information

Registration Desk:

The Registration Desk is located at the Crowne Plaza Hotel, Brock Main Lobby (see the Conference Map for direction). The open hours are:

- October 14 (Friday): 3:00 pm – 7:00 pm
- October 15 (Saturday): 7:00 am – 5:00 pm
- October 16 (Sunday): 7:00 am – 5:00 pm

This is the best place to ask questions and locate any lost items.

Conference Rooms:

There will be four concurrent sessions. The conference rooms, shown on the Conference Map, are

- Niagara Room: This is the main conference room. All of the keynotes and plenary talks will be held in this room. It will also be used for concurrent oral presentation sessions. Breakfast, Lunch and Dinner will be held in this room.
- Brock Room: This room is for concurrent oral presentation sessions.
- Elizabeth Room: This room is for concurrent oral presentation sessions.
- Canadian/B Room: **This is on the 5th floor**. It is also for concurrent oral presentation sessions.

Student Poster Presentation Room:

- Canadian/A Room located on the 5th Floor is for student poster presentations.

Meals:

The conference will provide all meals for registered participants during the conference time period, except dinner on October 16. This includes:

- **Breakfast, Lunch and Dinner on October 15**
- **Breakfast and Lunch on October 16.**

All meals are buffet style and will be served in the Niagara Room.

Please wear your name tag when you come for the meal.

Internet Connection:

Wireless Internet connection is available for the conference attendees. It will expire on October 17, 2016. Use the following code to access the Internet. The Username and Password are case sensitive.

Group:	**ICOSDA**
Username:	**icosda**
Password:	**Conference**

Need a Presentation Certificate?

If you need a certificate of presentation, please e-mail Carl Lee (carl.lee@cmich.edu) by stating the exact name(s) and the title of presentation you would like to be printed on the certificate and the mailing address by October 31st. Your certificate of presentation will be mailed by Mid-November.

Equipment for Oral Presentation at the Conference Room:

All oral presentation rooms are equipped with a laptop computer, projection system and a wireless microphone.

- **If you have submitted your presentation to the conference organizing committee** (in PPT, PDF), it has been arranged and stored in a subfolder with the corresponding Session Number of your presentation inside the ICOSDA Folder on computer Desktop for easy access.
- **If you have not submitted your presentation prior to your arrival or you have a revised/updated presentation,** please make sure you transfer your presentation to the laptop during the intermission before your session.

Equipment and Set up for Student Poster Presentations:

The student poster presentations for those who registered as students are displayed in the **Canadian/A** Room. An easel and a board of 6' (width) x4' (height) is prepared and arranged for each poster.

- A card with the presenter's name is attached to each poster board. When you set up your poster presentation, please look for the designated easel and board.
- The poster must be set up no later than the intermission at 2:45 pm – 3:00 pm on October 15, and will be displayed until Noon on October 16, unless you need to leave early.
- Every poster presenter must be at the poster between 5:45 pm – 6:30 pm on October 15.

Sponsor Exhibition Area:

Springer Publishing will have an exhibition desk located at the Brock Main Lobby, next to the Registration Desk in the Brock Main Lobby.

Recycling Papers and Name Badge holders:

Please put papers and name badge holder that you do not want to take home in the recycling bins provided at the registration desk.

Evaluation and Suggestions:

A Conference Evaluation form is in your registration bag. Please fill the form and return it to the Registration Desk. We highly value your feedback about the conference for possible future conference.

Procedure for full paper submission to JSDA:

We would like to invite every presenter to submit the full paper of the presentation to the Journal of Statistical Distributions and Applications (http://jsdajournal.com) for consideration of possible publication in the special thematic series for ICOSDA 2016. The submitted papers will go through normal rigorous peer-review process of JSDA.

We have limited amount of fund to partially support the Article Processing Charge (APC). If the paper is accepted for the thematic series, 75% of the APC will be waived provided the paper is submitted by February 28, 2017. The support will be available until the fund runs out. If an associate editor of JSDA is a co-author, the full APC will be waived provided the paper is submitted by December 31, 2016.

Keynote Speakers

8 – 9 am, Saturday Keynote Speaker 	Dr. Peter McCullagh is John D. MacArthur Distinguished Service Professor at the University of Chicago, Chicago, Illinois. He is a Fellow of the Institute of Mathematical Statistics, the American Association for the Advancement of Science, the American Academy of Arts and Sciences, and the Royal Society. Peter's research focuses on probabilistic modelling, statistical theory, and the application of statistical methods in diverse areas, particularly in scientific research such as biostatistics, agricultural research, ecology and animal behaviour. Recent probabilistic work includes boson point processes, exchangeability and random discrete structures such as random partitions, Gibbs random trees, random graphs and so on. Recent statistical work has focused on health monitoring and survival processes. Peter is the author of two books, Tensor Methods in Statistics, and Generalized Linear Models, with co-author John Nelder. He has served as editor of the journal Bernoulli, and as an associate editor of Biometrika, Journal of the Royal Statistical Society, and the Annals of the Institute of Statistical Mathematics.
7:30 -8:30 pm, Saturday Keynote Speaker 	Dr. Mei-Ling Ting Lee is the Director and professor of the Biostatistics & Risk Assessment Center, Department of Epidemiology & Biostatistics, University of Maryland, College Park, MD. Previously she was a faculty member at Boston University, Harvard University, and was professor and chair of the Department of Biostatistics at the Ohio State University. Dr. Lee is a biostatistician with a wide range of research interests. Her works in statistical distributions include dependence properties of multivariate distributions and generalizing the Sarmanov distributions. Dr. Lee is the founding editor and editor-in-chief of the international journal *Lifetime Data Analysis*, the only international statistical journal that is specialized in modeling time-to-event data. Dr. Lee has received many awards and recognitions including Fellow of the American Statistical Association, the Institute of Mathematical Statistics and Royal Statistical Society.
8 – 9 am, Sunday Keynote Speaker 	Dr. Kjell Doksum is Senior Scientist in the Statistics Department at the University of Wisconsin, Madison, and he is Emeritus Professor in the Statistics Department at the University of California, Berkeley. He is a Fellow of the Institute of Mathematical Statistics and of the American Statistical Association, as well as an elected member of the International Statistical Institute and the Royal Norwegian Society of Sciences and Letters. His research focuses on statistical theory and modeling. It includes inference for nonparametric regression and correlation curves, global measures of association in semiparametric and nonparametric settings, estimation of regression quantiles, Bayesian nonparametric inference, and high dimensional data analysis. Applications include statistical modeling of HIV data, and the analysis of financial data. Kjell Doksum is the co-author with Peter Bickel of the book "Mathematical Statistics: Basic Concepts and Selected Topics. Volumes I and II", CRC Press.

Plenary Speakers

1:15 – 1:45 pm, Saturday Plenary Speaker 	Dr. Marc G. Genton is Professor of Statistics in the division of Computer, Electrical and Mathematical Sciences and Engineering (CEMSE) at King Abdullah University of Science and Technology (KAUST) in Saudi Arabia. Prof. Genton is a Fellow of the American Statistical Association, of the Institute of Mathematical Statistics, of the American Association for the Advancement of Science, and elected member of the International Statistical Institute. In 2010, he received the El-Shaarawi award for excellence from the International Environmetrics Society and the Distinguished Achievement award from the Section on Statistics and the Environment of the American Statistical Association. Prof. Genton has published over 180 articles in scientific journals, has edited a book on multivariate skew-elliptical distributions, and has given over 300 presentations at conferences and universities worldwide. Prof. Genton's research interests include statistical analysis, flexible modeling, prediction, and uncertainty quantification of spatio-temporal data, with applications in environmental and climate science, renewable energies, geophysics, and marine science.
1:45 – 2:15 pm, Saturday Plenary Speaker 	Dr. Yi Li is a Professor of Biostatistics and Director of the Kidney Epidemiology and Cost Center, University of Michigan. His current research interests are survival analysis, longitudinal and correlated data analysis, measurement error problems, spatial models and clinical trial designs. His group is developing methodologies for analyzing large-scale and high-dimensional datasets, with direct applications in observational studies as well in genetics/genomics. His methodologic research is funded by various NIH statistical grants starting from year 2003. Yi Li is actively involved in collaborative research in clinical trials and observational studies with researchers from the University of Michigan and Harvard University. The applications have included chronic kidney disease surveillance, organ transplantation, cancer preventive studies and cancer genomics. Professor Li is a Fellow of the American Statistical Association and has been serving as associate editor in various journals including JASA, Biometrics, and Lifetime Data Analysis.
2:15 – 2:45 pm, Saturday Plenary Speaker 	Dr. John Stufken is the Charles Wexler Professor of Statistics in the School of Mathematical and Statistical Sciences at Arizona State University. Previously he served as Head of the Department of Statistics at the University of Georgia (2003-2014) and as Program Director for Statistics in the Division of Mathematical Sciences at the National Science Foundation (2000-2003). He also held faculty positions at Iowa State University (1988-2002) and the University of Georgia (1986-1990). His primary area of research interest is design and analysis of experiments. He is co-author of the book Orthogonal Arrays: Theory and Applications (1999, Springer Verlag, with A. Hedayat and N.J.A. Sloane), and co-Editor of the Handbook of Design and Analysis of Experiments (2015, Chapman and Hall/CRC, with D. Bingham, A. Dean and M. Morris). He serves currently as Associate Editor for the Journal of the American Statistical Association, Statistica Sinica, and the Journal of Statistical Theory and Practice. He served as Executive Editor for the Journal of Statistical Planning and Inference (2004-2006) and as Editor for The American Statistician (2009-2011). He is an elected Fellow of the Institute of Mathematical Statistics (2000) and of

	the American Statistical Association (2001), and was the Rothschild Distinguished Visiting Fellow at the Isaac Newton Institute for Mathematical Sciences in Cambridge, UK, for the program on Design and Analysis of Experiments in 2011.
1:15 – 1:45 pm, Sunday Plenary Speaker 	Dr. Gwo Dong Lin is a Research Fellow in the Institute of Statistical Science at Academia Sinica, Taiwan. He is an Elected Member of the International Statistical Institute and has served or is serving as an Associate Editor of several journals including Statistica Sinica, IEEE Transactions on Reliability, Journal of Statistical Distributions and Applications, and Statistics-A Journal of Theoretical and Applied Statistics. His research interests include Distribution Theory, Applied Probability and Survival Analysis. He has published over 70 papers in a variety of theoretical and applied journals such as Bernoulli, Probability Theory and Related Fields, Sankhya, JAP, TPA, JOTP, JMVA, AISM, JSPI, JSDA, JMAA, and others.
1:45 – 2:15 pm, Sunday Plenary Speaker 	Dr. Anand Vidyashankar is a Professor at George Mason University. He received his doctoral degree in mathematics and statistics at Iowa State University. His research interests span a wide variety of areas including branching processes, large deviations, high-dimensional data analysis, robust inference, stochastic fixed point equations, clinical trials, financial and actuarial risk assessment, machine learning, non-parametric methods, and statistical foundations. His research has been supported by industry extensively and by the NSF.
2:15 – 2:45 pm, Sunday Plenary Speaker 	Dr. Fraser is a Professor Emeritus at the University of Toronto, Toronto, Canada. His Bachelor's degree is from the University of Toronto and his PhD is from Princeton University. He has held visiting positions at many establishments including Princeton University, Stanford University, University of Wisconsin, University of Geneva and University College, London. Dr. Fraser has numerous honors and awards. He is a Fellow of many professional societies including Institute of Mathematical Statistics, Royal Statistical Society, American Statistical Association, Royal Society of Canada, American Association for the Advancement of Science, and American Mathematical Society. His research interests include, but not limited to likelihood asymptotic theory, large sample theory of statistics, Bayesian analysis and qualitative data analysis. Dr. Fraser is the author of many popular books including *Nonparametric Methods in Statistics*, *The Structure of Inference*, and *Inference and Linear Models*. He is currently addressing the conflicts between reproducibility and 'objective' Bayesian methodology.

Keynote and Plenary Speakers (By Time Order)

Date	Start Time	Type	Name	Title	Room
Oct 15	8:00 AM	Keynote	McCullagh, Peter	Statistical models for survival processes	NI
Oct 15	7:30 PM	Keynote	Lee, Mei-Ling Ting	From Bacon and Eggs to Fréchet Shock-Degradation Models	NI
Oct 16	8:00 AM	Keynote	Doksum, Kjell	Ensemble subspace methods for high dimensional data	NI
Oct 15	1:15 PM	Plenary	Genton, Marc G.	Tukey g-and-h random fields and max-stable processes	NI
Oct 15	1:45 PM	Plenary	Li, Yi	Classification with Ultrahigh-Dimensional Features	NI
Oct 15	2:15 PM	Plenary	Stufken, John	Optimal design and subdata selection for big data	NI
Oct 16	1:15 PM	Plenary	Lin, Gwo Dong	Recent Developments on the Moment Problem	NI
Oct 16	1:45 PM	Plenary	Vidyashankar, Anand	Networks in High Dimensional Problems	NI
Oct 16	2:15 PM	Plenary	Fraser, Don	Distributional methods have changed statistical inference	NI

Abstracts for Keynote and Plenary Speakers (Alphabetic Order)

Keynote	**Doksum, Kjell**
Title	Ensemble subspace methods for high dimensional data

We consider high dimensional regression frameworks where the number p of predictors exceed the number *n* of subjects. Recent work in high dimensional regression analysis has embraced an approach that consists of selecting random subsets with fewer than *n* predictors, doing statistical analysis on each subset, and then merging the results from the subsets. This ensemble approach makes it possible to construct methods for high dimensional data using methods designed for low dimensional data. Moreover, penalty methods such as Lasso that are unstable when $p>n$ unless very stringent conditions are imposed, perform much better when used in the ensemble approach. We examine the extent of the improvement achieved by the ensemble approach when it is applied to Lasso, Lars, and the Elastic Net. Comparisons are also made with variable selection methods.

Keynote	**Lee, Mei-Ling Ting**
Title	From Bacon and Eggs to Fréchet Shock-Degradation Models

Some distributions arise naturally to meet practical needs. I'll discuss two interesting examples, Sarmanov multivariate distributions and Fréchet shock-degradation models.
One can generate many multivariate distributions having given marginals. The density of the bivariate Sarmanov distributions with beta marginal can be expressed as a linear combination of products of independent beta densities. This pseudo conjugate property greatly reduces the complexity of posterior computations when this bivariate beta distribution is used as a prior (Lee, 1996). An interesting marketing study found that people who purchase bacon will often buy eggs, hence the bivariate beta-binomial distributions applied well in analyzing the data. Recently the method has also been applied in multivariate meta analysis.
Many systems experience gradual degradation while simultaneously being exposed to a stream of random shocks that eventually cause failure when the shock exceeds the residual strength of the system. This failure mechanism is found in diverse fields of application. A tractable new family of Fréchet shock-degradation models will be presented. This family has the attractive feature of defining the failure event as a first passage event and the time to failure as a first hitting time (FHT) of a threshold by an underlying stochastic process. The Fréchet shock-degradation family includes a wide class of underlying degradation processes. We derive the survival function for the shock-degradation process as a convolution of the Fréchet shock process and any candidate degradation process that possesses stationary independent increments (Lee, Whitmore 2016). Statistical properties of the survival distribution will be discussed.

Keynote	**McCullagh, Peter**
Title	Statistical models for survival processes

The focus of a survival study is partly on the distribution of survival times, and partly on the health or quality of life of patients while they live. Health varies over time, and survival is the most basic aspect of health, so the two aspects are closely intertwined. Depending on the nature of the study, a range of variables may be measured; some constant in time, others not; some regarded as responses, others as explanatory risk factors; some directly and personally health-related, others less directly so. We begin by classifying variables that may arise in such a setting, emphasizing in particular, the mathematical distinction between vital variables, non-vital variables and external or exogenous variables. The goal is to construct a family of continuous-time stochastic process for vital health variables, and to use such models for the analysis of data collected intermittently in time, especially in situations where mortality is appreciable.

Plenary	**Fraser, Don**
Title	Distributional methods have changed statistical inference

Saddlepoint methods entered statistics rather slowly: Henry Daniels in 1954 then Barndorff-Nielsen and Cox 1979, just 25 years. But since then the methods have radically changed the landscape for the core methods of inference. And p-values no longer need to be in the wild west stage. We briefly survey the distributional methods that altered the statistical landscape.

Plenary	**Genton, Marc G.**
Title	Tukey g-and-h random fields and max-stable processes

We propose a new class of trans-Gaussian random fields named Tukey g-and-h (TGH) random fields to model non-Gaussian spatial data. The proposed TGH random fields have extremely flexible marginal distributions, possibly skewed and/or heavy-tailed, and, therefore, have a wide range of applications. The special formulation of the TGH random field enables an automatic search for the most suitable transformation for the dataset of interest while estimating model parameters. Asymptotic properties of the maximum likelihood estimator and the probabilistic properties of the TGH random fields are investigated. An efficient estimation procedure, based on maximum approximated likelihood, is proposed and an extreme spatial outlier detection algorithm is formulated. Kriging and probabilistic prediction with TGH random fields are developed along with prediction confidence intervals. The predictive performance of TGH random fields is demonstrated through extensive simulation studies and an application to a dataset of total precipitation in the south east of the United States. Extensions of these ideas to the construction of new spatial max-stable processes are presented as well.

Plenary	Li, Yi
Title	Classification with Ultrahigh-Dimensional Features

Although much progress has been made in classification with high-dimensional features, classification with ultrahigh-dimensional features, wherein the features much outnumber the sample size, defies most existing work. This paper introduces a novel and computationally feasible multivariate screening and classification method for ultrahigh-dimensional data. Leveraging inter-feature correlations, the proposed method enables detection of marginally weak and sparse signals and recovery of the true informative feature set, and achieves asymptotic optimal misclassification rates. We also show that the proposed procedure provides more powerful discovery boundaries compared to those in Cai and Sun (2014) and Jin et al. (2009). The performance of the proposed procedure is evaluated using simulation studies and demonstrated via classification of patients with different post-transplantation renal functional types.

Plenary	Lin, Gwo Dong
Title	Recent Developments on the Moment Problem

We consider univariate distributions with finite moments of all positive orders. The moment problem is to determine whether or not a given distribution is uniquely determined by the sequence of its moments. There is an inexhaustible literature on this classical topic. In this survey, we focus only on the recent developments on the checkable moment-(in)determinacy criteria including Cramer's condition, Carleman's condition, Hardy's condition, Krein's condition and the growth rate of moments, which help us solve the problem more easily. Both Hamburger and Stieltjes cases are investigated. The former is concerned with distributions on the whole real line, while the latter deals only with distributions on the right half-line. Some new results or new simple (direct) proofs of previous criteria are provided. Finally, we review the most recent problem for products of independent random variables with different distributions, which occur naturally in stochastic modelling of complex random phenomena.

Plenary	Stufken, John
Title	Optimal design and subdata selection for big data

The theory for optimal design has been developed for experiments that, typically, yield “small” amounts of data. Consequently, there is no immediate connection to big data. However, if big data is really big, then a common strategy is to select subdata, and draw conclusions from the subdata. Just as in experimental design, this amounts to a selection problem, namely that of selecting appropriate subdata. We will discuss how ideas from design of experiments can help us to select subdata judiciously.

Plenary	Vidyashankar, Anand
Title	Implicit Networks in High Dimensional Problems

In a variety of contemporary applications, especially those involving big-data, it is becoming a common practice to use high-dimensional regression models for data analysis. While such methods yield important information concerning associations between a response and a set of features, they fail to capture the global characteristics of the feature set. To address some of these limitations, we introduce the concept of supervised implicit networks and investigate the theoretical properties of various network wide metrics (NWM). Specifically, we provide an assessment of variability in the statistical estimates of NWM and discuss their use in the context of data analysis. Finally, we apply these methods to develop supervised clustering algorithms and use it to identify communities in the network.

