ΕΛΛΗΝΙΚΟ ΣΤΑΤΙΣΤΙΚΟ ΙΝΣΤΙΤΟΥΤΟ
(Ε.Σ.Ι)
GREEK STATISTICAL INSTITUTE
(G.S.I)

Celebrating 40 years of Greek Statistical Institute 1981-2021

A virtual scientific event

dedicated to the memory of the founder of GSI

Theophilos Cacoullos

March 26 – 28, 2021

The ***Greek Statistical Institute*** *(G.S.I.)* is organizing the online-conference with theme "***Celebrating 40 years of the Greek Statistical Institute (1981-2021)***" during the period ***March 26-28, 2021***. The conference, which is the main event for the celebration of the *40* years of *G.S.I.* since its establishment in *1981*, **is dedicated to the memory of *Theophilos Cacoullos***, the founder of *G.S.I.*, who passed away one year ago, in *April 2020*.

Theophilos Cacoullos, April 5, 1932 – April 3, 2020

As part of the event, welcome notes will be delivered among others, by founding members of *G.S.I.* who are greatly involved in the activities of *G.S.I.* for the last *40* years as well as representatives of Societies, Institutions and Authorities while scientific presentations will be delivered by well-recognized scientists on **Statistics and Probability and their applications**.

https://esi-stat-gr.weebly.com/

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CONFERENCE PROGRAM

FRIDAY MARCH 26, 2021

(all times refer to the local Greek time)

Link: ZOOM
https://aegean-gr.zoom.us/j/96200594801?pwd=ekRFa3UzOWVHL29FY29iTVY5b0tydz09

Meeting ID: 962 0059 4801 Passcode: 208907

16:00-19:30 WELCOME ADDRESSES

BOARD & FOUNDING MEMBERS OF GSI

Chair: A. Karagrigoriou

16:00	**Ch. Moysiadis, Vice President of the Board of GSI**
16:15	**S. Kounias, T. Papaioannou, Ch. A. Charalambides, Ch. Damianou**
17:00	**J. Panaretos, H. Papageorgiou, A. Kyriakoussis, G. Donatos**
17:45	BREAK

SCIENTIFIC SOCIETIES, INSTITUTIONS & AUTHORITIES

Chair: A. Burnetas

18:00	I. **Stournaras,** Governor**,** *Bank of Greece*
18:10	**A. Thanopoulos,** President, *Hellenic Statistical Authority*
18:20	**A. Fellouris,** President, *Hellenic Mathematical Society*
18:30	**S. Mejza,** President, *Polish Biometric Society*
18:40	**C. Tudor,** General Secretary, *Romanian Society of Probability & Statistics*
18:50	**L. Mutaftchief**, *American University in Bulgaria*
19:00	**T. Christofides,** President, *Cyprus Statistical Society*
19:10	**S. Anastasiadou, S. Bersimis, I. Ntzoufras, S. Xanthopoulos**, *Chairs Stat Depts*
19:30	BREAK

19:45-20:30 HISTORICAL DATA ANALYSIS GSI 1981-2021

Chair: A. Kalamatianou

19:45	**I. Stamatoulis,** *Greek Statistical Institute*
20:05	**V. Karagiannis, Th. Moysiadis and Ch. Moysiadis,** *Greek Statistical Institute*

SATURDAY MARCH 27, 2021

(all times refer to the local Greek time)

Link: ZOOM
https://aegean-gr.zoom.us/j/96200594801?pwd=ekRFa3UzOWVHL29FY29iTVY5b0tydz09

Chair: I. Koutrouvelis

16:00	**P. Castagliola, France**
16:25	**I. Karatzas, USA**
16:50	**M. Brown, USA**
17:15	**M. Viana, USA**
17:40	**M. Markatou, USA**
18:05	BREAK

Chair: S. Kourouklis

18:25	**S. M. Ross, USA**
18:50	**I. Bayramoglu, Turkey**
19:15	**A. L. Wright & R. Stefani, USA**
19:40	**F. Ruggeri, Italy**
20:05	**G. G. Roussas, USA**

SUNDAY MARCH 28, 2021

(all times refer to the local Greek time)

Link: ZOOM
https://aegean-gr.zoom.us/j/96200594801?pwd=ekRFa3UzOWVHL29FY29iTVY5b0tydz09

Chair: Ch. Skiadas

16:00	**U. Kamps, Germany**
16:25	**S. Utev, UK**
16:50	**G. Saporta, France**
17:15	**L. Pardo, Spain**
17:40	**C. Lefèvre, Belgium**
18:05	BREAK

Chair: S. Meintanis

18:25	N. **Balakrishnan, Canada**
18:50	**A. Perperoglou, UK**
19:15	**I. Ntzoufras, Greece**
19:40	**M. Kateri, Germany**
20:05	CLOSING REMARKS (**R. Cacoullos**)

HISTORICAL PRESENTATIONS SHORT ABSTRACTS

FRIDAY MARCH 26

Ioannis Stamatoulis, *GSI and Athens Univ. of Economics & Business*
(Supervision: M. Vamvakari, GSI and Harokopio Univ. and X. Pedeli, AUEB)

Title: *GSI Analytics*

Abstract: This work focuses on data representing the details of all contributions to the Annual Statistical Conferences of the Greek Statistical Institute over the last 15 years and provides various analytics for the qualitative as well as the quantitative characteristics of the database. In addition to standard univariate and bivariate statistical analysis, multivariate methods with emphasis on clustering techniques have also been used. The analysis has been performed with the use of Python.