Topic-Invited Sessions: Topics and Organizers

Room Abbreviation: NI – Niagara Room, BR - Brock Room, EL – Elizabeth Room, CAN/B – Canadian Room/B

Session	Topic	Organizer	Date	Time	Room
TI 1	Applications of Statistical Distributions in Business, Management and Economics	Sarabia, Jose Maria	Oct 15	9:15 am - 10:35 am	NI
TI 2	Some Recent Issues and Methods in Statistics and Biostatistics	Yi, Grace	Oct 15	9:15 am - 10:35 am	BR
TI 3	Relative Belief Inferences	Evans, Michael	Oct 15	9:15 am - 10:35 am	EL
TI 4	Recent developments in designs and analysis of statistical experiments	Xu, Xiaojian	Oct 15	9:15 am - 10:35 am	CAN/B
TI 5	Generalized distributions and its application	Alzaatreh, Ayman	Oct 15	3:00 pm - 4:20pm	NI
TI 6	Don't Count on Poisson! Introducing the Conway-Maxwell-Poisson distribution for statistical methodology regarding count data	Sellers, Kimberly	Oct 15	3:00 pm - 4:20pm	BR
TI 7	Extreme Value Distributions and Models	Huang, Mei-Ling	Oct 15	3:00 pm - 4:20pm	EL
TI 8	Moment-Based Methodologies for Approximating and Estimating Density Functions	Provost, Serge B.	Oct 15	3:00 pm - 4:20pm	CAN/B
TI 9	Dependence modelling with applications in insurance and finance	Furman, Edward	Oct 16	9:15 am - 10:35 am	NI
TI 10	Multivariate distributions	Richter, Wolf-Dieter	Oct 16	9:15 am - 10:35 am	BR
TI 11	Bayesian analysis for highly structured processes	Ferreira, Marco A. R.	Oct 16	9:15 am - 10:35 am	EL
TI 12	Recent development on Complex Data Analysis	Gao, Xiaoli	Oct 16	9:15 am - 10:35 am	CAN/B
TI 13	Copula Modeling of Discrete Dependent Data	De Oliveira, Victor	Oct 16	10:50 am - 12:10 pm	NI
TI 14	Statistics and Modelling	Stehlik, Milan	Oct 16	10:50 am - 12:10 pm	CAN/B
TI 15	Copula Theory and Applications to Insurance and Finance	Cooray, Kahadawala	Oct 16	3:00 pm - 4:20pm	NI
TI 16	Bayesian approaches on models and distributions estimation	Cheng, Chin-I	Oct 16	3:00 pm - 4:20pm	BR
TI 17	Compounding and Copulas: Generalized and Extended Distributions	Oluyede, Broderick O.	Oct 16	3:00 pm - 4:20pm	EL
TI 18	Modeling complex data	Amezziane, Mohamed	Oct 16	3:00 pm - 4:20pm	CAN/B
TI 19	Mixtures of Non-Gaussian Distributions with Applications in Clustering	McNicholas, Paul	Oct 16	4:30 pm - 5:50 pm	NI
TI 20	Likelihood-based Inference: Methods and Applications	Coelho, Carlos A.	Oct 16	4:30 pm - 5:50 pm	BR

TI 21	Statistical Methods for Analysis of Industrial and Medical Data	Ng, Hon Keung Tony	Oct 16	4:30 pm - 5:50 pm	EL
TI 22	Construction of new statistical distributions and statistical data modeling	Akinsete, Alfred	Oct 16	4:30 pm - 5:50 pm	CAN/B

Topic-Invited Session: Presenters (in Alphabetic Order)

Session Name: TI m_k (m_k = k^{th} speaker in m^{th} session)

Room Abbreviation: NI – Niagara Room, BR - Brock Room, EL – Elizabeth Room, CAN/B – Canadian Room/B

Name	Session	Date	Start	Roo
Al-Aqtash, Raid	TI 22_3	Oct 16	5:10 PM	CAN/B
Al-Labadi, Luai	TI 3_4	Oct 15	10:15 AM	EL
Alzaatreh, Ayman	TI 5_4	Oct 15	4:00 PM	NI
Arslan, Olcay	TI 10_2	Oct 16	9:35 AM	BR
Baharith, Lamya A.	TI 17_1	Oct 16	3:00 PM	EL
Brill , Percy and Huang, Mei Ling	TI 7_1	Oct 15	3:00 PM	EL
Chatterjee, Arpita	TI 16_2	Oct 16	3:20 PM	BR
Cheng, Chin-I	TI 16_4	Oct 16	4:00 PM	BR
Choo-Wosoba, Hyoyoung	TI 6_3	Oct 15	3:40 PM	BR
Christara, Christina C.	TI 14_4	Oct 16	11:50 AM	CAN/B
Coelho, Carlos A.	TI 20_4	Oct 16	5:30 PM	BR
Cooray, Kahadawala	TI 15_4	Oct 16	4:00 PM	NI
Cossette,Hélène/Itre Mtalai/Etienne Marceau/Déry	TI 9_1	Oct 16	9:15 AM	NI
Dang, Sanjeena	TI 19_1	Oct 16	4:30 PM	NI
Dang, Utkarsh	TI 19_3	Oct 16	5:10 PM	NI
De Oliveira, Victor	TI 13_4	Oct 16	11:50 AM	NI
Evans, Michael	TI 3_1	Oct 15	9:15 AM	EL
Fang, Yixin	TI 12_3	Oct 16	9:55 AM	CAN/B
Filus, Jerzy	TI 14_2	Oct 16	11:10 AM	CAN/B
Filus, Lidia	TI 14_1	Oct 16	10:50 AM	CAN/B
Gallaugher, Michael	TI 19_2	Oct 16	4:50 PM	NI
Ghosh, Indranil	TI 5_3	Oct 15	3:40 PM	NI
Giurcanu, Mihai	TI 18_4	Oct 16	4:00 PM	CAN/B
Gomez-Deniz, Emilio	TI 1_2	Oct 15	9:35 AM	NI
Hamedani, Gholamhossein	TI 5_2	Oct 15	3:20 PM	NI
He, Jianghua	TI 16_1	Oct 16	3:00 PM	BR
He, Wenqing	TI 2_2	Oct 15	9:35 AM	BR
Hirose, Kei	TI 12_1	Oct 16	9:15 AM	CAN/B
Hlynka, Myron	TI 7_3	Oct 15	3:40 PM	EL
Hoegh, Andrew	TI 11_4	Oct 16	10:15 AM	EL
Hughes, John	TI 13_1	Oct 16	10:50 AM	NI
Ishimura, Naoyuki	TI 14_3	Oct 16	11:30 AM	CAN/B
Jang, Gun Ho and Stein, Lincoln	TI 3_2	Oct 15	9:35 AM	EL
Jayalath, Kalanka	TI 21_2	Oct 16	4:50 PM	EL
Jevtić, Petar/Hurd, Thomas R.	TI 9_4	Oct 16	10:15 AM	NI
Keefe, Matthew J.	TI 11_3	Oct 16	9:55 AM	EL
Kim, Jong-Min	TI 17_2	Oct 16	3:16 PM	EL

Kleiber, Christian	TI 10_3	Oct 16	9:55 AM	BR
Li, Pengfei	TI 4_3	Oct 15	9:55 AM	CAN/B
Madsen, Lisa	TI 13_2	Oct 16	11:10 AM	NI
Mailhot, Mélina	TI 9_3	Oct 16	9:55 AM	NI
Makubate, Boikanyo	TI 17_5	Oct 16	4:04 PM	EL
Mallick, Avishek	TI 22_4	Oct 16	5:30 PM	CAN/B
Mandal, Saumen	TI 4_1	Oct 15	9:15 AM	CAN/B
McNicholas, Paul	TI 19_4	Oct 16	5:30 PM	NI
Morris, Darcy S.	TI 6_4	Oct 15	4:00 PM	BR
Moura, Ricardo	TI 20_3	Oct 16	5:10 PM	BR
Muthukumarana, Saman	TI 3_3	Oct 15	9:55 AM	EL
Ng, Hon Keung Tony	TI 21_4	Oct 16	5:30 PM	EL
Nguyen, Christine and Huang, Mei Ling	TI 7_4	Oct 15	4:00 PM	EL
Nkurunziza, Sévérien	TI 18_3	Oct 16	3:40 PM	CAN/B
Nolde, Natalia	TI 10_1	Oct 16	9:15 AM	BR
Oh, Dong Hwan	TI 15_3	Oct 16	3:40 PM	NI
Oluyede, Broderick O.	TI 17_4	Oct 16	3:48 PM	EL
Otunuga, Michael	TI 22_2	Oct 16	4:50 PM	CAN/B
Paolella, Marc	TI 8_3	Oct 15	3:40 PM	CAN/B
Pararai, Mavis	TI 22_1	Oct 16	4:30 PM	CAN/B
Peng, Yingwei	TI 2_3	Oct 15	9:55 AM	BR
Pigeon, Mathieu	TI8_2	Oct 15	3:20 PM	CAN/B
Plante, Jean-François	TI 15_1	Oct 16	3:00 PM	NI
Prieto, Faustino and Sarabia, Jose Maria	TI 1_3	Oct 15	9:55 AM	NI
Provost, Serge	TI 8_4	Oct 15	4:00 PM	CAN/B
Raim, Andrew	TI 6_2	Oct 15	3:20 PM	BR
Ren, Jiandong	TI 8_1	Oct 15	3:00 PM	CAN/B
Richter, Wolf-Dieter	TI 10_4	Oct 16	10:15 AM	BR
Saez-Castillo, Antonio Jose and Conde-Sanchez, Antonio	TI 1_1	Oct 15	9:15 AM	NI
Samanthi, Ranadeera	TI 15_2	Oct 16	3:20 PM	NI
Sarabia, Jose Maria and Prieto, Faustino	TI 1_4	Oct 15	10:15 AM	NI
Sclove, Stanley	TI 7_2	Oct 15	3:20 PM	EL
Sellers, Kimberly	TI 6_1	Oct 15	3:00 PM	BR
Shahtahmassebi, Golnaz	TI 16_3	Oct 16	3:40 PM	BR
Sinha, Sanjoy	TI 4_2	Oct 15	9:35 AM	CAN/B
So, Hon Yiu	TI 21_3	Oct 16	5:10 PM	EL
Song, Peter	TI 13_3	Oct 16	11:30 AM	NI
Su, Steve	TI 5_1	Oct 15	3:00 PM	NI
Tegge, Allison N.	TI 11_1	Oct 16	9:15 AM	EL
Teodoro, M. Filomena	TI 20_2	Oct 16	4:50 PM	BR
Tsukahara, Hideatsu	TI 17_3	Oct 16	3:32 PM	EL
Vinogradov, Vladimir and Paris, Richard B.	TI 18_1	Oct 16	3:00 PM	CAN/B
Wang, Bin	TI 12_2	Oct 16	9:35 AM	CAN/B
Wang, Dongliang	TI 21_1	Oct 16	4:30 PM	EL
Wu, Changbao	TI 2_1	Oct 15	9:15 AM	BR
Wu, Ho-Hsiang	TI 11_2	Oct 16	9:35 AM	EL
Wu, Jiang/ Zitikis,Ricardas	TI 9_2	Oct 16	9:35 AM	NI

Xie, Yuying	TI 12_4	Oct 16	10:15 AM	CAN/B
Xu, Xiaojian	TI 4_4	Oct 15	10:15 AM	CAN/B
Yagi, Ayaka and Seo, Takashi	TI 20_1	Oct 16	4:30 PM	BR
Yi, Grace Y.	TI 2_4	Oct 15	10:15 AM	BR
Yu, Guan	TI 18_2	Oct 16	3:20 PM	CAN/B

General-Invited Session: Topics and Session Chairs

Session Name: GI m_k (m_k = k^{th} speaker in m^{th} session)

Room Abbreviation: NI – Niagara Room, BR - Brock Room, EL – Elizabeth Room, CAN/B – Canadian Room/B

Session	Topic	Session Chair	Date	Time	Room
GI 1	Modeling 1 - Life Time, Biostatistics	Pararai, Mavis	Oct 15	10:50 am - 12:05 pm	NI
GI 2	High Dimension Data Analysis	Amezziane, Mohamed	Oct 15	10:50 am - 12:05pm	BR
GI 3	Bayesian 1 , Spatial	Samanthi, Madhuka	Oct 15	10:50 am - 12:05 pm	EL
GI 4	Other - Miscellaneous	Sepanski, Steve	Oct 15	10:50 am - 12:05 pm	CAN/B
GI 5	Generalized Distributions 1	Pararai, Mavis	Oct 15	4:30 pm - 5:45 pm	NI
GI 6	Inference -Estimation, Testing	Amezziane, Mohamed	Oct 15	4:30 pm - 5:45 pm	BR
GI 7	Modeling 2 -Estimation	Samanthi, Madhuka	Oct 15	4:30 pm - 5:45 pm	EL
GI 8	Reliability, Risk	Daniels, John	Oct 15	4:30 pm - 5:45 pm	CAN/B
GI 9	Bayesian 2: Estimation, Model	Cheng, Chin-I	Oct 16	10:50 am – 12:05 pm	BR
GI 10	Generalized Distributions 2	Cooray, K.	Oct 16	10:50 am – 12:05 pm	EL

General-Invited Session: Presenters (in Alphabetic Order)

Session Name: GI m_k - m^{th} session, k^{th} speaker

Room Abbreviation: NI – Niagara Room, BR - Brock Room, EL – Elizabeth Room, CAN/B – Canadian Room/B

Name	Session	Date	Start Time	Room
Abdelrazeq, Ibrahim	GI 4_4	Oct 15	11:35 AM	CAN/B
Aljarrah, Mohammad	GI 10_1	Oct 16	10:50 AM	EL
Alshkaki, Rafid S.	GI 10_2	Oct 16	11:05 AM	EL
Alzaghal, Ahmad	GI 10_3	Oct 16	11:20 AM	EL
Arowolo, Olatunji and Ayinde, Kayode	GI 7_5	Oct 15	5:30 PM	EL
Bakar, Shaiful Anuar Abu	GI 1_5	Oct 15	11:50 AM	NI
Bayramoglu, Konul Kavlak	GI 1_4	Oct 15	11:35 AM	NI
Bingham, Melissa	GI 4_2	Oct 15	11:05 AM	CAN/B
Boulieri, Areti	GI 3_1	Oct 15	10:50 AM	EL
Chacko, Manoj	GI 9_5	Oct 16	11:50 AM	BR
Daniels, John	GI 3_4	Oct 15	11:35 AM	EL

Doray, Louis G.	GI 8_4	Oct 15	5:15 PM	CAN/B
El Ktaibi, Farid	GI 7_4	Oct 15	5:15 PM	EL
Faisal, Shahla	GI 2_4	Oct 15	11:35 AM	BR
Ferrari, Silvia L. P. and Fumes, Giovana	GI 5_2	Oct 15	4:45 PM	NI
Gleaton, James	GI 8_1	Oct 15	4:30 PM	CAN/B
Godbole, Anant	GI 10_5	Oct 16	11:50AM	EL
Hodge, Miriam	GI 5_1	Oct 15	4:30 PM	NI
Hoshino, Nobuaki	GI 4_3	Oct 15	11:20 AM	CAN/B
Hristopulos, Dionissios T.	GI 5_3	Oct 15	5:00 PM	NI
Huang, Hsin-Hsiung	GI 3_2	Oct 15	11:05 AM	EL
Jiang, Jiancheng	GI 6_4	Oct 15	5:15 PM	BR
Jureckova, Jana	GI 5_5	Oct 15	5:30 PM	NI
Karlis, Dimitris	GI 8_2	Oct 15	4:45 PM	CAN/B
Lewin, Alex	GI 6_1	Oct 15	4:30 PM	BR
Liu, Sifan and Xie, Min-ge	GI 7_1	Oct 15	4:30 PM	EL
Mandrekar, Jay	GI 1_3	Oct 15	11:20 AM	NI
Maruyama, Yuzo	GI 9_4	Oct 16	11:35 AM	BR
Matheson , Matthew	GI 1_1	Oct 15	10:50 AM	NI
Mi, Jie	GI 4_1	Oct 15	10:50 AM	CAN/B
Minkova, Leda	GI 8_3	Oct 15	5:00 PM	CAN/B
Nolan, John	GI 10_4	Oct 16	11:35 AM	EL
Ozturk, Omer	GI 4_5	Oct 15	11:50 AM	CAN/B
Paul, Rajib	GI 3_5	Oct 15	11:50 AM	EL
Peer, Bilal Ahmad	GI 9_2	Oct 16	11:05 AM	BR
Pérez-Casany, Marta	GI 5_4	Oct 15	5:15 PM	NI
Potgieter, Cornelis	GI 6_3	Oct 15	5:00 PM	BR
Ross, Sheldon	GI 9_1	Oct 16	10:50 AM	BR
Ruth, David M.	GI 2_2	Oct 15	11:05 AM	BR
Schick, Anton	GI 7_2	Oct 15	4:45 PM	EL
Song, Xinyuan	GI 1_2	Oct 15	11:05 AM	NI
Stehlik, Milan	GI 6_5	Oct 15	5:30 PM	BR
Sun, Ying	GI 3_3	Oct 15	11:20 AM	EL
Sylvan, Dana	GI2_5	Oct 15	11:50 AM	BR
Thomas, Hoben and Hettmansperger, T.P	GI 6_2	Oct 15	4:45 PM	BR
Wang, Min and Li, Shengnan	GI 9_3	Oct 16	11:20 AM	BR
Wang, Qiying	GI 7_3	Oct 15	5:00 PM	EL
Yu, Chong Ho	GI 2_1	Oct 15	10:50 AM	BR
Yu, Jihnhee; Yang, Luge; Vexler, Albert and Hutson, Alan	GI 8_5	Oct 15	5:30 PM	CAN/B
Zahid, Faisal Maqbool and Heumann, Christian	GI 2_3	Oct 15	11:20 AM	BR

Poster Presentations (in Alphabetic order)

Set Up Time: By 3:00 pm, October 15	
Presentation Time: 5:45 pm - 6:30 pm, October 15	**Room: Canadian/A**
Name	**Title**
Aldeni, Mahmoud	Families of distributions arising from the quantile of generalized lambda distribution

Arapis, Anastasios N.	Joint distribution of k-tuple statistics in zero-one sequences
Chaba, Linda and Omolo, Bernard	Using copulas to select prognostic genes in melanoma patients
Chan, Stephen	Extreme value analysis of electricity demand in the UK
Cordero, Osnamir Elias Bru; Jaramillo, Mario César and Canal, Sergio Yáñez	Random Number Generation for a Survival Bivariate Weibull Distribution
De Silva, Kushani	Bayesian Approach to Profile Gradient Estimation using Exponential Cubic Splines
Darkenbayeva, Gulsim	Convergence of some quadratic forms used in regression analysis
Hamed, Duha	T-Pareto family of distributions: Properties and Applications
Kang, Kai	Bayesian semiparametric mixed hidden Markov models
Krutto, Annika	Estimation in Univariate Stable Laws
Mdziniso, Nonhle Channon	Odd Pareto Families of Distributions for Modeling Loss Payment Data
Nitithumbundit, Thanakorn	Maximum leave-one-out likelihood estimation for location parameter of unbounded densities
Odhiambo, Collins Ojwang	A Smooth Test of Goodness-of-fit for the Weibull Distribution: An Application to an HIV Retention data
Selvitella, Alessandro	The Simpson's Paradox in Quantum Mechanics
Yan, Hongxuan	Modeling Financial Time Series of Count Data with Long Memory
Zhang, Yuanyuan	New bivariate wrapped distributions

Scientific Program (Based on Time)

October 14, 2016 (Friday)

3:00 pm – 7:00 pm	**Conference Check-in at Brock Main Lobby**

October 15, 2016 (Saturday)

Type: REG: Registration, EXHI - Exhibition, KEY- Keynote, PLE - Plenary, TI -Topic Invited, GI - General Invited,
SP - Student Poster.
Room: NI - Niagara, BR - Brock, BR/M: Brock Main Lobby, EL - Elizabeth,
CAN/A - Canadian/A, CAN/B - Canadian/B

Time	Room	Type	Organizer (O) / Chair (C) /Speaker	Title
7:00 am - 5:00 pm	**BR/M**	**REG**	**Registration at Brock Main Lobby**	
8:00 am - 5:00 pm	**BR/M**	**EXHI**	**Springer Publishing Exhibition at Brock Main Lobby**	
7:00 am - 7:50 am	**NI**	**Breakfast**		
7:50 am – 8:00 am	**NI**		**Ejaz Ahmed**	**Opening Remark**
8:00 am - 9:00 am	**NI**	**KEY**	**Felix Famoye (C)**	**Welcome**
8:00 AM			Peter McCullagh	Statistical models for survival processes
9:00 am - 9:15 am		**Intermission**		
9:15 am - 10:35 am	**NI**	**TI 1**	**Jose Maria Sarabia (O,C)**	**Applications of Statistical Distributions in Business, Management and Economics**

9:15 AM			Antonio Jose Saez-Castillo	Regression models based on extended Poisson distributions in R
9:35 AM			Emilio Gomez-Deniz	Computing Credibility Bonus-Malus Premiums Using a Bivariate Discrete Distribution
9:55 AM			Faustino Prieto	Family of generalized power law (GPL) distributions: Properties and Applications
10:15 AM			Jose Maria Sarabia	A Hierarchy of Multivariate Pareto Distributions with Applications in Risk Analysis
9:15 am - 10:35 am	**BR**	**TI 2**	**Grace Yi (O,C)**	**Some Recent Issues and Methods in Statistics and Biostatistics**
9:15 AM			Changbao Wu	Distribution Theory in Empirical Likelihood for Complex Survey Data
9:35 AM			Wenqing He	Improving Performance of Support Vector Machine Classifiers with Data Adaptive Kernel
9:55 AM			Yingwei Peng	Prediction accuracy for cure probability in cure models
10:15 AM			Grace Y. Yi	Analysis of High-Dimensional Correlated Data in the Presence of Missing Observations and Measurement Error
9:15 am - 10:35 am	**EL**	**TI 3**	**Michael Evans (O,C)**	**Relative Belief Inferences**
9:15 AM			Michael Evans	Measuring Statistical Evidence Using Relative Belief
9:35 AM			Gun Ho Jang and Lincoln Stein	Relative Belief based Signal Segmentation
9:55 AM			Saman Muthukumarana	Non-inferiority Hypothesis Testing in Two-arm Trials using Relative Belief Ratios
10:15 AM			Luai Al-Labadi	Prior-based model checking
9:15 am - 10:35 am	**CAN/B**	**TI 4**	**Xiaojian Xu (O,C)**	**Recent developments in designs and analysis of statistical experiments**
9:15 AM			Saumen Mandal	Optimal designs for minimizing correlations among parameter estimators in a linear model
9:35 AM			Sanjoy Sinha	Joint modeling of longitudinal and survival data with a covariate subject to limit of detection
9:55 AM			Pengfei Li	Controlling IER and EER in replicated regular two-level factorial experiments
10:15 AM			Xiaojian Xu	Optimal designs for regression when measurement error is present
10:35 am - 10:50 am	**NI**	**Refreshment**		
10:50 am - 12:05 pm	**NI**	**GI 1**	**Mavis Pararai (C)**	**Modeling 1 - Life Time, Biostatistics**
10:50 AM			Matthew Matheson	The Shape of the Hazard Function: The Generalized Gamma and Its Competitors
11:05 AM			Xinyuan Song	Analysis of proportional mean residual life model with latent variables
11:20 AM			Jay Mandrekar	Statistical approach for the development, prediction, and validation of a simple risk score: application to a neurocritical care study.
11:35 AM			Konul Bayramoglu Kavlak	The mean wasted life time of a component of system

11:50 AM			Shaiful Anuar Abu Bakar	Actuarial loss modeling with the composite models and its computer implementation
10:50 am - 12:20 pm	**BR**	**GI 2**	**Mohamed Amezziane (C)**	**High Dimension Data Analysis**
10:50AM			Chong Ho Yu	Pattern recognition: The role of data visualization and data mining in statistics
11:05 AM			David M. Ruth	An approach to the multivariate two-sample problem using classification and regression trees with minimum-weight spanning subgraphs
11:20 AM			Faisal Maqbool Zahid and Christian Heumann	Multiple Imputation using Regularization
11:35 AM			Shahla Faisal	Improved Nearest Neighbors Imputation for High-Dimensional Longitudinal Data
11:50 AM			Dana Sylvan	Exploration and visualization of space-time data with complex structures
10:50 am - 12:05 pm	**EL**	**GI 3**	**Madhuka Samanthi (C)**	**Bayesian 1 - Biostatistics**
10:50AM			Areti Boulieri	A Bayesian detection model for chronic disease surveillance: application to COPD hospitalisation data
11:05 AM			Hsin-Hsiung Huang	New Mixed Gaussian Affine-Invariant Bayesian Clustering Method
11:20 AM			Ying Sun	A Stochastic Space-time Model for Intermittent Precipitation Occurrences
11:35 AM			John Daniels	Variogram Fitting Based on the Wilcoxon Norm
11:50 AM			Rajib Paul	Real Time Estimation of ILI (Influenza Like Illnesses) Rates Using Dynamic Downscaling
10:50 am - 12:20 pm	**CAN/B**	**GI 4**	**Steve Sepanski (C)**	**Other - Miscellaneous**
10:50 AM			Jie Mi	Instant System Availability
11:05 AM			Melissa Bingham	Quantifying Spread in 3-D Rotation Data: Comparison of Nonparametric and Parametric Techniques
11:20 AM			Nobuaki Hoshino	On the marginals of a random partitioning distribution
11:35 AM			Ibrahim Abdelrazeq	Goodness-of-Fit Test: Levy Driven Continuous ARMA Model
11:50 AM			Omer Ozturk	Ratio estimators based on ranked set sampling in survey sampling
12:05 pm - 1:15 pm	**NI**	**Lunch**		
1:15 pm - 2:45 pm	**NI**	**PLE**	**Chin-I Cheng (C)**	
1:15 PM			Marc G. Genton	Tukey g-and-h random fields and max-stable processes
1:45 PM			Yi Li	Classification with Ultrahigh-Dimensional Features
2:15 PM			John Stufken	Optimal design and subdata selection for big data
2:45 pm - 3:00 pm	**NI**	**Refreshment**		

3:00 pm - 4:20 pm	**NI**	**TI 5**	**Ayman Alzaatreh (O,C)**	**Generalized distributions and its application**
3:00 PM			Steve Su	Transformation and Family of Generalised Lambda Distributions
3:20 PM			Gholamhossein Hamedani	Characterizations of Probability Distribution Via the Concept of Sub-Independence
3:40 PM			Indranil Ghosh	Some alternative bivariate Kumaraswamy models
4:00 PM			Ayman Alzaatreh	Parameter estimation for the log-logistic distribution based on order statistics
3:00 pm - 4:20 pm	**BR**	**TI 6**	**Kimberly Sellers (O,C)**	**Don't Count on Poisson! Introducing the Conway-Maxwell-Poisson distribution for statistical methodology regarding count data**
3:00 PM			Kimberly Sellers	Introducing the Conway-Maxwell-Poisson distribution
3:20 PM			Andrew Raim	A flexible zero-inflated model to address data dispersion
3:40 PM			Hyoyoung Choo-Wosoba	Marginal Regression Models for Clustered Count Data Based on Zero-Inflated Conway-Maxwell-Poisson Distribution with Applications
4:00 PM			Darcy S. Morris	Bivariate Conway-Maxwell-Poisson Distribution: Formulation, Properties, and Inference
3:00 pm - 4:20 pm	**EL**	**TI 7**	**Mei-Ling Huang (O,C)**	**Extreme Value Distributions and Models**
3:00 PM			Percy Brill	A Renewal Process for Extremes
3:20 PM			Stanley Sclove	Extreme Values or Mixture Distribution?
3:40 PM			Myron Hlynka	Comments on the Gumbel Distribution
4:00 PM			Christine Nguyen	On High Quantile Regression
3:00 pm - 4:20pm	**CAN/B**	**TI 8**	**Serge B. Provost (O,C)**	**Moment-Based Methodologies for Approximating and Estimating Density Functions**
3:00 PM			Jiandong Ren	Moment-Based Density Approximations for Aggregate Losses
3:20 PM			Mathieu Pigeon	Composite (mixed) models for individual loss reserving
3:40 PM			Marc Paolella	Stable Paretian Distribution Testing
4:00 PM			Serge Provost	Differentiated Logdensity Estimates and Approximants as Rational Functions
4:20 pm - 4:30 pm	**NI**	**Intermission**		
4:30 pm - 5:45 pm	**NI**	**GI 5**	**Mavis Pararai (C)**	**Generalized Distributions 1**
4:30 PM			Miriam Hodge	Comparison of liquefaction data: An application of a logistic normal distribution in the simplex sample space
4:45 PM			Silvia L. P. Ferrari	Box-Cox symmetric distributions and applications to nutritional data
5:00 PM			Dionissios T. Hristopulos	A probability distribution function for finite-size systems with renormalized weakest-link behavior
5:15 PM			Marta Pérez-Casany	Random-Stopped Extreme distributions
5:30 PM			Jana Jureckova	Specifying the tails of a distribution

4:30 pm - 5:45 pm	**BR**	**GI 6**	**Mohamed Amezziane (C)**	**Inference -Estimation, Testing**
4:30 PM			Alex Lewin	Fuzzy multiple testing procedures for discrete test statistics
4:45 PM			Hoben Thomas and T.P. Hettmansperger	Test Scores, HRX, and Distribution Function Tail Ratios
5:00 PM			Cornelis Potgieter	Goodness-of-fit testing for generalized skew-symmetric distributions
5:15 PM			Jiancheng Jiang	A new diversity estimator
5:30 PM			Milan Stehlik,	Exact distributions of LR tests and their applications
4:30 pm - 5:45 pm	**EL**	**GI 7**	**Madhuka Samanthi (C)**	**Modeling 2 -Estimation**
4:30 PM			Sifan Liu and Min-ge Xie	Exact Inference on Meta-Analysis with Generalized Fixed-Effects and Random-Effects Models
4:45 PM			Anton Schick	Estimation of the error distribution function in a varying coefficient regression model
5:00 PM			Qiying Wang	Limit theorems for nonlinear cointegrating regression
5:15 PM			Farid El Ktaibi	Change point detection for stationary linear models and MBB applications
5:30 PM			Olatunji Arowolo and Kayode Ayinde	Parameter estimation techniques of simultaneous equation model with multicollinearity problem
4:30 pm - 5:45 pm	**CAN/B**	**GI 8**	**John Daniels (C)**	**Reliability, Risk**
4:30 PM			James Gleaton	Characteristics of Generalized Log-Logistic Families of Lifetime Distributions and Asymptotic Properties of Parameter Estimators
4:45 PM			Dimitris Karlis	On mixtures of multiple discrete distributions with application
5:00 PM			Leda Minkova	Distributions of order K in risk models
5:15 PM			Louis G. Doray	The Double Pareto Lognormal Distribution with Covariates and its Applications in Finance and Actuarial Science
5:30 PM			Jihnhee Yu, Luge Yang, Albert Vexler and Alan D. Hutson	Variance Estimation of the Nonparametric Estimator of the Partial Area under the ROC Curve
5:45 pm - 6:30 pm	**CAN/A**	**SP**	**Student Poster presentations**	
6:30 pm- 7:20 pm	**NI**	**Dinner**		
7:20 pm – 7:30 pm	**NI**		**Nancy Reid**	**Welcome Remarks from CANSSI**
7:30 pm - 8:30 pm	**NI**	**KEY**	**Jungsywan Sepanski (C)**	
7:30 PM			Mei-Ling Ting Lee	From Bacon and Eggs to Fréchet Shock-Degradation Models

October 16, 2016 (Sunday)

Type: REG: Registration, EXHI - Exhibition, KEY- Keynote, PLE - Plenary, TI -Topic Invited, GI - General Invited,
SP - Student Poster.
Room: NI - Niagara, BR - Brock, BR/M: Brock Main Lobby, EL - Elizabeth,
CAN/A - Canadian/A , CAN/B - Canadian/B

Time	Room	Type	Organizer (O)/ Chair (C) /Speaker	Title
7:00 am - 5:00 pm	**BR/M**	**REG**	**Registration at Brock Main Lobby**	
8:00 am - 5:00 pm	**BR/M**	**EXHI**	**Springer Publishing Exhibition at Brock Main Lobby**	
7:00 am - 8:00 am	**NI**	**Breakfast**		
8:00 am - 9:00 am	**NI**	**KEY**	**Ejaz Ahmed (C)**	
8:00 AM			Kjell Doksum	Ensemble subspace methods for high dimensional data
9:00 am - 9:15 am		**Intermission**		
9:15 am - 10:35 am	**NI**	**TI 9**	**Edward Furman (O), Cossette (C)**	**Dependence modelling with applications in insurance and finance**
9:15 AM			Hélène Cossette	Archimedean copulas: Aggregation and capital allocation
9:35 AM			Jiang Wu and Ricardas Zitikis	Background risk models, two-period economies, and optimal strategies that minimize financial losses
9:55 AM			Mélina Mailhot	Reciprocal Reinsurance Treaties Under an Optimal and Fair Joint Survival Probability
10:15 AM			Petar Jevtić, Thomas R. Hurd	The joint mortality of couples in continuous time
9:15 am - 10:35 am	**BR**	**TI 10**	**Wolf-Dieter Richter (O,C)**	**Multivariate distributions**
9:15 AM			Natalia Nolde	Multivariate light-tailed distributions: from the asymptotic shape of sample clouds to properties of multivariate extremes.
9:35 AM			Olcay Arslan	A unified approach to some multivariate skew distributions
9:55 AM			Christian Kleiber	On moment indeterminacy of the generalized variance
10:15 AM			Wolf-Dieter Richter	Statistical reasoning on scaling parameters in dependent p-generalized elliptically contoured distributions
9:15 am - 10:35 am	**EL**	**TI 11**	**Marco A.R. Ferreira (O,C)**	**Bayesian analysis for highly structured processes**
9:15 AM			Allison N. Tegge	Bayesian analysis for multi-subject time course RNA-seq experiments
9:35 AM			Ho-Hsiang Wu	Mixtures of Nonlocal Priors for Variable Selection in Generalized Linear Models
9:55 AM			Matthew J. Keefe	Objective Bayesian Analysis for Gaussian Improper CAR Models

10:15 AM			Andrew Hoegh	Multiscale Spatiotemporal Modeling for Predicting Civil Unrest
9:15 am - 10:35 am	**CAN/B**	**TI 12**	**Xiaoli Gao (O), Xie (C)**	**Recent development on Complex Data Analysis**
9:15 AM			Kei Hirose	Robust estimation for sparse Gaussian graphical model
9:35 AM			Bin Wang	Normalizing next-generation sequencing data via Density Estimation and Binning
9:55 AM			Yixin Fang	Variable selection for partially linear models via learning gradients
10:15 AM			Yuying Xie	Joint Estimation of Multiple Dependent Gaussian Graphical Models with Applications to Mouse Genomics
10:35 am - 10:50 am	**NI**	**Refreshment**		
10:50 am - 12:10 pm	**NI**	**TI 13**	**Victor De Oliveira (O,C)**	**Copula Modeling of Discrete Dependent Data**
10:50 AM			John Hughes	Hierarchical Copula Regression Models for Areal Data
11:10 AM			Lisa Madsen	Simulating Dependent Count Data
11:30 AM			Peter Song	Copula Random Field with Application to Longitudinal Neuroimaging Data Analysis
11:50 AM			Victor De Oliveira	On the Correlation Structure of Gaussian Copula Models for Geostatistical Count Data
10:50 am - 12:05 pm	**BR**	**GI 9**	**Chin-I Cheng (C)**	**Bayesian 2: Estimation**
10:50 AM			Sheldon Ross	Friendship Paradox and Friendship Network Model
11:05 AM			Peer Bilal Ahmad	Bayesian analysis of misclassified generalized Power Series distributions under different loss functions
11:20 AM			Min Wang and Shengnan Li	Bayesian estimation of the generalized lognormal distribution using objective priors
11:35 AM			Yuzo Maruyama	Harmonic Bayesian prediction under alpha-divergence
11:50 AM			Manoj Chacko	Bayesian density estimation using ranked set sample when ranking is not perfect
10:50 am - 12:05 pm	**EL**	**GI 10**	**K. Cooray (C)**	**Generalized Distributions 2**
10:50 AM			Mohammad Aljarrah	Exponential-Normal distribution
11:05 AM			Rafid S. Alshkaki	An Extension to the Zero-Inflated Generalized Power Series Distributions
11:20 AM			Ahmad Alzaghal	The Exponentiated Gamma-Pareto Distribution, Properties and Application
11:35 AM			John Nolan	Classes of generalized spherical distributions
11:50 AM			Anant Godbole	Statistical Distributions in Combinatorics: Moving from Intractability to Tractability
10:50 am - 12:10 pm	**CAN/B**	**TI 14**	**Milan Stehlik (O,C)**	**Statistics and Modelling**
10:50 AM			Lidia Filus	Two Kinds of Stochastic Dependencies Bi-variate Distributions; Part 1

11:10 AM			Jerzy Filus	Two Kinds of Stochastic Dependencies Bi-variate Distributions; Part 2
11:30 AM			Naoyuki Ishimura	Evolution of copulas and its applications
11:50 AM			Christina C. Christara	PDE option pricing with variable correlations
12:10 pm - 1:15 pm	**NI**	**Lunch**		
1:15 pm - 2:45 pm	**NI**	**PLE**	**John Daniels (C)**	
1:15 PM			Gwo Dong Lin	Recent Developments on the Moment Problem
1:45 PM			Anand Vidyashankar	Implicit Networks in High Dimensional Problems
2:15 PM			Don Fraser	Distributional methods have changed statistical inference
2:45 pm - 3:00 pm	**NI**	**Refreshment**		
3:00 pm - 4:20 pm	**NI**	**TI 15**	**Kahadawala Cooray (O,C)**	**Copula Theory and Applications to Insurance and Finance**
3:00 PM			Jean-François Plante	Rank Correlation under Categorical Confounding
3:20 PM			Ranadeera Samanthi	Comparing the Riskiness of Dependent Insurance Portfolios
3:40 PM			Dong Hwan Oh	Time-Varying Systemic Risk: Evidence from a Dynamic Copula Model of CDS Spreads
4:00 PM			Kahadawala Cooray	Strictly Archimedean Copula with Complete Association for Multivariate Dependence Based on the Clayton Family
3:00 pm - 4:20 pm	**BR**	**TI 16**	**Chin-I Cheng (O,C)**	**Bayesian approaches on models and distributions estimation**
3:00 PM			Jianghua He	Bayesian Reliability Assessment of Facility-Level Patient Outcome Measures
3:20 PM			Arpita Chatterjee	A note on Dirichlet Process based semiparametric Bayesian models
3:40 PM			Golnaz Shahtahmassebi	Bayesian Estimation of Change Point problems using Conditionally Specified Prior Distributions with Applications
4:00 PM			Chin-I Cheng	Bayesian Estimators of the Odd Weibull distribution with censored data
3:00 pm - 4:20 pm	**EL**	**TI 17**	**Broderick O. Oluyede (O,C)**	**Compounding and Copulas: Generalized and Extended Distributions**
3:00 PM			Lamya A. Baharith	Bivariate Truncated Type I Generalized Logistic Distribution
3:16 PM			Jong-Min Kim	Directional Dependence via Copula Stochastic Volatility Model.
3:32 PM			Hideatsu Tsukahara	The empirical beta copula
3:48 PM			Broderick O. Oluyede	The Burr XII Weibull Power Series Distribution: Theory and Applications
4:04 PM			Boikanyo Makubate	Dagum Power Series Class of Distributions with Applications to Lifetime Data

3:00 pm - 4:20 pm	**CAN/B**	**TI 18**	**Mohamed Amezziane (O,C)**	**Modeling complex data**
3:00 PM			Vladimir Vinogradov and Paris, Richard B.	Poisson-Tweedie mixtures: a case study
3:20 PM			Guan Yu	Sparse Regression for Block-missing Multi-modality Data
3:40 PM			Sévérien Nkurunziza	A class of restricted estimators in multivariate measurement error regression model
4:00 PM			Mihai Giurcanu	Thresholding Least Squares Inference in High Dimensional Regression Models
4:20 pm - 4:30 pm	**NI**	**Intermission**		
4:30 pm - 5:50 pm	**NI**	**TI 19**	**Paul McNicholas (O,C)**	**Mixtures of Non-Gaussian Distributions with Applications in Clustering**
4:30 PM			Sanjeena Dang	Mixtures of Dirichlet-Multinomial Regression Models for Microbiome Data
4:50 PM			Michael Gallaugher	Clustering Clickstream Data Using a Mixture of Continuous Time Markov Models
5:10 PM			Utkarsh Dang	Parsimonious skew power-exponential mixture models
5:30 PM			Paul McNicholas	Mixture of Coalesced Generalized Hyperbolic Distributions
4:30 pm - 5:50 pm	**BR**	**TI 20**	**Carlos A. Coelho (O,C)**	**Likelihood-based Inference: Methods and Applications**
4:30 PM			Ayaka Yagi and Takashi Seo	The null distribution of the LRT statistic for mean vectors with monotone missing data
4:50 PM			M. Filomena Teodoro	Modeling the time between failures using likelihood ratio tests
5:10 PM			Ricardo Moura	Likelihood-based exact inference for Posterior and Fixed-Posterior Predictive Sampling synthetic data under the MLR model
5:30 PM			Carlos A. Coelho	Likelihood ratio test for the equality of mean vectors when the joint covariance matrix is block-circulant or block compound symmetric
4:30 pm - 5:50 pm	**EL**	**TI 21**	**Hon Keung Tony Ng (O,C)**	**Statistical Methods for Analysis of Industrial and Medical Data**
4:30 PM			Dongliang Wang	Penalized Empirical Likelihood for the Cox Regression Model
4:50 PM			Kalanka Jayalath	A Graphical Test for Testing Random Effects in Common Statistical Designs
5:10 PM			Hon Yiu So	The EM algorithm for One-shot Device Testing with Competing Risk under Different Lifetimes Distributions
5:30 PM			Hon Keung Tony Ng	Statistical Inference for Component Distribution from System Lifetime Data
4:30 pm - 5:50 pm	**CAN/B**	**TI 22**	**Alfred Akinsete (O,C)**	**Construction of new statistical distributions and statistical data modeling**
4:30 PM			Mavis Pararai	A New Lifetime Distribution With Applications
4:50 PM			Michael Otunuga	Distribution Models of Energy Commodity Spot Price Processes

5:10 PM			Raid Al-Aqtash	Gumbel-Burr XII {logistic} distribution
5:30 PM			Avishek Mallick	Robustness of Multiple Comparison Methods for One-way and Two-way ANOVA with Repeated Measurements
6:00 pm - 7:00 pm	**NI**	**Closing**	**Carl Lee**	**Raffle Draw. Many door prices will be given away, including over 50 advanced level books, a tablet and others.**

Abstracts – Topic-Invited Speakers (Alphabetically Ordered)

Session Name: TI m_k (m_k = k^{th} speaker in m^{th} session)

It is assumed the first author is the presenter, unless an asterisk (*) is used to indicate the presenter. The affiliation listed is the presenter's affiliation only.