Vassilis Karagiannis, Theodore Moysiadis, Chronis Moysiadis,
University of Thessaloniki, Greece & University of Nicosia, Cyprus

Title: *Network of Scientific Collaborations in the Proceedings of the Conferences in the 40 Years of Activity of GSI*

Abstract: During the 40 years since the founding of the Greek Statistical Institute (GSI) in 1981, 32 conferences have been held. For all of them (except the first one) the GSI has published Proceedings, which constitute a database for the cooperation between the scientists, members of the GSI and their collaborators. In the Proceedings up to year t, for $t = 1988, \dots, 2019$, a paper j by one or more scientists, defines one or more pairs of a two-part relationship between the set of published papers and the set of their authors. The adjacency matrix of this relation is defined as the $0-1$ matrix $A_t = [a_{ij}^t]$, with $a_{ij}^t = 1$, if the scientist i is one of the authors of the paper j, and can be studied using network theory either as a biparty network (two-mode network), or by using the product of matrices $W_{\Sigma,t} = A_t A_t^T$ and $W_{E,t} = A_t^T A_t$ as two weighted non-directed networks. The first is the collaboration network between scientists, with weights the number of the collaborations between two authors and the second is the network of papers with weights the number of coauthors between two papers. In a 2010 paper, the network $W_{\Sigma,2009} = A_{2009} A_{2009}^T$ $(1990 \le t \le 2009)$

was studied, based on empirical studies of similar networks that include distribution estimates, small-word property, centrality measures, correlation between vertices, existence of patterns, and community detection. In the present paper, the results are extended and enriched based on all three types of networks created by the adjacency matrix A_{2019}.

SCIENTIFIC PRESENTATIONS SHORT ABSTRACTS

SATURDAY MARCH 27 1st SESSION

Philippe Castagliola, ***Université de Nantes, France***

Title: *A Distribution-Free EWMA Control Chart for Monitoring Time-Between-Events-and-Amplitude Data*

Abstract: During the recent years, many control charts have been developed for the simultaneous monitoring of the time interval T between successive occurrences of an event E and its magnitude X. All these TBEA (Time Between Events and Amplitude) control charts assume a known distribution for the random variables T and X (like, for instance, the normal, lognormal, gamma or Weibull distributions). But, in practice, as it is rather difficult to know the actual distribution of the time T or the amplitude X, proposing a distribution-free approach could be a way to overcome this "distribution choice" dilemma. For this reason, we suggest a distribution-free upper-sided EWMA (Exponentially Weighted Moving Average) type control chart, for simultaneously monitoring the time interval T and the magnitude X of an event. In order to investigate the performance of this control chart and obtain its run length properties, we also introduce a specific method called "continuousify" which, coupled with a classical Markov chain technique, allows to obtain reliable and replicable results. A numerical comparison shows that our distribution-free EWMA TBEA chart performs as the parametric Shewhart TBEA chart, but without the need to pre-specify any distribution. An illustrative example obtained from a French forest fire database is also provided to show the implementation of the proposed distribution-free EWMA TBEA control chart.

Ioannis Karatzas, ***Columbia University, USA***

Title: *Another Look at the Problem of Optimal Stopping*

Abstract: The problem of optimal stopping is of fundamental importance in sequential analysis and has found many applications in many other fields. We review two relatively new approaches to it, one using a pathwise representation and another using an integral representation. Both have found interesting applications, make contact with the classical approach via the Snell envelope, and shed light on it.

Mark Brown, ***Columbia University, USA***

Title: *Variance Estimation for a Univariate Normal Distribution*

Abstract: For a univariate normal sample with unknown mean the most widely used estimator of the variance σ^2 is the "sample variance", $\hat{\sigma}^2(0) = S^2/(\mathrm{n}-1)$, where

$$S^2 = \sum_{i=1}^{n} (\mathrm{X}_i - \overline{X})^2 .$$

The estimator is the minimum variance unbiased estimator under squared error loss. It is dominated by the maximum likelihood estimator, $\hat{\sigma}^2(1) = \mathrm{S}^2/n$, which is also inadmissible. The MLE is dominated by $\hat{\sigma}^2(2) = S^2/(\mathrm{n}+1)$, which has the minimum mean square error among constant multiples of S^2.