TI 22_3	**Al-Aqtash, Raid**	**Marshall University, USA**
Title	Gumbel-Burr XII {logistic} distribution	
In this project, a member of the Gumbel-X family of distributions is defined. Many properties will be presented including shapes, moments, skewness, kurtosis, parameter estimation. The distribution will be used to fit real life data and compare the performance with other used probability distributions.		
TI 3_4	**Al-Labadi, Luai**	**University of Toronto, Canada**
Title	Prior-based model checking	
Model checking procedures are considered based on the use of the Dirichlet process and relative belief. This combination is seen to lead to some unique advantages for this problem.		
TI 5_4	**Alzaatreh, Ayman**	**Nazarbayev University, Kazakhstan**
Title	Parameter estimation for the log-logistic distribution based on order statistics	
In this talk, the moments and product moments of the order statistics in a sample of size n drawn from the log-logistics distribution are discussed. We provide more compact forms for the mean, variance and covariance of order statistics. Parameter estimation for the log-logistic distribution based on order statistics is studied. In particular, best linear unbiased estimators (BLUEs) for the location and scale parameters for the log-logistic distribution with known shape parameter are studied. Hill estimator is proposed for estimating the shape parameter.		
TI 10_2	**Arslan, Olcay**	**Ankara University, Republic of Turkey**
Title	A unified approach to some multivariate skew distributions	
The main objective of the present work is to introduce a unified class of skew and heavy-tailed distributions. We construct the new class by defining the variance–mean mixture of a skew normal distributed random variable with a positive scalar-valued random variable independent of the skew normal distributed random variable. The new class can be regarded as an extension of the following classes: the normal variance mixture distributions, the variance mixture of the skew normal distribution and the normal variance–mean mixture distributions. An explicit expression for the density function of the new class is given and some of its distributional properties are examined. We give a simulation algorithm to generate random variates from the new class and propose an EM algorithm for maximum likelihood estimation of its parameters.		
TI 17_1	**Baharith, Lamya A.**	**King Abdulaziz University, Saudi Arabia**
Title	Bivariate Truncated Type I Generalized Logistic Distribution	
Truncated type I generalized logistic distribution has been used in variety of applications. In this article, new bivariate truncated type I generalized logistic distribution based on different types of copula functions is introduced. A study of some properties is illustrated. Different methods of estimation are		

used to estimate the parameters of the proposed distribution. Monte Carlo simulation is carried out to examine the performance of the estimators. Finally, real data set is analyzed to illustrate the satisfactory performance of the proposed distribution.

TI 7_1	**Brill, Percy and Huang, Mei Ling**	**University of Windsor, Canada**
Title	A Renewal Process for Extremes	

We derive the finite time-t probability density function (pdf) of the excess, age, and total life of *a renewal process* where inter-arrival times have a heavy tailed distribution, namely, a no-mean Pareto distribution with shape parameter Alpha in (0,1]. We compare the time-t pdf's with the corresponding limiting pdf's of a renewal process with inter-arrival times distributed as a finite-mean, truncated Pareto distribution having the same shape parameter Alpha. We give an example with fixed value t, and right truncation point K, such that the corresponding limiting pdf's closely approximate the finite time-t pdf's on a subset of support.

TI 16_2	**Chatterjee, Arpita**	**Georgia Southern University, USA**
Title	A note on Dirichlet Process based semiparametric Bayesian models	

Semiparamatric Bayesian models have become increasingly popular over the past few decades. As compared to their parametric counterparts, the semiparametric models allow for a greater flexibility in capturing the parameter uncertainty. Dirichlet process mixed models form a particular class of Bayesian semiparametric models by assuming a random mixing distribution, taken to be a realization from a Dirichlet process, for the mixture. In this research, we show that while hierarchical DP models may provide flexibility in model fit, they may not perform uniformly better in other aspects as compared to the parametric models.

TI 16_4	**Cheng, Chin-I**	**Central Michigan University, USA**
Title	Bayesian Estimators of the Odd Weibull distribution with censored data	

The Odd Weibull distribution is a three-parameter generalization of the Weibull distribution. The Bayesian methods with Jeffreys priors for estimating parameters of the Odd Weibull with censored data is considered. The Adaptive Rejection Sampling (ARS) and Adaptive Rejection Metropolis Sampling (ARMS) are adapted to generate random samples from full conditionals for inferences on parameters. The estimates based on Bayesian and maximum likelihood on censored data are compared. In order to clarify and advance the validity of Bayesian and likelihood estimators of the Odd Weibull distribution, one simulated data set and two examples about failure time are analyzed.

TI 6_3	**Choo-Wosoba, Hyoyoung**	**NIH/NCI, USA**
Title	Marginal Regression Models for Clustered Count Data Based on Zero-Inflated Conway-Maxwell-Poisson Distribution with Applications	

We propose a marginal regression model with a Conway-Maxwell-Poisson (CMP) distribution for clustered count data exhibiting excessive zeros and a wide range of dispersion patterns. Two estimation methods (MPL and MES) are introduced. Finite sample behaviors of the estimators and the resulting confidence intervals are studied using an extensive simulation study. We apply our methodologies to the data from the Iowa Fluoride Study and identify significant protective and risk factors from dietary and non-dietary covariates. We also provide an application of an under-dispersion case with a maize Hybrids experiment data.

TI 14_4	**Christara, Christina C.**	**University of Toronto, Canada**
Title	PDE option pricing with variable correlations	

Correlation between financial quantities plays an important role in pricing financial derivatives. Existing popular models assume that correlation either is constant, or exhibits some deterministic behaviour. However, market observations suggest that correlation is a more complicated process. We consider correlation structures that are guided by regime switching or by a stochastic process. We derive the related Partial Differential Equation (PDE) problems for pricing several types of financial derivatives, and solve them by accurate and efficient numerical methods. We also study the effect of model parameters to the prices. We present the PDE, the numerical solution, and comparison of the PDE results to Monte-Carlo simulations. We also discuss the relevant numerical challenges. This is joint work with Chun Ho (Nat) Leung.

TI 20_4	Coelho, Carlos A.	Universidade Nova de Lisboa, Portugal
Title	Likelihood ratio test for the equality of mean vectors when the joint covariance matrix is block-circulant or block compound symmetric	
The test developed and presented may be seen not only as a generalization of the common test of equality of mean vectors, under the assumption of independence of the corresponding random vectors or of independence of the samples, as well as a generalization of the tests for equality of means under the assumptions of a circulant or compound symmetric covariance matrix. Since the exact p.d.f. and c.d.f. of this likelihood ratio statistic do not have tractable expressions, near-exact distributions are developed, which enable the easy obtainment of sharp quantiles and p-values, and as such the practical implementation of these tests.		
TI 15_4	**Cooray, Kahadawala**	**Central Michigan University, USA**
Title	Strictly Archimedean Copula with Complete Association for Multivariate Dependence Based on the Clayton Family	
The Clayton copula is one of the most discussed Archimedean copulas for dependency measurement. However, the major drawback is that when it accounts for negative dependence, the copula becomes nonstrict and its support depends on the parameter. To address this issue, this talk introduces a new two-parameter family of strict Archimedean copula to measure exchangeable multivariate dependence. Closed-form formulas for the complete monotonicity and the d−monotonicity parameter region of the generator, copula distribution function, and the Kendall's distribution function are derived. Simulation studies are conducted to assess the performance of the ml estimators of the d−variate copula under known margins.		
TI 9_1	**Cossette,Hélène; Itre Mtalai; Etienne Marceau and Déry Veilleux**	**Laval University, Canada**
Title	Archimedean copulas: Aggregation and capital allocation	
Risk aggregation evaluates the distribution of the sum of n random variables which represent individual risks. Researchers in insurance and finance have investigated the aggregation of dependent risks to determine an adequate level of capital to offset the global risk $S=X_1+\ldots+$ Xn of a portfolio of n risks with known joint distribution. Risk measures, such as the VaR and TVaR, can be used to calculate the minimum capital requirement associated to S and the amount of capital allocated for each risk within the portfolio. We consider a portfolio of dependent risks represented by a vector of positive random variables whose joint distribution function is defined by a copula C and its margins F1, ..., Fn. We assume that the copula C is either an Archimedean copula or a nested Archimedean copula. Our objective is to introduce a deterministic method of computation of the distribution of S which relies on the fact that an Archimedean copula can be represented as a common mixture with a positive mixing variable. The exchangeability property of Archimedean copulas restricts their application. We hence extend some results to nested Archimedean copulas and propose a different approach permitting to get around certain constraints of these copulas.		
TI 19_1	**Dang, Sanjeena**	**Binghamton University – SUNY, USA**
Title	Mixtures of Dirichlet-Multinomial Regression Models for Microbiome Data	
The human gut microbiome is a source of great genetic and metabolic diversity. Microbiome samples which share similar biota compositions are known as enterotypes. Exploring the relationship between biological/environmental covariates and the taxonomic composition of the gut microbial community can shed light on the enterotype structure. Dirichlet-multinomial models have been previously suggested to investigate this relationship, however these models did not account for any latent group structure. Here, a finite mixture of Dirichlet-multinomial regression models is proposed and illustrated. These models allow for accounting for the enterotype structure and allow for a probabilistic investigation of the relationship between bacterial abundance and biological/environmental covariates within each inferred enterotype. Furthermore, a generalization of these models is also proposed that can incorporate the concomitant effect of the covariates on the resulting mixing proportions.		
TI 19_3	**Dang, Utkarsh**	**Binghamton University – SUNY, USA**
Title	Parsimonious skew power-exponential mixture models	

A family of parsimonious mixtures of multivariate power exponential distributions is presented. The multivariate power exponential distribution is a flexible elliptical alternative to the Gaussian and Student t-distributions, allowing for dealing with both varying tail-weight (light or heavy) and peakedness of data. For particular values of the shape parameter, special and limiting cases of this distribution include the double-exponential, Gaussian, and the uniform distributions. Furthermore, an extension of these models is presented that can also model asymmetric data. Computational and inference challenges will be discussed. Lastly, the utility of the proposed models is illustrated using both toy and benchmark data.

TI 13_4	**De Oliveira, Victor**	**The University of Texas at San Antonio, USA**
Title	On the Correlation Structure of Gaussian Copula Models for Geostatistical Count Data	

We describe a class of random field models for geostatistical count data based on Gaussian copulas. Unlike hierarchical Poisson models often used to describe this type of data, Gaussian copula models allow a more direct modelling of the marginal distributions and association structure of the count data. We study in detail the correlation structure of these random fields when the family of marginal distributions is either negative binomial or zero-inflated Poisson; these represent two types of overdispersion often encountered in geostatistical count data. We also contrast the correlation structure of one of these Gaussian copula models with that of a hierarchical Poisson model having the same family of marginal distributions, and show that the former is more flexible than the latter in terms of range of feasible correlation, sensitivity to the mean function and modelling of isotropy. An exploratory analysis of a dataset of Japanese beetle larvae counts illustrate some of the findings. All of these investigations show that Gaussian copula models are useful alternatives to hierarchical Poisson models, specially for geostatistical count data that display substantial correlation and small overdispersion.

TI 3_1	**Evans, Michael**	**University of Toronto, Canada**
Title	Measuring Statistical Evidence Using Relative Belief	

A fundamental concern of any theory of statistical inference is how one should measure statistical evidence. Certainly the words `statistical evidence', or perhaps just 'evidence', are much used in statistical contexts. Still it is fair to say that the precise characterization of this concept is somewhat elusive. Our goal here is to provide a definition of how to measure statistical evidence for any particular statistical problem. Since evidence is what causes beliefs to change, we measure evidence by the change in belief from a priori to a posteriori. As such our definition involves prior beliefs and this raises issues of subjectivity versus objectivity in statistical analyses. We deal with this through a principle requiring the falsifiability of any ingredients to a statistical analysis. This leads to a discussion of checking for prior-data conflict and measuring the a priori bias in a prior.

TI 12_3	**Fang, Yixin**	**New Jersey Institute of Technology, USA**
Title	Variable selection for partially linear models via learning gradients	

The performance of the proposed estimator is demonstrated in both simulation studies and real examples. Partially linear models, a compromise between parametric regression and non-parametric regression models, are very useful for analyzing high-dimensional data. Variable selection plays an important role in the use of partially linear models, which are of both linear and non-linear components. Variable selection for the linear component has been well studied. However, variable selection for the non-linear component usually relies on some assumption imposed on the structure of the non-linear component. For example, variable selection methods have been developed for additive partially linear models and generalized additive partially linear models. In this manuscript, we propose a new variable selection method based on learning gradients for partially linear models without any assumption on the structure of the non-linear component. The proposed method utilizes the reproducing-kernel-Hilbert-space tool to learn the gradients and the group-lasso penalty to select variables. In addition, a block-coordinate descent algorithm is described and some theoretical properties are derived. The performance of the proposed method is evaluated via simulation studies and a real data application.

TI 14_2	**Filus, Jerzy**	**Oakton Community College, USA**
Title	Two Kinds of Stochastic Dependencies Bi-variate Distributions; Part 2	

A new class of bivariate probability densities as stochastic models for some biomedical as well as for reliability phenomena is constructed. The models are fusions of the already known bivariate

"pseudodistributions" (pseudoexponential and pseudoWeibulian, in particular) with a rather new class of bivariate survival functions that, basically, look like a generalization of the first bivariate Gumbel's survival function. This generalization is obtained by use of 'additive hazard models' (see, Aalen, 1989) which are some modifications of the famous model by Cox (1972). The class of the "Gumbel-like" models, we will present, is quite general so that it, possibly, contains "most of" bivariate survival functions met in practical applications. In biomedical (or reliability) situations, we consider, a member of this class is supposed to model some particular stochastic dependence between biomedical quantities according to a bio-physical phenomena. In addition, stochastic description of some other, more complex type of phenomena, one obtains by applying to the previous bivariate distribution a pseudo-linear transformation of the random vector possessing the previously mentioned property of being the "Gumbel-like" distributed. The pseudo-linear transformation once applied to independent random variables produces the pseudodistributions. In the case it is applied to the random variables having the joint Gumbel-like distributions one obtains the fusion of two different stochastic models. Some analysis of the "combined" bivariate distributions will be presented.

TI 14_1	**Filus, Lidia**	**Northeastern Illinois University, USA**
Title	Two Kinds of Stochastic Dependencies Bi-variate Distributions; Part 1	

A new class of bivariate probability densities as stochastic models for some biomedical as well as for reliability phenomena is constructed. The models are fusions of the already known bivariate "pseudodistributions" (pseudoexponential and pseudoWeibulian, in particular) with a rather new class of bivariate survival functions that, basically, look like a generalization of the first bivariate Gumbel's survival function. This generalization is obtained by use of 'additive hazard models' (see, Aalen, 1989) which are some modifications of the famous model by Cox (1972). The class of the "Gumbel-like" models, we will present, is quite general so that it, possibly, contains "most of" bivariate survival functions met in practical applications. In biomedical (or reliability) situations, we consider, a member of this class is supposed to model some particular stochastic dependence between biomedical quantities according to a bio-physical phenomena. In addition, stochastic description of some other, more complex type of phenomena, one obtains by applying to the previous bivariate distribution a pseudo-linear transformation of the random vector possessing the previously mentioned property of being the "Gumbel-like" distributed. The pseudo-linear transformation once applied to independent random variables produces the pseudodistributions. In the case it is applied to the random variables having the joint Gumbel-like distributions one obtains the fusion of two different stochastic models. Some analysis of the "combined" bivariate distributions will be presented.

TI 19_2	**Gallaugher, Michael**	**McMaster University, Canada**
Title	Clustering Clickstream Data Using a Mixture of Continuous Time Markov Models	

In today's society, the internet is quickly becoming a major source of data. One interesting type of data that can be utilized from the internet is clickstream data, which monitors a user's web browsing patterns. Clustering is the process of finding underlying group structures in a dataset, and although there has been ample work done in the clustering paradigm for clickstream data, the methods often neglect the amount of time spent on each website. By failing to include a time component in the model, we are robbing ourselves of potentially valuable information. We propose a mixture of continuous time first order Markov models for the clustering of clickstreams which would incorporate the time aspect. Both simulated data, and real datasets will be considered for the evaluation of the proposed methodology.

TI 5_3	**Ghosh, Indranil**	**University of North Carolina at Wilmington, USA**
Title	Some alternative bivariate Kumaraswamy models	

In this paper we discuss various strategies for constructing bivariate Kumaraswamy distributions. As alternatives to the Nadarajah, Cordeiro and Ortega (2011) bivariate model, four different models are introduced utilizing a conditional specification approach, a conditional survival function approach, an Arnold-Ng bivariate beta distribution construction approach, and a copula based construction approach. Distributional properties for such bivariate distributions are investigated. Parameter estimation strategies for the models are discussed, as are the consequences of fitting two of the models to a particular data set involving hemoglobin content in blood samples before and after treatment.

TI 18_4	Giurcanu, Mihai	University of Florida, USA
Title	Thresholding Least Squares Inference in High Dimensional Regression Models	
We propose a thresholding least-squares method of inference for high-dimensional regression models when the number of parameters, p, tends to infinity with the sample size, n. Extending the asymptotic behavior of the F-test in high dimensions, we establish the oracle property of the thresholding least-squares estimator when p = o(n). We propose two automatic selection procedures for the thresholding parameter using Scheffe and Bonferroni methods. We show that, under additional regularity conditions, the results continue to hold even if p = exp(o(n)). Lastly, we show that, if properly centered, the residual-bootstrap estimator of the distribution of thresholding least-squares estimator is consistent, while a naive bootstrap estimator is inconsistent. In an intensive simulation study, we assess the finite sample properties of the proposed methods for various sample sizes and model parameters. The analysis of a real world data set illustrates an application of the methods in practice.		
TI 1_2	**Gomez-Deniz, Emilio**	**University of Las Palmas de Gran Canaria, Spain**
Title	Computing Credibility Bonus-Malus Premiums Using a Bivariate Discrete Distribution	
A simple modification for computing the automobile insurance bonus-malus premiums is proposed here. Traditionally, in automobile insurance the premium assigned to each policyholder is based only on the number of claims made. Therefore, a policyholder who has had an accident producing a relatively small amount of loss is penalised to the same extent as one who has had a more costly accident and this seems to be unfair. We propose a statistical model which distinguishes between two different types of claims, incorporating a bivariate distribution based on the assumption of dependence. We also describe a bivariate prior distribution conjugated with respect to the likelihood. This approach produces credibility bonus-malus premiums that satisfy appropriate transition rules. A practical example of its application is presented and the results obtained are compared with those derived from the traditional model in which only the number of claims is taken into account.		
TI 5_2	**Hamedani, Gholamhossein**	**Marquette University, USA**
Title	Characterizations of Probability Distribution Via the Concept of Sub-Independence	
Limit theorems as well as other well-known results in probability and statistics are often based on the distribution of the sums of independent (and often identically distributed) random variables rather than the joint distribution of the summands. Therefore, the full force of independence of the summands will not be required. In other words, it is the convolution of the marginal distributions which is needed, rather than the joint distribution of the summands. The concept of sub-independence, which is much weaker than that of independence, is shown to be sufficient to yield the conclusions of these theorems and results. It also provides a measure of dissociation between two random variables which is much stronger than uncorrelatedness. In this talk, certain characterizations of probability distributions based on the concept of sub-independence will be presented.		
TI 16_1	**He, Jianghua**	**University of Kansas Medical Center, USA**
Title	Bayesian Reliability Assessment of Facility-Level Patient Outcome Measures	
Patient health outcome measures at facility-level are often used as quality indicators of patient care. Within-facility variations of such measures often differ among facilities. The intraclass correlation coefficient based on equal within-subject variation may not be directly applied. Signal-to-noise approach can be used to assess the facility-specific reliability of a measure with different within-subject variation among facilities. In this study, we propose a new approach of assessing the reliability of patient outcome measures at facility-level in differentiating one facility from others by allowing for facility-specific variation. The Bayesian framework is utilized to handle measures of events rates with non-negligible zeros.		
TI 2_2	**He, Wenqing**	**University of Western Ontario, Canada**
Title	Improving Performance of Support Vector Machine Classifiers with Data Adaptive Kernel	
Support Vector Machine (SVM) is popularly used in the classification/prediction of discrete outcomes, especially in high dimensional data analysis such as gene expression data analysis and image analysis. In this talk, a new enhance SVM method will be presented. The initial kernel function for the SVM is rescaled in an adaptive way so that the separation between two classes can be effectively enlarged,		

based on the prior knowledge obtained from the conventional SVM. The modified classifier takes into consideration the distribution of the support vectors in the feature space, and the correlation will be dealt with by selecting only limited numbers of parameters properly. Improvement of prediction accuracy from this data dependent SVM is shown with numerical studies.

TI 12_1	**Hirose, Kei**	**Kyushu University, Japan**
Title	Robust estimation for sparse Gaussian graphical model	

In Gaussian graphical modeling, we often use a penalized maximum likelihood approach with the L1 penalty for learning a high-dimensional graph. However, the penalized maximum likelihood procedure is sensitive to outliers. To overcome this problem, we introduce a robust estimation procedure based on the \gamma-divergence. The parameter estimation procedure is constructed using the Majorize-Minimization algorithm, which guarantees that the objective function monotonically decreases at each iteration. This method has a redescending property, which is known as a desirable property in robust statistics. Extensive simulation studies showed that our procedure performed much better than the existing methods.

TI 7_3	**Hlynka, Myron**	**University of Windsor, Canada**
Title	Comments on the Gumbel Distribution	

The talk will discuss the Gumbel distribution and its relationship to integer partitions.

TI 11_4	**Hoegh, Andrew**	**Montana State University, USA**
Title	Multiscale Spatiotemporal Modeling for Predicting Civil Unrest	

Civil unrest is a complicated, multifaceted social phenomenon that is difficult to forecast. Relevant data for predicting future protests consist of a massive set of heterogeneous data sources, primarily from social media. A modular approach to extract pertinent information from disparate data sources is implemented to develop a multiscale spatiotemporal framework to fuse predictions from algorithms mining social media. The novel multiscale spatiotemporal framework is scalable to handle massive spatiotemporal datasets and can incorporate hierarchical covariates. An efficient sequential Monte Carlo procedure coupled with the multiscale framework enables rapid computation of a richly specified Bayesian hierarchical model for spatiotemporal data.

TI 13_1	**Hughes, John**	**University of Colorado, Denver, USA**
Title	Hierarchical Copula Regression Models for Areal Data	

Regression analysis for spatially aggregated data is common in a number of fields, including public health, ecology, and econometrics. Often, the goal of such an analysis is to quantify the relationship between an outcome of interest and one or more covariates. The mixed model with proper conditional autoregressive (CAR) spatial random effects is commonly used to model such data but suffers serious drawbacks. First, an analyst must interpret covariate effects conditionally although marginal effects may be of interest. Second, the dependence parameter of the proper CAR model has an intuitive conditional interpretation, but the parameter's marginal interpretation is complicated and counterintuitive; specifically, spatial units with a similar number of neighbors have different marginal correlations. To overcome these two drawbacks, we propose a copula-based hierarchical model with covariance selection. Our approach allows for unbiased estimation of marginal parameters and thus an intuitive marginal interpretation. The covariance-selection copula's single dependence parameter is the first-order correlation. This provides a dependence structure having intuitive conditional and marginal interpretations. We develop a computational framework that permits efficient frequentist inference for our model, even for large datasets. We evaluate the small- and large-sample performance of our method under simulated conditions, and apply our procedure to a widely studied Slovenia stomach cancer dataset.

TI 14_3	**Ishimura, Naoyuki**	**Chuo University, Japan**
Title	Evolution of copulas and its applications	

Copula is known to provide a flexible method for the understanding of dependence structure among random events. However, a copula function does not usually involve a time variable. We have developed, on the other hand, the concept of evolution of copulas, which claim that copula itself evolves according

to the time variable. In this presentation, we review our recent study on this evolution of copulas and consider its applications, which include in particular the analysis of exchange rate modeling.

TI 3_2	Jang, Gun Ho and Stein, Lincoln	Ontario Institute for Cancer Research, Canada
Title	Relative Belief based Signal Segmentation	

Cancers display a considerable degree of genomic copy number alteration (CNA), manifested as chromosomal and segmental amplifications and deletions. Many CNA detection algorithms assume the events follow a locally constant signal model, but low tumor fractions and/or subclonal heterogeneity create weak signals that are difficult to interpret accurately. We propose a segmentation method using a relative belief inference on a locally constant model. The performance of the proposed method is presented and compared with several segmentation algorithms including circular binary segmentation, allele-specific piecewise constant fitting and SCAN algorithms.

TI 21_2	Jayalath, Kalanka	University of Houston - Clear Lake, USA
Title	A Graphical Test for Testing Random Effects in Common Statistical Designs	

Analysis of means (ANOM) is a powerful graphical testing procedure for comparing means and variances in fixed effect models. The graphical interpretation of ANOM is a great advantage over the classical ANOVA approach. However, the ANOM only deals with the fixed factor effects. In this talk, we discuss the ability to extend the ANOM approach to testing random effects. We also discuss the use of the new ANOM approach in many different statistical designs including both random and mixed effects models with illustrative examples. The power performance of the proposed procedure is compared to the ANOVA approach via a simulation study.

TI 9_4	Jevtić, Petar and Hurd, Thomas R.	McMaster University , Canada
Title	The joint mortality of couples in continuous time	

This paper introduces a probabilistic framework for the joint survivorship of couples in the context of dynamic stochastic mortality models. In contrast to previous literature, where the dependence between male and female times of death was achieved using a copula approach, this new framework gives an intuitive and flexible pairwise cohort-based probabilistic mechanism that can accommodate both deterministic and stochastic effects which the death of one member of couple causes on the other. It is sufficiently flexible to allow modeling of effects that are short term (broken heart) or long term in their durations. In addition, it can account for the state of health of the both the surviving and dying spouse and thus can allow for dynamic and asymmetric reactions of varying complexity. Finally, it can accommodate the dependence of lives before the first death. Analytical expressions for bivariate survivorship in representative models are given, and their estimation, done in two stages, is seen to be straightforward. First, marginal survivorship functions are calibrated based on UK mortality data for males and females of chosen cohorts. Second, the maximum likelihood approach is used to estimate the remaining parameters from simulated joint survival data. We show that the calibration methodology is simple, robust and fast, and can be readily used in practice.

TI 11_3	Keefe, Matthew J.	Virginia Tech, USA
Title	Objective Bayesian Analysis for Gaussian Improper CAR Models	

Choosing appropriate priors for parameters of Bayesian hierarchical models for areal data is challenging. In particular, an improper conditional autoregressive (CAR) component is often used to account for spatial association. The use of vague proper priors for this model requires the selection of suitable hyperparameters. In this talk, we derive objective priors for the Gaussian hierarchical model with an improper CAR component and show that the reference prior results in a proper posterior distribution. We present results from a simulation study to compare properties of the proposed Bayesian procedures. We illustrate our methodology by modeling foreclosure rates in Ohio.

TI 17_2	Kim, Jong-Min	University of Minnesota, Morris, USA
Title	Directional Dependence via Copula Stochastic Volatility Model.	

By a theorem due to Sklar in 1959, a multivariate distribution can be represented in terms of its underlying margins by binding them together a copula function. Copulas are useful devices to explain the dependence structure between variables by eliminating the influence of marginals. A copula method for understanding multivariate distributions has a relatively short history in statistics literature; most of the

statistical applications have arisen in the last twenty years. In this talk, directional dependence via copula stochastic volatility model will be introduced with real example using financial data.

TI 6_1	Sellers, Kimberly	Georgetown University, USA
Title	Introducing the Conway-Maxwell-Poisson distribution	

The Conway-Maxwell-Poisson (COM-Poisson) distribution is a flexible alternative for modeling count data, and it is quickly growing in popularity in both the statistics and applied quantitative disciplines. While the Poisson distribution maintains the constrained equi-dispersion assumption (where the variance and mean equal), the COM-Poisson distribution allows for data over- or under-dispersion (where the variance is larger or smaller than the mean), and captures three classical distributions as special cases. This talk will introduce the distribution and serve as a review survey for the work done, and a prologue to the subsequent talks in the session.

TI 10_3	Kleiber, Christian	Universitaet Basel, Switzerland
Title	On moment indeterminacy of the generalized variance	

The moment problem asks whether a distribution can be uniquely characterized by the sequence of its moments. In the univariate case, counterexamples have been known for decades, e.g., the lognormal and certain generalized gamma distributions. In the multivariate case, knowledge is still much more limited. Here we consider a univariate sampling distribution from classical multivariate analysis, the generalized variance, which leads to a Stieltjes-type moment problem. It is shown that this object is not determined by the sequence of its moments although all the moments are finite. There is a dimension effect: the bivariate case the distribution is moment-determinate, whereas in dimensions greater than two the distribution is moment-indeterminate.

TI 4_3	Li, Pengfei	University of Waterloo, Canada
Title	Controlling IER and EER in replicated regular two-level factorial experiments	

Replicated regular two-level factorial experiments are very useful for industry. The goal of these experiments is to identify active effects that affect the mean and variance of the response. Hypothesis testing procedures are widely used for this purpose. However, the existing methods give results that are either too liberal or conservative in controlling the individual and experimentwise error rates (IER and EER). In this paper, we propose a resampling procedure and an exact-variance method to identify active effects for the mean and variance, respectively, of the response. Monte Carlo studies show that our methods control the IER and EER well.

TI 13_2	Madsen, Lisa	Oregon State University, USA
Title	Simulating Dependent Count Data	

Statisticians simulate data for a variety of purposes: to assess and compare the performance of statistical procedures and to design studies. Therefore, the ability to simulate realistic data is an important tool. I will discuss a method to simulate count-valued dependent random variables from the Gaussian copula that mimic observed data sets. Researchers typically characterize dependence by Pearson's produce-moment correlation, but for small-mean counts, this is not as sensible as other measures such as Spearman's rank correlation. Furthermore, for small-mean count distributions, the high probability of ties requires special attention. I will show how to determine the Gaussian copula correlation matrix that will lead to any specified feasible Spearman or Pearson correlation matrix. I will demonstrate the method with an example based on an actual data set.

TI 9_3	Mailhot, Mélina	Concordia University, Canada
Title	Reciprocal Reinsurance Treaties Under an Optimal and Fair Joint Survival Probability	

Optimal reinsurance treaties between an insurer and a reinsurer considering both parties' interests will be presented. Most articles only focus on the insurer's point of view. The latest research considering both sides have considerably oversimplied the joint survival function. This situation leads to an unrealistic optimal solution; one of the parties can make risk-free profits while the other bears all the risk. A fair joint survival probability will be defined and optimized for a reciprocal reinsurance treaty under different principles and types of contract.

TI 17_5	**Makubate, Boikanyo, Galetlhakanelwe Motsewabagale, Broderick O. Oluyede, Alphonse Amey**	**Botswana International University of Science and Technology**
Title	Dagum Power Series Class of Distributions with Applications to Lifetime Data	

In this paper, we present a new distribution class of distributions called the Dagum-Power Series (DPS) distribution and in particular the Dagum-Poisson (DP) distribution. This model is obtained by compounding Dagum distribution with the power series distribution. The hazard function, reverse hazard function, moments and mean residual life function are obtained. Methods of finding estimators such as Minimum Distance, Maximum Product of Spacing, Bayesian estimators, Least Squares, Weighted Least Squares and Maximum Likelihood will be discussed. A simulation study will be carried out to compare these estimation methods. Each method has its own strength and weakness. We also carry out some hypothesis tests using the Wald test statistic. This distribution will be shown to be competitive model for describing censored observations in life time reliability problems. Finally, we apply the Dagum-Poisson distribution to real dataset to illustrate the usefulness and applicability of the distribution.

TI 22_4	**Mallick, Avishek**	**Marshall University, USA**
Title	Robustness of Multiple Comparison Methods for One-way and Two-way ANOVA with Repeated Measurements	

In many experiments several observations are taken over time or with several treatments applied to each subject. These observations tend to be highly correlated, particularly those observed adjacent to each other with respect to time. In this paper we investigate the effect of the correlations among the observations in one-way and two-way ANOVA. A modification of the standard tests suitable for AR(1) correlation structure is proposed and its properties are investigated. We also apply the approximations to the distribution of F tests as suggested by Andersen, Jensen, and Schou (1981) and carry out the analysis. The modified procedure allows us to have a better control of the nominal significance level α. Consequently, the multiple comparisons and multiple tests based on this modified procedure will lead to conclusions with better accuracy.

TI 4_1	**Mandal, Saumen**	**University of Manitoba, Canada**
Title	Optimal designs for minimizing correlations among parameter estimators in a linear model	

In many regression designs it is desired to render certain parameter estimators uncorrelated with others. Motivated by this fact, we construct optimal designs for minimizing covariances among the parameter estimators in a linear model, thereby rendering the parameter estimators approximately uncorrelated with each other. In the case of rendering a parameter estimator uncorrelated with another two estimators, we set up a compound optimization problem and transform the problem to one of maximizing two functions of the design weights simultaneously. The approaches are formulated for a general regression model and are explored through some examples including one practical problem arising in Chemistry.

TI 19_4	**McNicholas, Paul**	**McMaster University, Canada**
Title	Mixture of Coalesced Generalized Hyperbolic Distributions	

A mixture of multiple scaled generalized hyperbolic distributions (MSGHDs) is introduced. Then, a mixture of coalesced generalized hyperbolic distributions is developed by joining a finite mixture of generalized hyperbolic distributions with a MSGHD. After detailing the development of the mixture of MSGHDs, which arises via implementation of a multi-dimensional weight function, the density of the coalesced distribution is developed. A parameter estimation scheme is developed using the ever-expanding class of MM algorithms and the Bayesian information criterion is used for model selection. The issue of cluster convexity is examined and a special case of the MSGHDs is developed that is guaranteed to have convex clusters. These approaches are illustrated and compared using simulated and real data.

TI 6_4	**Morris, Darcy S.**	**U.S. Census Bureau, USA**
Title	Bivariate Conway-Maxwell-Poisson Distribution: Formulation, Properties, and Inference	

The bivariate Poisson distribution is a popular distribution for modeling bivariate count data. Its basic assumptions and marginal equidispersion, however, may prove limiting in some contexts. To allow for

data dispersion, we developed a bivariate Conway-Maxwell-Poisson (COM-Poisson) distribution that includes the bivariate Poisson, bivariate geometric, and bivariate Bernoulli distributions all as special cases. As a result, the bivariate COM-Poisson distribution serves as a flexible alternative and unifying framework for modeling bivariate count data, especially in the presence of data dispersion. This is joint work with Kimberly Sellers (Georgetown University) and Narayanaswamy Balakrishnan (McMaster University).

TI 20_3	**Moura, Ricardo**	**Universidade Nova de Lisboa (CMA-FCT/UNL), Portugal**
Title	Likelihood-based exact inference for Posterior and Fixed-Posterior Predictive Sampling synthetic data under the MLR model	

Synthesizing datasets as a Statistical Disclosure Control technique has become more and more popular. Under multivariate linear regression model, likelihood-based exact inference for singly and multiply imputed synthetic data generated under Posterior Predictive Sampling (PPS) will be presented, filling a gap in the existing SDC literature. It will be also presented a likelihood-based exact inference for multiply imputed data generated via a new method, called Fixed-Posterior Predictive Sampling (FPPS), proposed to overcome problems inherent to the PPS method. An application using U.S. 2000 Current Population Survey data will be discussed and comparisons between PPS and FPPS are presented.

TI 3_3	**Muthukumarana, Saman**	**University of Manitoba, Canada**
Title	Non-inferiority Hypothesis Testing in Two-arm Trials using Relative Belief Ratios	

We discuss a Bayesian approach for assessing non-inferiority in two-arm trials using relative belief ratio. A relative belief ratio is a measure of the evidence in favour of a hypothesis. It is similar to the Bayes factor as both measure the change in belief from a priori to a posteriori but has better optimal properties. Under different conditions, we obtain the posterior distribution of the difference in treatment effects between experimental treatment and reference treatment. Once this distribution is determined, we propose a Bayesian decision criterion using the relative belief ratio. We illustrate the proposed method by applying it to data arising from two-arm clinical trials. Some extensions to discrete data with excessive zeros will also be discussed.

TI 21_4	**Ng, Hon Keung Tony**	**Southern Methodist University, USA**
Title	Statistical Inference for Component Distribution from System Lifetime Data	

In this talk, statistical inference of the reliability characteristics of the components in the system based on the lifetimes of systems will be discussed. We study the problem of testing the homogeneity of distributions of component lifetime based on system lifetime data with known system signatures. Both parametric and nonparametric procedures are developed for this problem. The performance and limitations of the proposed nonparametric method are discussed. Then, we assume the component lifetimes follow exponential distributions and develop exact and asymptotic parametric tests. Monte Carlo simulation study is used to compare the performance of different parametric and nonparametric procedures.

TI 7_4	**Nguyen, Christine and Huang Mei Ling**	**Brock University, Canada**
Title	On High Quantile Regression	

The estimation of conditional quantiles at very high or low tails of a heavy tailed distribution is of interest in numerous applications. We study a linear quantile regression model which uses an L1- loss function, and the optimal solution of linear program, for estimating coefficients of regression. This paper proposes a weighted quantile regression method for certain extreme value sets. Monte Carlo simulations show good results for the proposed weighted method. Comparisons of the proposed method and existing methods are given. The paper also investigates real-world examples by using the proposed weighted method.

TI 18_3	**Nkurunziza, Sévérien**	**University of Windsor, Canada**
Title	A class of restricted estimators in multivariate measurement error regression model	

In this paper, we study an estimation problem in multivariate regression model with measurement error. In particular, we consider the case where the regression coefficient may satisfy some restrictions. We propose the unrestricted estimator (UE) and a class of restricted estimators, which includes as a special cases three restricted estimators given in recent literature. Further, we study the asymptotic properties

of the proposed class of estimators under the null and alternative hypothesis. To this end, we generalize some findings underlying the elliptically contoured distributions. Thanks to the generalized findings, we establish Asymptotic Distributional Risk (ADR) for the UE as well as the ADR of any member of the proposed class of the restricted estimators and we compare their relative performance. It is established that near the null hypothesis, the restricted estimators (REs) perform better than the UE. But the REs perform worse than the UE when one moves far away from the null hypothesis. Finally, in order to illustrate the application of the proposed method, we present some simulations and we analyze a real data set. The numerical findings corroborate the established theoretical results.

TI 10_1	**Nolde, Natalia**	**University of British Columbia, Canada**
Title	Multivariate light-tailed distributions: from the asymptotic shape of sample clouds to properties of multivariate extremes.	

Sample clouds of multivariate data points from light-tailed distributions can often be scaled to converge onto a deterministic set as the sample size tends to infinity. It turns out that the shape of this limit set can be related to a number of extremal tail and dependence properties of the underlying multivariate distribution. In this talk, I will present several simple relations, and illustrate how they can be used to replace frequently cumbersome or intractable analytical computations.

TI 15_3	**Oh, Dong Hwan**	**Board of Governors of the Federal Reserve System, USA**
Title	Time-Varying Systemic Risk: Evidence from a Dynamic Copula Model of CDS Spreads	

This paper proposes a new class of copula-based dynamic models for high dimension conditional distributions, facilitating the estimation of a wide variety of measures of systemic risk. Our use of copula-based models enables the estimation of the joint model in stages, greatly reducing the computational burden. We use the proposed new models to study a collection of daily CDS spreads on 100 U.S. firms. We find that while the probability of distress for individual firms has greatly reduced since the 2008 financial crisis, a measure of systemic risk is substantially higher now than in the pre-crisis period.

TI 17_4	**Oluyede, Broderick O.**	**Georgia Southern University, USA**
Title	The Burr XII Weibull Power Series Distribution: Theory and Applications	

A new class of power series distributions is developed and presented. In particular, the new Burr XII Weibull-Poisson (BWP) distribution is introduced and its properties are explored in detail. Some estimation techniques including maximum likelihood estimation method are used to estimate the model parameters and finally applications of the model to real data sets are presented to illustrate the usefulness of the proposed class of distributions.

TI 22_2	**Otunuga, Michael**	**Marshall University, USA**
	Distribution Models of Energy Commodity Spot Price Processes	

In this work, we undertake the study to shed light on world oil market and price movement, price balancing process and energy commodity behavior. A system of stochastic model for dynamic of energy pricing process is proposed. Different methods for parameter estimation is discussed. In addition, by developing a Local Lagged Adapted Generalized Method of Moment (LLGMM) method, an attempt is made to compare the simulated estimates derived using LLGMM and other existing method. These developed results are applied to the Henry Hub natural gas, crude oil, coal, and ethanol data set.

TI 8_3	**Paolella, Marc**	**University of Zurich, Switzerland**
Title	Stable Paretian Distribution Testing	

A fast method for estimating the parameters of a stable-APARCH not requiring likelihood or iteration is proposed. Several powerful tests for the (asymmetric) stable Paretian distribution with tail index $1< \alpha < 2$ are developed and used for assessing the appropriateness of the stable assumption as the innovations process in stable-GARCH-type models for daily stock returns. Overall, there is strong evidence against the stable as the correct innovations assumption for all stocks and time periods, though for many stocks and windows of data, the stable hypothesis is not rejected.

TI 22_1	**Pararai, Mavis**	**Indiana University of Pennsylvania, USA**
Title	A New Lifetime Distribution With Applications	

The beta Lindley-Poisson (BLP) distribution which is an extension of the Lindley-Poisson Distribution is introduced and its properties are explored. This new distribution represents a more flexible model for the lifetime data. Some statistical properties of the proposed distribution including the expansion of the density function, hazard rate function, moments and moment generating function, skewness and kurtosis are explored. Renyi entropy and the distribution of the order statistics are given. The maximum likelihood estimation technique is used to estimate the model parameters and finally applications of the model to real data sets are presented for the illustration of the usefulness of the proposed distribution.

TI 2_3	**Peng, Yingwei**	**Queen's University, Canada**
Title	Prediction accuracy for cure probability in cure models	

Prediction accuracy of a cure model to predict the cure probability of a subject is an important but not well addressed issue in survival analysis. We propose a method to assess the prediction accuracy of a mixture cure model in predicting cure probability based on inverse probability of censoring weights to incorporate the censoring and latent cure status in the data. The consistency of the estimator is examined. A simulation study is conducted to investigate the performance of estimator based on training data only. An application of the method to a real data set is illustrated.

TI 8_2	**Pigeon, Mathieu**	**UQAM, Montréal (Québec), Canada**
Title	Composite (mixed) models for individual loss reserving	

In this talk, we consider composite models (CM) based on a distribution *f* up to an unknown threshold and a distribution *g* thereafter. Instead of using a single threshold value applying uniformly to the whole dataset, a composite mixed model (CMM) allows for heterogeneity with respect to the threshold and let it vary among observations. More specifically, the threshold value for a particular observation is seen as the realization of a random variable and the CMM is obtained by averaging over the population of interest. We apply these models, and some extensions, to evaluate loss reserves in a micro-level actuarial dataset. We illustrate results with an empirical analysis using a real portfolio as well as with simulations.

TI 15_1	**Plante, Jean-François**	**HEC Montréal, Business School in Montreal, Québec, Canada**
Title	Rank Correlation under Categorical Confounding	

Rank correlation is invariant to marginal transformations, but it is not immune to confounding. Assuming a categorical confounding variable is observed, the author proposes weighted coefficients of correlation developed within a larger framework based on copulas. While the weighting is clear under the assumption that the dependence is the same within each group implied by the confounder, the author extends the Minimum Averaged Mean Squared Error (MAMSE) weights to borrow strength between groups when the dependence may vary across them. Asymptotic properties of the proposed coefficients are derived and simulations are used to assess their finite sample properties.

TI 1_3	**Prieto, Faustino and Sarabia, Jose Maria**	**University of Cantabria, Spain**
Title	Family of generalized power law (GPL) distributions: Properties and Applications	

Many real phenomena can be modelled by the Power Law (Pareto) distribution in their upper tail. However, that distribution usually fails when we focus on their whole range. In this paper, we provide empirical evidence that, the family of Generalized Power Law (GPL) distributions, can be useful for modelling the whole range, of those real phenomena with power law tail. To do that, we combine maximum likelihood method, as a fitting technique, with Kolmogorov-Smirnov test method based on bootstrap resampling, as a goodness of fit test. In addition, we compare that family of distributions with other well known distributions.

TI 8_4	**Provost, Serge**	**The University of Western Ontario, Canada**
Title	Differentiated Logdensity Estimates and Approximants as Rational Functions	

We propose a density approximation methodology whereby the derivative of the logarithm of a density approximant is expressed as a polynomial or a rational function. The polynomial coefficients are determined by matching moments and solving the resulting system of linear equations. This methodology is applied to two test statistics as well as certain mixtures of density functions. As well, it is explained that this approach can produce density estimates.

TI 6_2	**Raim, Andrew**	**U.S. Census Bureau, USA**
Title	A flexible zero-inflated model to address data dispersion	

The Conway–Maxwell–Poisson distribution has seen increased interest in recent years due to its ability to model both overdispersion and underdispersion relative to the Poisson distribution. This work considers a zero-inflated Conway–Maxwell–Poisson (ZICMP) distribution for the common problem of excess zeroes in count data. ZICMP becomes a flexible regression model by linking covariates to its count rate and zero-inflation parameters. Through simulation, we examine some properties of the maximum likelihood estimator and a test for equidispersion. ZICMP performs favorably compared to related count models in analyzing several synthetic datasets, as well as a real study of unwanted pursuit behaviors in separated couples.

TI 8_1	**Ren, Jiandong**	**The University of Western Ontario, Canada**
Title	Moment-Based Density Approximations for Aggregate Losses	

The determination of the distribution of aggregate losses is of crucial importance for an insurer. We apply a moment-based density approximation method to approximate the distributions of univariate and bivariate aggregate losses. The proposed technique which is conceptually simple and computationally efficient, constitutes a viable alternative to the commonly used recursive and FFT methods. As well, given a set of observed aggregate losses, the methodology advocated herein can readily be applied in conjunction with the sample moments for modeling purposes.

TI 10_4	**Richter, Wolf-Dieter**	**University of Rostock, Germany**
Title	Statistical reasoning on scaling parameters in dependent p-generalized elliptically contoured distributions	

Scaling parameters of two dependent variables having known expectations are compared if the two-dimensional observation vector follows a p-generalized elliptically contoured distribution. Basic properties of the geometric representation of the multivariate sample distribution are used in constructing exact significance tests and confidence estimates.

TI 1_1	**Saez-Castillo, Antonio Jose and Conde-Sanchez, Antonio**	**University of Jaen, Spain**
Title	Regression models based on extended Poisson distributions in R	

Many discrete probability distribution has tried to extend the Poisson distribution and solve the problem of lack of equidispersion, mainly due to the presence of individual heterogeneity, but also caused by the existence of negative contagion effect. Only a reduced subset of these extended Poisson distributions has been employed to develop regression models for count data. In this work, we present a survey of such models which have been implemented in R Statistical Software. Code to describe applications in Business, Management and Economics is included and commented to facilitate their use.

TI 15_2	**Samanthi, Ranadeera**	**Central Michigan University, USA**
Title	Comparing the Riskiness of Dependent Insurance Portfolios	

A nonparametric test based on nested L-statistics to compare the riskiness of portfolios was introduced by Brazauskas, Jones, Puri, and Zitikis (2007). In this work, we investigate how the performance of the test changes when insurance portfolios are dependent. To achieve that goal, we perform a simulation study using spectral risk measures. Further, three insurance portfolios are generated, and their interdependence is modeled with the three-dimensional elliptical copulas. It is found that the presence of comonotonicity makes the test liberal for all the risk measures under consideration. We illustrate how to incorporate such findings into sensitivity analysis of decisions.

TI 1_4	**Sarabia, Jose Maria and Prieto, Faustino**	**University of Cantabria, Spain**
Title	A Hierarchy of Multivariate Pareto Distributions with Applications in Risk Analysis	

The Pareto distribution and all its different versions have long been used as a suitable model for many non-negative economic variables, including losses and other variables in risk analysis. In this paper we introduce a hierarchy of multivariate Pareto distributions. The hierarchy is composed by three families, which permits more and more flexibility. We consider the aggregated risks and we study the individual and collective risk models based on the three dependence structures. In two of these families we consider some relevant collective models with Poisson and negative binomial as primary distributions. Finally, some applications with data are given.

TI 7_2	**Sclove, Stanley**	**University of Illinois at Chicago, USA**

Title	Extreme Values or Mixture Distribution?	
For modeling a dataset of employee days ill, or accidents among insureds, levels of granularity are considered in describing the population, from a single distribution, possibly with extreme values, to a bimodal distribution, to a mixture of two or more distributions, to modeling the population at the individual level.		
TI 16_3	**Shahtahmassebi, Golnaz**	**Nottingham Trent University, UK**
Title	Bayesian Estimation of Change Point problems using Conditionally Specified Prior Distributions with Applications	
In data analysis, change point problems correspond to abrupt changes in stochastic mechanisms generating data. The detection of change points is a relevant problem in the analysis and prediction of time series. In this talk, we propose and illustrate a Bayesian solution to the estimation of change point problems. The estimation is based on a broad class of conjugate prior distributions constructed from a conditional specification methodology. Hyperparameter elicitation methodologies are discussed and simulation from the resulting posterior distributions is obtained using Gibbs sampler. We demonstrate some examples with simulated and real data.		
TI 4_2	**Sinha, Sanjoy**	**Carleton University, USA**
Title	Joint modeling of longitudinal and survival data with a covariate subject to limit of detection	
Joint models are often used for investigating the effect of an endogenous time-dependent covariate on survival times. I will discuss a novel method for jointly analyzing longitudinal and time-to-event data when a covariate is subject to the limit of detection. We often assume latent processes based on random effects in order to describe the association between longitudinal and time-to-event data. We study the effects of misspecified random effects distributions on the estimates of the model parameters. We also present an application of the proposed method using a large clinical dataset.		
TI 21_3	**So, Hon Yiu**	**McMaster University, Canada**
Title	Title of Presentation: The EM algorithm for One-shot Device Testing with Competing Risk under Different Lifetimes Distributions	
In this talk, we extend the recent works of Balakrishnan and Ling by introducing a competing risk model into a one-shot device testing analysis under accelerated life test setting. Expectation maximization (EM) algorithms are developed for the estimation of model parameters under di_erent lifetime distributions. Extensive Monte Carlo simulations are carried out to assess the performance of the proposed method of estimation. The advantages of the EM algorithms over the traditional Fisher scoring method are displayed through simulation.		
TI 13_3	**Song, Peter**	**University of Michigan, USA**
Title	Copula Random Field with Application to Longitudinal Neuroimaging Data Analysis	
Motivated by the needs of analyzing massive longitudinal imaging data, we present an extension of GeoCopula proposed by Bai et al. (2014). This new model, termed as imageCopula, helps us to address multilevel spatial-temporal dependencies arising from longitudinal imaging data. We propose an efficient composite likelihood approach by constructing joint composite estimating equations (JCEE) and develop computationally feasible algorithm to solve the JCEE. We show that the computation is scalable to large-scale imaging data. We conduct several simulation studies to evaluate the performance of the proposed models and estimation methods. We apply the imageCopula to analyze a longitudinal PET data set from the Alzheimer's Disease Neuroimaging Initiative (ADNI) study.		
TI 5_1	**Su, Steve**	**Covance Pty Ltd, Australia**
Title	Transformation and Family of Generalised Lambda Distributions	
Generalised lambda distributions (GLDs) are very versatile distributions that can effectively model a wide range of continuous empirical data, despite their simple looking formulae. The versatility of GLDs can be extended further by considering one to one, monotonic transformation of GLD variables to generate new distributions. This presentation discusses the theory, application and fitting algorithm of exponential, arctan, inverse (domain of data being positive or negative, but not both) and squared (positive values only) transformations of GLDs for survival analysis, truncated data and extreme value modelling, and attaining shapes that traditionally can only be achieved using mixtures of statistical distributions.		

TI 11_1	Tegge, Allison N.	Virginia Tech, USA
Title	Bayesian analysis for multi-subject time course RNA-seq experiments	
We introduce Bayesian methodology for the analysis of multi-subject time course RNA-seq experiments. Our methodology facilitates the study of gene reactions to certain biological processes through time. Specifically, we develop an empirical Bayes approach to detect differentially expressed genes that reduces the high dimensionality of time course data by empirical orthogonal functions. The proposed model assumes distinct distributions for differentially and non-differentially expressed genes, and borrows strength across genes and subjects to increase detection power. We illustrate our methodology with an analysis of an RNA-seq dataset from B cells to study their temporal response pattern to the human influenza vaccine.		
TI 20_2	**Teodoro, M. Filomena**	**Portuguese Navy & CEMAT, Instituto Superior Técnico, Lisbon University, Portugal**
Title	Modeling the time between failures using likelihood ratio tests	
The aim of this work is to model the time between failures of certain type of equipment essential for the proper functioning of ships from a certain class from Portuguese Navy, so the maintenance can be adjusted avoiding additional costs. To help us choose among different distributions that may be fitted to these data, we will use likelihood ratio tests for the equality of Gamma distributions. Since the exact distributions of the statistics are not tractable, near-exact distributions will be developed to obtain very sharp p-values and quantiles. This will allow for the easy practical implementation of these tests.		
TI 17_3	**Tsukahara, Hideatsu**	**Seijo University, Japan**
Title	The empirical beta copula	
Applying Baker's construction of copulas based on the order statistics with the ranks being coefficients leads us to define the empirical beta copula, which is a particular case of the empirical Bernstein copula. We show that the empirical beta copula is a genuine copula by providing (necessary and) sufficient conditions for a Bernstein transformation to be a copula. Furthermore, we establish the assumptions under which the standard asymptotic results hold for the empirical Bernstein copula. Our Monte Carlo simulation study shows that the empirical beta copula outperforms the empirical copula in terms of the bias and the integrated mean squared error.		
TI 18_1	**Vinogradov, Vladimir and Paris, Richard B.**	**Ohio University, USA/University of Abertay Dundee, Scotland**
Title	Poisson-Tweedie mixtures: a case study	
Poisson-Tweedie mixtures constitute a subclass of the family of Poisson mixtures corresponding to the case where the mixing measure is generated by a member of the power-variance family of distributions with non-negative support. For a specific value of the “power” parameter, such mixtures comprise both an additive exponential dispersion model and a factorial dispersion model, which are characterized by the variance and the dispersion functions, respectively. We concentrate on the former structure illustrating our results by paying attention to Neyman type A distributions. We construct local approximations for Poisson-Tweedie mixtures.		
TI 12_2	**Wang, Bin**	**University of South Alabama, USA**
Title	Normalizing next-generation sequencing data via Density Estimation and Binning	
Next-generation sequencing (NGS) is widely used in biomedical studies. Normalization is challenging and crucial in NGS gene expression profiling data analysis. We propose to normalize gene profiles by binning the data and estimating the distributions using three methods: 1) root-unroot algorithm, 2) finite normal mixture model using expectation-maximization algorithm, and 3) fitting generalized lambda distribution. In addition, a novel measure of similarity of the gene profiles is proposed to assess the normalization results and detect differentially expressed genes as well. The proposed methods will be applied to multiple NGS data sets and will be benchmarked with some existing NGS normalization methods.		
TI 21_1	**Wang, Dongliang**	**SUNY Upstate Medical University, USA**
Title	Penalized Empirical Likelihood for the Cox Regression Model	
Current penalized regression methods for selecting and estimating regression coefficients in the Cox model are mainly developed on partial likelihood. In this paper, an empirical likelihood method is		

proposed in conjunction with appropriate penalty function. Asymptotic properties of the resulting estimators, including the consistency, asymptotic normality and the oracle property with respect to variable selection, are theoretically proved. Simulation studies suggest that empirical likelihood is superior to partial likelihood in terms of selecting correct risk factors and reducing estimation error. The well-known primary biliary cirrhosis data set is used to illustrate and compare the empirical likelihood method with existing methods.

TI 2_1	**Wu, Changbao**	**University of Waterloo, Canada**
Title	Distribution Theory in Empirical Likelihood for Complex Survey Data	

Empirical likelihood has been shown to be a useful tool for handling parameters defined through estimating equations. The use of empirical likelihood for complex survey data, however, encounters various issues for the ``non-standard'' asymptotic distribution of the empirical likelihood ratio statistics. In this talk, we present some basic distribution theory for two different formulations of the empirical likelihood methods for survey data. We further present results on the posterior distribution of the Bayesian empirical likelihood methods and the related computational issues in Bayesian inference for surveys.

TI 11_2	**Wu, Ho-Hsiang**	**National Cancer Institute, USA**
Title	Mixtures of Nonlocal Priors for Variable Selection in Generalized Linear Models	

We propose two novel scale mixtures of nonlocal priors (SMNP) for variable selection in generalized linear models. In addition, we develop a Laplace integration procedure to compute posterior model probabilities. We show that under certain regularity conditions the proposed methods are variable selection consistent. Simulation studies indicate that our proposed SMNP-based methods select true models with higher success rates than other existing Bayesian methods. Furthermore, our methods lead to mean posterior probabilities for the true models that are closer to their empirical success rates. Finally, we illustrate the application of our SMNP-based methods with the analyses of two real datasets.

TI 9_2	**Wu, Jiang and Zitikis, Ricardas**	**Western University, Canada**
Title	Background risk models, two-period economies, and optimal strategies that minimize financial losses	

Background risk models, including a myriad of Pareto- and beta-type multivariate distributions, provide a particularly intuitive and fruitful way for modeling dependence in real-life applications. In this talk, we shall discuss one of such applications that concerns decision-making in a two-period economy when a pivotal decision needs to be made during the first time-period and cannot be subsequently reversed.

TI 12_4	**Xie, Yuying**	**Michigan State University, USA**
Title	Joint Estimation of Multiple Dependent Gaussian Graphical Models with Applications to Mouse Genomics	

Gaussian graphical models are widely used to represent conditional dependence among random variables. In this paper we propose a novel estimator for data arising from a group of Gaussian graphical models that are themselves dependent. A motivating example is that of modeling gene expression collected on multiple tissues from the same individual: a multivariate outcome that is affected by dependencies at the level of both the tissue and the whole body, and existing methods that assume independence among graphs are not applicable. To estimate multiple dependent graphs, we decompose the problem into two graphical layers: the systemic layer, which is the network affecting all outcomes and thereby inducing cross-graph dependency, and the category-specific layer, which represents the graph-specific variation. We propose a graphical EM technique that estimates the two layers jointly, establish the estimation consistency and selection sparsistency of the proposed estimator, and confirm by simulation that the EM method is superior to a simple one-step method. Lastly, we apply our graphical EM technique to mouse genomics data and obtain biologically plausible results.

TI 4_4	**Xu, Xiaojian**	**Brock University, Canada**
Title	Optimal designs for regression when measurement error is present	

Optimal designs for regression have a great impact on the precision of model parameter estimation. Utilizing a D-optimal design may ensure that the joint confidence regions for true model parameters will be as small as possible for a fixed sample size. Moreover, measurement error is often present in the

majority of models and should be taken into account when designing an experiment. Considering a simple linear model with possible measurement error in both the response and explanatory variables, we have investigated the properties of exact and approximate Doptimal designs for various cases of variance structure associated with measurement error involved.		
TI 20_1	**Yagi, Ayaka and Seo, Takashi**	**Tokyo University of Science, Japan**
Title	The null distribution of the LRT statistic for mean vectors with monotone missing data	
In this talk, we consider the likelihood ratio test (LRT) for a normal mean vector or two normal mean vectors when the data have a monotone pattern of missing observations. For the one-sample and two-sample problems, we derive the modified likelihood ratio test statistics by using the asymptotic expansion approximation. Further, we investigate the accuracy of the upper percentiles of these test statistics by Monte Carlo simulation.		
TI 2_4	**Yi, Grace Y.**	**University of Waterloo, Canada**
Title	Analysis of High-Dimensional Correlated Data in the Presence of Missing Observations and Measurement Error	
In contrast to extensive attention on model selection for univariate data, research on correlated data remains relatively limited. Furthermore, in the presence of missing data and/or measurement error, standard methods would typically break down. To address these issues, we propose marginal methods that simultaneously carry out model selection and estimation for high-dimensional correlated data which are subject to missingness and measurement error. To justify the proposed methods, we provide both theoretical properties and numerical assessments.		
TI 18_2	**Yu, Guan**	**State University of New York at Buffalo, USA**
Title	Sparse Regression for Block-missing Multi-modality Data	
In modern scientific research, many data are collected from multiple modalities (sources or types). Since different modalities could provide complementary information, sparse regression methods using multi-modality data could deliver better prediction performance. However, one special challenge for using multi-modality data is related to missing data. In practice, the observations of a certain modality can be missing completely, i.e., a complete block of the data is missing. In this paper, we propose a new two-step sparse regression method for block-missing multi-modality data. In the first step, we estimate the covariance matrix. Rather than deleting samples with missing data or imputing the missing observations, the proposed method makes use of all available information. In the second step, based on the estimated covariance matrix, a Lasso-type estimator is used to deliver a sparse estimate of the regression coefficients in the linear regression model. The effectiveness of the proposed method is demonstrated by theoretical studies, simulated examples, and a real data example from the Alzheimer's Disease Neuroimaging Initiative. The comparison between the proposed method and some existing methods also indicates that our method has promising performance.		

Abstracts for General-Invited Speakers (Alphabetic Order)

Session Name: GI m_k (m_k = k^{th} speaker in m^{th} session)

It is assumed the first author is the presenter, unless an asterisk (*) is used to indicate the presenter. The affiliation listed is the presenter's affiliation only.

GI 4_4	**Abdelrazeq, Ibrahim**	**Rhodes College, USA**
Title	Goodness-of-Fit Test: Levy Driven Continuous ARMA Model	
The Levy driven CARMA(p,q) process is becoming a popular one with which to model stochastic volatility. However, there has been little development of statistical tools to verify this model assumption and assess the goodness-of-_t of real world data (Realized		

Volatility). When a Levy driven CARMA(p,q) process is observed at high frequencies, the unobserved driving process can be approximated from the observed process. Since, under general conditions, the Levy driven CARMA(p,q) process can be written as a sum of p-dependent Levy driven Ornstein-Uhlenbeck processes, the methods developed in Abdelrazaeq et al. (2014) can be employed in order to use the approximated increments of the driving process to test the assumption that the process is Levy-driven. Performance of the test is illustrated through simulation assuming that the model parameters are known.

GI 10_1	**Aljarrah, Mohammad**	**Tafila Technical University, Jordan**
Title	Exponential-Normal distribution	

In this paper, a new three parameter distribution called the exponential-normal distribution is defined and studied. Various properties of the distribution such as hazard function, quantile function, moments, Shannon entropy are discussed. The method of maximum likelihood is proposed to estimate the parameters of the distribution. A real data set is applied to illustrate the flexibility of the distribution.

GI 10_2	**Alshkaki, Rafid S.**	**Ahmed Bin Mohammed Military College, Doha, Qatar**
Title	An Extension to the Zero-Inflated Generalized Power Series Distributions	

In many sampling involving non negative integer data, the zeros are observed to be significantly higher than the expected assumed model. Such models are called zero-inflated models, and are recently cited in literature in various fields of science including; engineering, natural, social and political sciences. The class of zero-inflated Generalized Power Series distributions was recently considered and studied due to its empirical needs and application. In this paper an extension to class of zero-inflated power series distributions was introduced, and its characteristics were studied and analyzed.

GI 10_3	**Alzaghal, Ahmad**	**State University of New York at Oswego, USA**
Title	The Exponentiated Gamma-Pareto Distribution, Properties and Application	

A new distribution, the exponentiated gamma-Pareto distribution is introduced and studied. Some of its properties, including distribution shapes, limit behavior, hazard function, Rényi and Shannon entropies, moments, and deviations from the mean and median are discussed. The method of maximum likelihood is used to estimate the exponentiated gamma-Pareto distribution parameters and a simulation study is carried out to assess its performance. The flexibility of the exponentiated gamma-Pareto distribution is illustrated by applying it to real data sets and the results compared with other distributions.

GI 7_5	**Arowolo, Olatunji and Ayinde, Kayode**	**Lagos State Polytechnic, Nigeria/Ladoke Akintola University of Technology, Nigeria**
Title	Parameter estimation techniques of simultaneous equation model with multicollinearity problem	

Multicollinearity problem is still inevitable in Simultaneous Equation Model (SEM). The work adopted the single equation estimators for handling multicollinearity, Ordinary Ridge Regression Estimator (ORRE) and Generalized Ridge Regression Estimator (GRRE) into SEM and proposed some estimators using the approach of the conventional ones. Monte Carlo experiments were conducted with two (2) types of exogenous variable at seven (7) levels of multicollinearity, correlation between error terms and sample sizes. The estimators were compared and ranked on the basis of their performances vis-à-vis their finite sampling properties. The proposed estimators, ORR-GRRE, 2SGRRE and OLS-GRRE, are recommended for parameters' estimation of SEM.

GI 1_5	**Bakar, Shaiful Anuar Abu**	**University of Malaya, Malaysia**
Title	Actuarial loss modeling with the composite models and its computer implementation	

Composite model is a statistical distribution model made by piecing together two distributions at a certain threshold. It increasingly deems attention in actuarial loss modelling. In this study, we propose several variations of the composite model in which Weibull distribution is assumed up to the threshold and a family of Beta distribution beyond it. We also specify two of the composite model parameters in term of other parameters of the model which in turn reduce the number of parameters and form a general construction rule for any two arbitrary distributions. The significance of such approach is further demonstrated with respect to computer implementation in R programming language. Finally the

performance of the models is assessed via application to real loss data sets using information criteria based approach.		
GI 1_4	**Bayramoglu, Konul Kavlak**	**Hacettepe University, Ankara, Turkey**
Title	The mean wasted life time of a component of system	
A reliability inspection model in which a component of a technical system has lifetime X and inspection time S is considered. It is assumed that X and S are random variables with absolutely continuous joint distribution function F_(X,S) and the joint probability density function f_(X,S). Firstly, we consider mean residual life function of the component under two different setups of inspection. Secondly, we consider an inspection model where at the inspection time the component is replaced with its spare regardless of whether the component is alive or failed at this time. Under condition that $0 < t < S < X$ we are interested in expected value of X - S, which is the mean wasted time of intact at time t component in the case if it will not be failed at inspection time, but will be replaced with the new one. Formula for mean wasted life time expressed in terms of f_(X,S) and partial derivatives of F_(X,S) is derived. Some examples with graphical representations are also provided.		
GI 4_2	**Bingham, Melissa**	**University of Wisconsin-La Crosse, USA**
Title	Quantifying Spread in 3-D Rotation Data: Comparison of Nonparametric and Parametric Techniques	
A measure of spread for 3-D rotation data, called the average misorientation angle, is introduced and bootstrapping will be used to develop confidence intervals for this measure. Existing parametric inference methods for estimating spread in 3-D rotations for the von Mises Uniform Axis-Random Spin and matrix Fisher distributions are then compared to the bootstrapping procedure through a simulation study. Based on the results on the simulation study, it is determined when the nonparametric or parametric techniques are preferred for different scenarios.		
GI 3_1	**Boulieri, Areti**	**Imperial College London, UK**
Title	A Bayesian detection model for chronic disease surveillance: application to COPD hospitalisation data	
Disease surveillance is an important public health practice, as it provides information which can be used to make successful interventions. Innovative surveillance systems are being developed to improve investigation of outbreaks, with the Bayesian models attracting a lot of interest. In this work, we propose an extension of a Bayesian hierarchical model introduced by Li et al. (2012), which is able to detect areas with an unusual temporal trend, and a simulation study is carried out to assess the performance of the model. The method is illustrated by application to chronic obstructive pulmonary disease (COPD) hospitalisation data in England at clinical commissioning group (CCG) level, from April 2010 to March 2011.		
GI 9_5	**Chacko, Manoj**	**University of Kerala, Trivandrum, India**
Title	Bayesian density estimation using ranked set sample when ranking is not perfect	
In this paper, we consider a ranked set sampling in which an auxiliary variable X is used to rank the sample units. A Bayesian method for estimating the underlying density function of the study variate Y using ranked set sample is proposed when measurement of Xs are also available along with Ys. A Markov chain Monte Carlo procedure is developed to obtain the Bayesian estimator of the density function of Y by assuming a parametric distribution for (X,Y), with the distribution of the parameters having a Dirichlet process prior. A simulation study is used to evaluate the performance of the proposed method.		
GI 3_4	**Daniels, John**	**Central Michigan University, USA**
Title	Variogram Fitting Based on the Wilcoxon Norm	
Within geostatistics research, estimation of the variogram points has been examined, particularly in developing robust alternatives. The fit of these variogram points, which eventually defines the kriging weights, has not received the same attention from a robust perspective. This paper proposes the use of the non-linear Wilcoxon norm over weighted non-linear least squares as a robust fitting alternative. First, we introduce the concept of variogram estimation and fitting. Then, as an alternative to non-linear weighted least squares, we discuss the non-linear Wilcoxon estimator. Next, the robustness properties of the non-linear Wilcoxon are demonstrated using a contaminated spatial data set. Finally, under		

simulated conditions, increasing levels of contaminated spatial processes have their variograms points estimated and fit. In the fitting of these variogram points, both non-linear Weighted Least Squares and non-linear Wilcoxon fits are examined for efficiency. At all levels of contamination, the non-weighted Wilcoxon outperforms weighted Least Squares.

GI 8_4	**Doray, Louis G.**	**Université de Montréal, Canada**
Title	The Double Pareto Lognormal Distribution with Covariates and its Applications in Finance and Actuarial Science	

We describe the double Pareto-lognormal distribution, present some new properties and show how the model can be extended by introducing explanatory variables. First, the double Pareto-lognormal distribution is built from the normal-Laplace distribution and some of its properties presented. The parameters can be estimated by using the method of moments or maximum likelihood. Next, explanatory variables are added to the model by using the mean of the normal distribution. The procedure of estimation for this model is also discussed. Finally, examples of application of the model in finance and fire insurance are illustrated and some useful statistical tests are conducted.

GI 7_4	**El Ktaibi, Farid**	**Zayed University, Abu Dhabi, U.A.E.**
Title	Change point detection for stationary linear models and MBB applications	

The problem of structural stability in a time series environment is a classical problem in statistics. In this presentation, we analyze the detection problem of a change in the marginal distribution of a stationary linear process using MBB techniques. Our model will incorporate simultaneously any change in the coefficients and/or the innovations of the linear process. Moreover, the change-point can be random and data dependent. Our results hold under very mild conditions on the existence of any moment of the innovations and a corresponding condition of summability of the coefficients. Lastly, the performance of our approach is demonstrated through simulations.

GI 2_4	**Faisal, Shahla**	**Ludwig Maximilians Univeristy, Munich, Germany**
Title	Improved Nearest Neighbors Imputation for High-Dimensional Longitudinal Data	

Longitudinal data often comes with missing values. These values cannot be ignored as it can result in loss of important information regarding samples. Therefore, imputation is a good strategy to overcome this problem. In this paper, we present a single imputation method based on weighted nearest neighbors that uses the information from other variables to estimate the missing values. These neighbors use the information from within the sample whose response is measured at different time points and between samples. The simulation results show that the suggested imputation method provides better results with smaller imputation errors.

GI 5_2	**Ferrari, Silvia L.P. and Fumes, Giovana**	**University of Sao Paulo, Brazil**
Title	Box-Cox symmetric distributions and applications to nutritional data	

We introduce and study the Box-Cox symmetric class of distributions, which is useful for modeling positively skewed, possibly heavy-tailed, data. The new class of distributions includes the Box-Cox t, Box-Cox Cole-Green, Box-Cox power exponential distributions, and the class of the log-symmetric distributions as special cases. It provides easy parameter interpretation, which makes it convenient for regression modeling purposes. Additionally, it provides enough flexibility to handle outliers. The usefulness of the Box-Cox symmetric models is illustrated in a series of applications to nutritional data.

GI 8_1	**Gleaton, James**	**University of North Florida, USA**
Title	Characteristics of Generalized Log-Logistic Families of Lifetime Distributions and Asymptotic Properties of Parameter Estimators	

A brief overview of the generalized log-logistic (GLL) transformation (also called the odd log-logistic transformation) group and the characteristics of lifetime distributions generated using this type of transformation is presented. It is shown that, for a baseline distribution in an exponential class, the MLE's for parameters of an exponentiated exponential-class (EE) distribution are jointly asymptotically normal and efficient. A representation of the GLL-exponential-class density as a series in which each term is proportional to an EE density is

developed. Work on the asymptotic properties of the MLE's for the GLL-exponential-class distribution is in progress.

GI 10_5	Godbole, Anant	East Tennessee State University, USA
Title	Statistical Distributions in Combinatorics: Moving from Intractability to Tractability	

In this talk, we will present several examples of problems from combinatorics for which the entire distribution of a key variable X is of interest in its own right to distribution theorists, beyond the point probability P(X=0), which is often the primary concern of combinatorialists. The distributions are either impossible to write in closed form, or available in an intractable closed form. The Stein-Chen method of Poisson approximation can be used however, to yield Poisson estimates together with error bounds.

GI 5_1	Hodge, Miriam	Lincoln University, New Zealand
Title	Comparison of liquefaction data: An application of a logistic normal distribution in the simplex sample space	

Liquefaction occurs when an earthquake liquefies water saturated soil and ejects it to the surface of the soil. This physical process is not well understood. We address this uncertainty with a novel model selection strategy to evaluate models which include: ejecta originate from a combination of multiple layers of sediment; the source sediment layer changed during ejection process; the source sediment layer could be deeper than the candidate samples. The data are logistic normal and comprised of percentages of 120-plus grain size ranges. Compositional analysis in the simplex space identified ejecta origins and the result is confirmed by qualitative analysis.

GI 4_3	Hoshino, Nobuaki	School of Economics, Kanazawa University, Japan
Title	On the marginals of a random partitioning distribution	

Kolchin's model is a class of random partitioning distributions of a positive integer, which includes the celebrated Ewens distribution. This type of distributions defines the joint probability of the frequencies of frequencies, but the marginal distribution of the frequency of a given frequency is not straightforward to derive because of its combinatorial nature. This talk motivates the derivation of such a marginal distribution, and shows two methods: the first one inverts factorial moments, and the second one exploits a fact that Kolchin's model is the product of some conditional distributions.

GI 5_3	Hristopulos, Dionissios T.	Technical University of Crete, Chania, Crete, Greece
Title	A probability distribution function for finite-size systems with renormalized weakest-link behavior	

We investigate weakest-link scaling in systems with complex interactions expressed as ensembles of representative volume elements (RVEs). The system survival probability function is expressed in terms of inter-dependent RVEs using a product rule. For a finite number of RVEs, we propose the κ-Weibull distribution. We discuss properties of the κ-Weibull and present results from the analysis of experimental data and simulations pertaining to the return interval distributions of seismic data and of avalanches in fiber bundle models. Areas of potential applications involve the fracture strength of quasibrittle materials, precipitation, wind speed, and earthquake return times.

GI 3_2	Huang, Hsin-Hsiung	University of Central Florida, USA
Title	New Mixed Gaussian Affine-Invariant Bayesian Clustering Method	

We develop a clustering algorithm which does not requires knowing the number of clusters in advance as well as it is rotation-, scale- and translation-invariant coordinatewise. A highly efficient split-merge Gibbs sampling algorithm is proposed. Using the Ewens sampling distribution as prior of the partition and the profile residual likelihoods of the responses under three different covariance matrix structures, we a posterior distribution on partitions. Our experimental results indicate that the proposed method outperforms other competing methods. In addition, the proposed algorithm is irreducible and aperiodic, so that the estimate is guaranteed to converge to the posterior distribution.

GI 6_4	Jiang, Jiancheng	UNC Charlotte, USA
Title	A new diversity estimator	

The maximum likelihood estimator (MLE) of Gini-Simpson's diversity (GS) index is widely used but suffers from large bias when the number of species is large relative to the sample size. We propose a new

estimator of the GS index and show its unbiasedness. Asymptotic normality of the proposed estimator is established when the number of species in the population is finite and known, finite but unknown, and infinite. Our theory demonstrates that the proposed estimators share the same efficiency as the MLE for finite and known number of species and is more efficient than the MLE for other situations. Simulations demonstrate advantages of our estimators over the MLE, and an example for the extinction of dinosaurs endorses the use of our approach.

GI 5_5	**Jureckova, Jana**	**Charles University in Prague, Czech Republic**
Title	Specifying the tails of a distribution	

The first question induced by observed data is whether they are governed by a heavy or light tailed probability distribution. Such decision is not always straightforward. When a specific test rejects the Gumbel hypothesis of exponentiality of the tails, we do not have an information how heavy is really the distribution. Instead of that, we can rather verify the hypothesis whether the tails of a distribution are heavier than a specific level, measured by the Pareto index. We will discuss some nonparametric tests of this hypothesis and compare them with the parametric likelihood ratio test on the parameters of generalized Pareto distribution. The nonparametric tests use the specific behavior of some sample statistics coming from a heavy-tailed distribution; this is of independent interest and can be extended e.g. to AR time series. While the parametric test behaves better when the data really come from a generalized Pareto distribution, the nonparametric tests are typically better for other cases.

GI 8_2	**Karlis, Dimitris**	**Athens University of Economics and Business, Greece**
Title	On mixtures of multiple discrete distributions with application	

In this paper we present a model to fit appropriately data with a lot of periodic spikes in certain values. The motivation comes from a dataset on the number of absence from work. The data show clearly spikes in certain days, implying the different scale of doctor decisions. A new modeling approach, based on finite mixtures of multiple discrete distributions of different multiplicities, is proposed to fit this kind of data. Multiple Poisson and negative binomial distributions are defined and used for modeling. A numerical application with a real dataset concerning the length, measured in days, of inability to work after an accident occurs is treated. The main finding is that the model provides a very good fit when working week, calendar week and month multiplicities are taken into account. Properties of the derived model are examined together with estimation and inference.

GI 6_1	**Lewin, Alex**	**Brunel University London, UK**
Title	Fuzzy multiple testing procedures for discrete test statistics	

Commonly used multiple testing procedures controlling the Family Wise Error Rate or the False Discovery Rate can be conservative when used with discrete test statistics. We propose fuzzy multiple comparison procedures which give a fuzzy decision function, using the critical function of randomised p-values. We also define adjusted p-values for the new multiple comparison procedures. The method is demonstrated on four data sets involving discrete statistics. A software package for the R language is available.

GI 7_1	**Liu, Sifan and Xie, Min-ge**	**Rutgers University, USA**
Title	Exact Inference on Meta-Analysis with Generalized Fixed-Effects and Random-Effects Models	

For meta-analysis with fixed-effects and random-effects models, conventional methods rely on Gaussian assumptions and/or large-sample approximations. However, when the number of studies is not large, or the sample sizes of individual studies are small, such assumptions and approximations may be inaccurate and lead to invalid conclusions. In this talk, we will present "exact'' confidence intervals for the overall effect using all available data. Our proposals cover generalized models without Gaussian assumptions, and there is no need of approximation. Confidence distribution interpretations and numerical studies, including quantifying the efficacy of BCG vaccine against tuberculosis, will be given for illustrations.

GI 1_3	**Mandrekar, Jay**	**Health Sciences Research, Mayo Clinic, USA**
Title	Statistical approach for the development, prediction, and validation of a simple risk score: application to a neurocritical care study.	

Patients admitted to neurocritical care units often have devastating neurologic conditions and are likely candidates for organ donation after cardiac death. Improving our ability to predict the time of death

after withdrawal of life-sustaining measures could have significant impact on rates of organ donation after cardiac death and allocation of appropriate medical resources. In the first part of the presentation, we will discuss using logistic regression and ROC analysis how we arrived at a prediction model based on a retrospective database. Next, we will discuss the validation of model and development of score using data from a multicenter prospective study.

GI 9_4	Maruyama, Yuzo	The University of Tokyo, Japan
Title	Harmonic Bayesian prediction under alpha-divergence	

We investigate Bayesian shrinkage methods for constructing predictive distributions. We consider the multivariate Normal model with a known covariance matrix and show that the Bayesian predictive density with respect to Stein's harmonic prior dominates the best invariant Bayesian predictive density, when the dimension is not less than three. Alpha-divergence from the true distribution to a predictive distribution is adopted as a loss function.

GI 1_1	Matheson, Matthew	Johns Hopkins Bloomberg School of Public Health, USA
Title	The Shape of the Hazard Function: The Generalized Gamma and Its Competitors	

A large number of distributions have been proposed for parametric survival analysis. The generalized gamma, with its flexible taxonomy of four distinct hazard shapes and ease of implementation, has proven to be one of the most popular. In search of distributions with potentially richer hazard behavior, we have investigated the exponentiated Weibull, generalized Weibull, and beta-generalized gamma using both real and simulated data. Somewhat surprisingly, these distributions appear unable to significantly improve on the flexibility of the generalized gamma for applications, with the generalized gamma being able to closely match almost any parameter combination of the other three distributions.

GI 4_1	Mi, Jie	Florida International University, USA
Title	Instant System Availability	

In this talk, we study the instant availability A(t) of a repairable system using integral equation. We have proved initial monotonicity of the availability, and derived various lower bounds of A(t) and average availability. The availabilities of two systems are also compared with the help of stochastic ordering.

GI 8_3	Minkova, Leda	Sofia University, Bulgaria
Title	Distributions of order K in risk models	

The most used generalization of the counting process in the Risk model is a compound Poisson process. In this talk a counting process with distributions of order K is given. At first we introduce the compound birth process of order K. As a particular case we consider the compound Poisson process. As examples, the Poisson process of order K, and two types of Polya-Aeppli processes of order K are given. Some functions related to corresponding risk models are analyzed. The derivation of the joint distribution of the time to ruin and the deficit at ruin as well as the ruin probability are given. We discuss in detail the particular case of exponentially distributed claims.

GI 10_4	Nolan, John	American University, USA
Title	Classes of generalized spherical distributions	

A flexible class of multivariate generalized spherical distributions with star-shaped level sets is developed. Tools from computational geometry and multivariate integration are used to work with dimension above two. The R package gensphere allows one to compute multivariate densities and simulate from such distributions.

GI 4_5	Ozturk, Omer	The Ohio State University, USA
Title	Ratio estimators based on ranked set sampling in survey sampling	

In this talk, we consider the ratio estimator in a finite population setting in a ranked set sampling (RSS) design when the sample is constructed without replacement. We show that the proposed ratio estimator is slightly biased, but the amount of bias is smaller than the bias of the simple random sample (SRS) ratio estimator. We provide an explicit expression for the approximated mean square error of the ratio estimator and for its precision relative to other competing estimators. We show that the new estimator has substantial amount of improvement in efficiency with respect to SRS estimator. We apply the

proposed estimator to estimate apple production in Marmara Region of Turkey in a finite population setting.		
GI 3_5	**Paul, Rajib**	**Western Michigan University, USA**
Title	Real Time Estimation of ILI (Influenza Like Illnesses) Rates Using Dynamic Downscaling	
Despite novel advances in surveillance of flu trends, the real-time daily estimates of ILI cases are often unavailable. The community health departments collect daily information on reported respiratory and constitutional symptoms (for example, fever, headache, cough etc.). Google flu trends provide weekly estimates per one hundred thousand people. We develop a Bayesian hierarchical model for dynamic downscaling of ILI rates on daily scale fusing these two datasets. We also incorporate environmental factors, such as, temperature and humidity. A sequential Monte Carlo algorithm is developed for faster computation. Our model is tested and validated using Michigan data over the years 2009-2013.		
GI 9_2	**Peer, Bilal Ahmad**	**Islamic University of Science & Technology, Awantipora, Pulwama (J&K), India**
Title	Bayesian analysis of misclassified generalized Power Series distributions under different loss functions	
In certain experimental investigations involving discrete distributions external factors may induce a measurement error in the form of misclassification. For instance, a situation may arise where certain values are erroneously reported; such a situation termed as modified or misclassified has been studied by many researchers. Cohen (1960) studied misclassification for Poisson and binomial random variables. In this paper, we discuss misclassification for the more general class of discrete distributions, the generalized power series distributions (GPSD), where some of the observations corresponding to $x=c+1$; $c\geq 0$ are erroneously observed or at least reported as being $x=c$ with probability α. This class includes among others the binomial, negative binomial, logarithmic series and Poisson distributions. We derive the Bayes estimators of parameters of the misclassified generalized power series distributions under different loss functions. The results obtained for misclassified GPSD are then applied to its particular cases like negative binomial, logarithmic series and Poisson distributions. An example is provided to illustrate the results and a goodness of fit test is done using the moment, maximum likelihood and Bayes estimators.		
GI 5_4	**Pérez-Casany, Marta**	**Technical University of Catalonia, Spain**
Title	Random-Stopped Extreme distributions	
The distribution of the maximum (minimum) of a random number of independent and identically distributed random variables is characterized by means of their probability generating function, and a duality property between the two sets of distributions is derived. These distributions appear in a natural way as data collection mechanisms, similar to the Stopped-sum distributions. When the sample size is geometrically distributed, one obtains the Marshall-Olkin transformation of the sampled distribution as a particular case. Special attention will be paid to the case where sample size is Poisson distributed, since it is the one with the most practical appeal.		
GI 6_3	**Potgieter, Cornelis**	**Southern Methodist University, USA**
Title	Goodness-of-fit testing for generalized skew-symmetric distributions	
Generalized skew-symmetric (GSS) distributions are very flexible and can model a wide variety of shapes. GSS distributions have a pdf that is the product of a symmetric pdf and a skewing function. Modeling is usually done assuming a specific symmetric component. It is therefore of interest to consider goodness-of-fit testing for whether this symmetric component has been correctly specified. A test based on the empirical characteristic function has already been proposed in the literature. A new test based on the quantile function of the squared distribution is also proposed here. These two tests are compared.		
GI 9_1	**Ross, Sheldon**	**University of Southern California, USA**
Title	Friendship Paradox and Friendship Network Model	
The friendship paradox says that "your friends tend to have more friends than you". We explore this paradox and then suggest a model for a friendship network.		
GI 2_2	**Ruth, David M.**	**United States Naval Academy, USA**

Title	An approach to the multivariate two-sample problem using classification and regression trees with minimum-weight spanning subgraphs	
The multivariate two-sample problem is one of continued interest in statistics. Approaches to this problem usually require a dissimilarity measure on the observation sample space; such measures are typically restricted to numeric variables. In order to accommodate both categorical and numeric variables, we use a new dissimilarity measure based on classification and regression trees. We briefly discuss this new measure and then employ it with a recently-developed graph-based multivariate test. New improvements to this test are discussed, test performance is examined via simulation study, and test efficacy is investigated using real-world data.		
GI 7_2	**Schick, Anton**	**Binghamton University, USA**
Title	Estimation of the error distribution function in a varying coefficient regression model	
This talk discusses estimation of the error distribution function in a varying coefficient regression model. Three estimators are introduced and their asymptotic properties described by uniform stochastic expansions. The first estimator is a residual-based empirical distribution function utilizing an under-smoothed local quadratic smoother of the coefficient function. The second estimator exploits the fact that the error distribution has mean zero. It improves on the first estimator, but is not yet efficient. An efficient estimator is obtained by adding a stochastic correction term to the second estimator.		
GI 1_2	**Song, Xinyuan**	**The Chinese University of Hong Kong, Hong Kong**
Title	Analysis of proportional mean residual life model with latent variables	
In this study, we propose a proportional mean residual life (MRL) model with latent variables to examine the effects of potential risk factors on the MRL function of ESRD in a cohort of Chinese type 2 diabetic patients. The proposed model generalizes conventional proportional MRL models to accommodate latent risk factors. We employ a factor analysis model to characterize latent risk factors via multiple observed variables. We develop a borrow-strength estimation procedure incorporating EM algorithm and the corrected estimating equation approach. The empirical performance of the proposed methodology is evaluated via numerical studies.		
GI 6_5	**Stehlik, Milan**	**Johannes Kepler University, Linz, Austria**
Title	Exact distributions of LR tests and their applications	
During the talk we introduce exact statistical procedures based on likelihood ratio. Also practical examples will be given. We introduce exact likelihood ratio tests in exponential family and for a generalized gamma distribution and its properties. We will derive general forms of distributions for exact likelihood ratio test of the homogeneity and scale. Applications and illustrative examples (missing and censored data, mixtures) will be given. Geometry of life time data will be discussed and related to I-divergence decomposition. Small samples testing for frailty through homogeneity test will be discussed. We will provide the methodology for exact and robust test for normality.		
GI 3_3	**Sun, Ying**	**King Abdullah University of Science and Technology, Saudi Arabia**
Title	A Stochastic Space-time Model for Intermittent Precipitation Occurrences	
Modeling a precipitation field is challenging due to its intermittent and highly scale-dependent nature. Motivated by the features of high-frequency precipitation data from a network of rain gauges, we propose a threshold space-time t random field (tRF) model for 15-minute precipitation occurrences. This model is constructed through a space-time Gaussian random field (GRF) with random scaling varying along time or space and time. It can be viewed as a generalization of the purely spatial tRF, and has a hierarchical representation that allows for Bayesian interpretation. Developing appropriate tools for evaluating precipitation models is a crucial part of the model-building process, and we focus on evaluating whether models can produce the observed conditional dry and rain probabilities given that some set of neighboring sites all have rain or all have no rain. These conditional probabilities show that the proposed space-time model has noticeable improvements in some characteristics of joint rainfall occurrences for the data we have considered.		
GI 2_5	**Sylvan, Dana**	**Hunter College, CUNY, USA**
Title	Exploration and visualization of space-time data with complex structures	

We introduce a versatile exploratory tool that may be used to describe and visualize various distributional characteristics of data with complex spatial and spatial-temporal dependencies. We present a flexible mathematical framework for modeling spatial random fields and give possible extensions to space-time data. For illustration we show applications to air pollution and baseball data.		
GI 6_2	**Thomas, Hoben and Hettmansperger, T.P**	**Pennsylvania State University, University Park, PA, USA**
Title	Test Scores, HRX, and Distribution Function Tail Ratios	
Let A and D denote advantaged and disadvantaged populations with cdfs $F(x)$ and $G(x)$ respectively, and $F(x) \leq G(x)$. Assume a selection setting; those selected have $x>c$, with p_A and p_D the selected proportions; $p_D/p_A<<1$. Often the desire is $p_D/p_A\approx 1.$ Consequently c is lowered. Surprisingly, the fail ratio $G(c)/F(c)$ and success ratio $[1-G(c)]/[1-F(c)]$ can both be increasing with decreasing c which Scanlan (2006) calls HRX. He argues HRX is widely misunderstood, with deleterious public policy results. Conditions for HRX are presented along with data examples.		
GI 9_3	**Wang, Min and Li, Shengnan**	**Michigan Technological University, USA**
Title	Bayesian estimation of the generalized lognormal distribution using objective priors	
The generalized lognormal distribution plays an important role in analyzing data from different life testing experiments. In this paper, we consider Bayesian analysis of this distribution using various objective priors for the model parameters. Specifically, we derive expressions for the three types of the Jeffreys priors, the reference priors with different group ordering of the parameters, and the first-order matching priors. We further investigate the properties of the corresponding posterior distributions of the unknown parameter under the various improper priors. It is shown that only two of them result in proper posterior distributions. Numerical simulation studies are conducted to compare the performances of the Bayesian approaches under the considered priors as well as the maximum likelihood estimates. A real-data study is also provided for illustrative purposes.		
GI 7_3	**Wang, Qiying**	**The University of Sydney, Australia**
Title	Limit theorems for nonlinear cointegrating regression	
The past decade has witnessed great progress in the development of nonlinear cointegrating regression. Unlike linear cointegration and nonlinear regression with stationarity where the traditional and classical methods are widely used in practice, estimation and inference theory in nonlinear cointegrating regression produce new mechanisms involving local time, a mixture of normal distributions and stochastic integrals. This talk aims to introduce the machinery of the theoretical developments, providing up-to-date limit theorems for nonlinear cointegrating regression.		
GI 2_1	**Yu, Chong Ho**	**Azusa Pacific University, USA**
Title	Pattern recognition: The role of data visualization and data mining in statistics	
Many people say, “Let the data speak for themselves,” yet in higher education the standard curriculum design are still overwhelmingly devoted to hypothesis testing. Although rejecting the null hypothesis based on the p value alone is questionable while there is no detectable pattern in the data, very often data visualization (DV) and data mining (DM) are going unheard among researchers. To rectify this situation, the presenter will show how various DV/DM tools, such as the ternary plot, the diamond plot, the bubble plot, and the GIS map, can be utilized to gain a holistic view of the data patterns.		
GI 8_5	**Yu, Jihnhee; Yang, Luge; Vexler, Albert and Hutson, Alan D.**	**University at Buffalo, SUNY, USA**
Title	Variance Estimation of the Nonparametric Estimator of the Partial Area under the ROC Curve	
The pAUC is commonly estimated based on a U-statistic with the plug-in sample quantile, making the estimator a non-traditional U-statistic. In this talk, an accurate and easy method to obtain the variance of the nonparametric pAUC estimator is proposed. The proposed method is easy to implement for both one biomarker test and the comparison of two correlated biomarkers since it simply adapts the existing variance estimator of U-statistics. Further, an empirical likelihood inference method is developed based on the proposed variance estimator through a simple implementation.		

GI 2_3	Zahid, Faisal Maqbool and Heumann, Christian	Ludwig Maximilians University, Munich, Germany
Title	Multiple Imputation using Regularization	
Multiple imputation (MI) is an increasingly popular approach for filling missing data with plausible values. In case of large number of covariates with missing data, existing MI softwares are likely to perform poorly or fail. We are proposing an MI algorithm based on regularized sequential regression models. Each variable (e.g., normal, binary, Poisson etc.) is imputed using its own imputation model. The proposed approach performs well even with large number of covariates and small samples. The results are compared with the existing softwares like mice, VIM, and Amelia in simulation studies. The results are compared using Mean Squared Imputation Error (MSIE) and Mean Absolute Imputation Error (MAIE).		

Abstracts for Student Posters (Alphabetically Ordered)

All Student Poster Presentations are in **Canadian/A Room**

The student posters must be posted by 3:00 pm on October 15

The student authors must be at their posters from 5:45 pm – 6:30 pm, October 15

It is assumed the first author is the presenter, unless an asterisk (*) is used to indicate the presenter. The affiliation listed is the presenter's affiliation only.

Authors	Aldeni, Mahmoud	Central Michigan University, USA
Title	Families of distributions arising from the quantile of generalized lambda distribution	
Statistical distributions play an important role in theory and applications, which are used to fit, model and describe real world phenomena. For this reason, developing new and more flexible univariate statistical distributions has received an increasing amount of attention over the last two decades. In this work, the class of T-R{generalized lambda} families of distributions based on the quantile of generalized lambda distribution has been proposed using the T-R{Y} framework. Different choices of the random variables T and R naturally lead to different families of the T-R{generalized lambda} distributions. Some general properties of these families of distributions are studied. Four members of the T-R{generalized lambda} families of distributions are derived, namely, the uniform-exponential{generalized lambda}, the normal-uniform{generalized lambda}, the Pareto-Weibull{generalized lambda}and the log-logistic-logistic{generalized lambda}. The shapes of these distributions can be symmetric, skewed to the left, skewed to the right, or bimodal. Two real life data sets are applied to illustrate the flexibility of the distributions and the results are compared with the results from some existing distributions.		
Authors	**Arapis, Anastasios N.**	**University of Patras, Greece**
Title	Joint distribution of k-tuple statistics in zero-one sequences	
Let a sequence of random variables with values (zero-one) ordered on a line. We consider runs of one of length larger than or equal to a fixed number. The statistics denoting the number of such runs, the number of ones in the runs and the distance between the first and the last run in the sequence, are defined. The paper provides, in a closed form, the exact joint distribution of these three statistics given that the number of such runs in the sequence is at least equal to two. The study is first developed on sequences of independent and identically distributed random variables and then is extended to exchangeable (symmetrically dependent) sequences. Numerical examples illustrate further the theoretical results.		
Authors	**Chaba, Linda and Omolo, Bernard***	**University of South Carolina-Upstate, USA**
Title	Using copulas to select prognostic genes in melanoma patients	
We developed a copula model for gene selection that does not depend on the distributions of the covariates, except that their marginal distributions are continuous. A comparison of the ability to control for the FDR of the copula-based model with the SAM and Bayesian models is performed via simulations.		

Simulations indicated that the copula-based model provided a better control of the FDR and yielded a more prognostic signature than the SAM and Bayesian model-based signatures. These results were validated in three publicly-available melanoma datasets. Relaxing parametric assumptions on microarray data may yield gene signatures for melanoma with better prognostic properties.

Authors	**Cordero, Osnamir Elias Bru, Jaramillo, Mario César and Canal, Sergio Yáñez**	**National University of Colombia in Medellin, Colombia**
Title	Random Number Generation for a Survival Bivariate Weibull Distribution	

A bivariate survival function of Weibull distribution is presented as Model VI(a)-5 by Murthy, Xie and Jiang. It is shown that the model corresponds to a Gumbel-Hougaard survival copula evaluated at two Weibull survival marginal. Their properties are studied to compare three method of random generation from that distribution. The CD-Vines methodology is used as the base reference for the purpose of methodology evaluation.

Authors	**Chan, Stephen**	**University of Manchester, UK**
Title	Extreme value analysis of electricity demand in the UK	

For the first time, an extreme value analysis of electricity demand in the UK is provided. The analysis is based on the generalized Pareto distribution. Its parameters are allowed to vary linearly and sinusoidally with respect to time to capture patterns in the electricity demand data. The models are shown to give reasonable fits. Some useful predictions are given for the value at risk of the returns of electricity demand.

Authors	**De Silva, Kushani**	**Clarkson University, USA**
Title	Bayesian Approach to Profile Gradient Estimation using Exponential Cubic Splines	

Reliable profile and profile gradient estimates are of utmost important for many physical models. In most situations, the derivative is either difficult to compute or it is impossible to obtain by direct measurement. Most importantly, for discrete noisy measurements, the differentiation magnifies the random error buried in the measurements, especially for high-frequency components. Estimating the derivative from point-wise noisy measurements is well known as an ill-posed problem. A Bayesian recipe based on a model using exponential cubic spline is implemented to estimate the profile gradient of discrete noisy measurements. The spline model is formulated in the space where the quantity (gradient) to be modeled is continuous, instead of being placed in the data space. The gradient profile is well-determined by the mean value of the posterior distribution calculated using Markov Chain Monte Carlo sampling technique.

Authors	**Darkenbayeva, Gulsim**	**Al-Farabi Kazakh National University, Kazakhstan**
Title	Convergence of some quadratic forms used in regression analysis	

We consider convergence in distribution of two quadratic forms arising in unit root tests for a regression with a slowly varying regressor. The error term is a unit root process with linear processes as disturbances. The linear processes are non-causal short-memory with independent identically distributed innovations. Our results generalize some statements from Phillips and Solo (1992).

Authors	**Hamed, Duha**	**Winthrop University, USA**
Title	T-Pareto family of distributions: Properties and Applications	

Six families of generalized Pareto distribution were defined and studied using the T-R{Y} framework will be presented with some of their properties and special cases including the Lorenz and Bonferroni curves. The flexibility of two members of these generalized families namely the normal-Pareto{Cauchy} and the exponentiated-exponential-Pareto{Weibull} distribution are assessed by applying them to a couple of real data sets and comparing their results with other distributions.

Authors	**Kang, Kai**	**The Chinese University of Hong Kong, Hong Kong**
Title	Bayesian semiparametric mixed hidden Markov models	

In this study, we develop a semiparametric mixed hidden Markov model to analyze longitudinal data. The proposed model comprises a parametric transition model for examining how potential predictors influence the probability of transition from one state to another and a nonparametric conditional model

for revealing the functional effects of explanatory variables on outcomes of interest. We propose a Bayesian approach that combines Bayesian P-splines and MCMC methods to conduct the statistical analysis. The empirical performance of the proposed methodology is evaluated via simulation studies. An application to a real-life example is presented.

Authors	**Krutto, Annika**	**University of Tartu, Estonia**
Title	Estimation in Univariate Stable Laws	

In the study four-parameter stable laws are considered. The explicit representations for the densities of stable laws in terms of elementary functions are unknown and that complicates the estimation of parameters. All stable laws can be uniquely expressed by their characteristic function. The motivation for this study arises from an estimation procedure based on the empirical characteristic function and known as the method of moments. In this study an amended and more fruitful version of the procedure is proposed, extensive simulation experiments over the parameter space are performed.

Authors	**Mdziniso, Nonhle Channon**	**Central Michigan University, USA**
Title	Odd Pareto Families of Distributions for Modeling Loss Payment Data	

A three-parameter generalization of the Pareto distribution is presented to deal with general situations in modeling loss payment data with various shapes in the density function. This generalized Pareto distribution will be referred to as the Odd Pareto family since it is derived by considering the distributions of the odds of the Pareto and inverse Pareto families. Various statistical properties of the Odd Pareto distribution are provided, including hazard function and moments. Loss payment data is used to illustrate applications of the Odd Pareto distribution. The method of maximum likelihood estimation is proposed for estimating the model parameters.

Authors	**Nitithumbundit, Thanakorn**	**University of Sydney, Australia**
Title	Maximum leave-one-out likelihood estimation for location parameter of unbounded densities	

Maximum likelihood estimation of a location parameter fails when the density have unbounded mode. An alternative approach is considered by leaving out a data point to avoid the unbounded density in the full likelihood. This modification gives rise to the leave-one-out likelihood. We propose an expectation/conditional maximisation (ECM) algorithm which maximises the leave-one-out likelihood. Podgórski and Wallin (2015) showed that the estimator which maximises the leave-one-out likelihood is consistent and super-efficient. To investigate other asymptotic properties such as the optimal rate of convergence and asymptotic distribution, we use our proposed algorithm on simulated data sets while also evaluating the accuracy of our estimator.

Authors	**Odhiambo, Collins Ojwang**	**Strathmore University, Kenya**
Title	A Smooth Test of Goodness-of-fit for the Weibull Distribution: An Application to an HIV Retention data	

In this paper, we propose a smooth test of goodness-of-fit for the two-parameter Weibull distribution. The smooth test described here is a score test that is an extension of the Neyman's smooth tests. Simulations are conducted to compare the power of the smooth test with three other goodness-of-fit tests for the Weibull distribution against the gamma and the lognormal alternatives. Results show that the smooth tests of order three and four are more powerful than the other goodness-of-fit tests. For validation, we apply the goodness-of-fit procedure to retention data in an HIV care setting in Kenya.

Authors	**Selvitella, Alessandro**	**McMaster University, Canada**
Title	The Simpson's Paradox in Quantum Mechanics	

In probability and statistics, the \emph{Simpson's paradox} is a paradox in which a trend that appears in different groups of data disappears when these groups are combined, while the reverse trend appears for the aggregate data. In this paper, we give some results about the occurrence of the \emph{Simpson's Paradox} in Quantum Mechanics. In particular, we prove that the \emph{Simpson's Paradox} occurs for solutions of the \emph{Quantum Harmonic Oscillator} both in the stationary case and in the non-stationary case. In the non-stationary case, the \emph{Simpson's Paradox} is persistent: if it occurs at any time $t=\tilde{t}$, then it occurs at any time $t\neq \tilde{t}$. Moreover, we prove that the \emph{Simpson's Paradox} is not an isolated phenomenon, namely that, close to initial data for which it

occurs, there are lots of initial data (a open neighborhood), for which it still occurs. Differently from the case of the \emph{Quantum Harmonic Oscillator}, we also prove that the paradox appears (asymptotically) in the context of the \emph{Nonlinear Schr\"{o}dinger Equation}, but at intermittent times.		
Authors	**Yan, Hongxuan**	**University of Sydney, Australia**
Title	Modeling Financial Time Series of Count Data with Long Memory	
This paper proposes to incorporate Gegenbauer Autoregressive Moving Average (GARMA) structure and a special case of it called Autoregressive Fractionally Integrated Moving Average (ARFIMA) structure into the mean function of a count distribution, Generalized Poisson (GP) distribution. This distribution displays equi-, over- and under -dispersion features, enhancing modeling feasibility. Besides, the error terms in the mean function are defined using the parameter- and observation-driven state space approach. Furthermore, Bayesian approach is implemented for parameter estimation through the user friendly Bayesian R module Rstan. DIC and WAIC are applied as two main model selection criteria. The models are demonstrated through the U.S. Commodity Futures Trading Commission data.		
Authors	**Zhang, Yuanyuan**	**University of Manchester, UK**
Title	New bivariate wrapped distributions	
There are not many models for bivariate directional data. Here, we introduce more than ten new bivariate wrapped distributions. For each distribution, expressions are given for the means, covariances, and five correlation coefficients.		

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