The preference for $\hat{\sigma}^2(0)$ would seem to suggest that unbiasedness is a highly valued attribute. Nevertheless, $\hat{\sigma}(0)$, the "sample standard deviation", is the estimator of choice for σ and is biased. It is a routine exercise to find a constant multiple of S that is unbiased but there do not seem to be advocates for such an estimator.

We look at the problem of comparing estimators of the form, $\hat{\sigma}^2(\mathrm{c}) = S^2/(\mathrm{n}-1+c)$, for $c > -(\mathrm{n}-1)$, under a class of loss functions which include total variance distance between $N(\overline{X}_n, \sigma^2)$ and $N(\overline{X}_n, \hat{\sigma}^2(\mathrm{c}))$, where $\overline{X}_n$ is the sample mean. Calling the loss $L(\mathrm{c})$, we show that the loss is stochastically increasing in $c \geq 0$. Under this class of loss functions, $\hat{\sigma}^2(0)$ dominates the MLE, $\hat{\sigma}^2(1)$, which in turn dominates $\hat{\sigma}^2(2)$. Various other comparisons are obtained.

Marlos Viana, ***University of Illinois at Chicago, USA***

Title: *Comments on a Class of Covariance Structures Derived from Discrete Bivariate Distributions*

Abstract: The usual efficiency indicators of biomedical screening tests are defined in terms of certain conditional and marginal probabilities of Multinomial or Dirichlet-Multinomial distributions. In this talk I will propose a projective-like representation of these indicators and a conjecture on their covariance structure under both distributions.

Marianthi Markatou, ***University of Buffalo, USA***

Title: *Clustering Mixed-Type Data*

Abstract: Despite the existence of a large number of clustering algorithms, clustering mixed interval (continuous) and categorical (nominal and/or ordinal) scale data remains a challenging problem. We show that current clustering methods for mixed-scale data suffer from at least one of two central challenges: 1) They are unable to equitably balance the contribution of continuous and categorical scale variables without strong parametric assumptions; 2) they are unable to properly handle data sets in which only a subset of variables are related to the underlying cluster structure of interest. We first develop KAMILA (KAY-means for MIxedLArge data), a clustering method that addresses (1) and in many situations (2) without requiring strong assumptions. We next develop MEDEA (Multivariate Eigenvalue Decomposition Error Adjustment), a weighting scheme that addresses (2) even in the face of a large number of uninformative variables. We study the properties of our methods and demonstrate their performance using Monte Carlo simulations and real data sets.

SATURDAY MARCH 27 2nd SESSION

Sheldon M. Ross, ***University of Southern California,*** **USA**

Title: *Choosing the Best Population*

Abstract: We consider the classic problem of determining which of n population distributions has the largest mean, both when the population distributions are Bernoulli and when they are normal with unknown means but known equal variance. We take a Bayesian approach and suppose the unknown means are the values of independent random variables from specified distributions. Subject to the constraint that the policy employed yields a correct decision with at least some specified probability, the objective is to find a policy that has a relatively small expected time until a decision is made. Among other things, it is shown in the Bernoulli case that if we assume a uniform (0, 1) prior and use a Bayesian version of the classical vector at a time procedure, then the procedure is more than competitive against all recent algorithms even when the Bernoulli means are arbitrary.

Ismihan Bayramoglu (Bairamov), ***Izmir Univ. of Economics,*** **Turkey**

Title: *On Probabilities of the Number of Inspections Needed for Detecting the Failed Components of k-out-of-n System*

Abstract: We consider a coherent system whose lifetime is the k-th order statistics and assume that under periodical inspections we get an information about the conditions of the system. We investigate the probabilities of the number of inspections we need in order to detect the failed components. The lifetimes of the components are assumed to be independent and identically distributed (iid) random variables with absolutely continuous distribution function. We derive the joint distributions of finite number of iid random variables and an order statistics constructed from these random variables and apply the result to estimate the probabilities of the number of inspections we need to detect required number of failed components. We present a formula for probability mass function of the random variable presenting the number of inspections and provide a numerical example calculating the expected value of this random variable.

Arthur L. Wright & Raymond Stefani, ***Columbia University & California State University Long Beach, USA***

Title: *Applications of the Kelly Criterion in Finance and Sports*

Abstract: We discuss uses of the Kelly Criterion for investing in stocks and other financial instruments and in betting on sports. Real examples of investors such as Warren Buffett and Ed Thorp (20% return over 25 years) are given. Ray Stefani explains the applications to sports betting. He has achieved a return of 15% over several years

Fabrizio Ruggeri, ***Italian National Research Council,*** **Italy**

Title: *New Classes of Priors based on Stochastic Orders: Theory and Applications in Reliability*

Abstract: In the context of robust Bayesian analysis, we first introduce a new class of univariate prior distributions based on stochastic orders and distortion functions. Then we introduce a new class of multivariate priors based on stochastic orders, multivariate total positivity of order 2 (MTP2) and weighted distributions. We provide the new definitions, their interpretation and the main properties and we also study the relationship with other classical classes of prior beliefs. We also consider metrics (Kolmogorov and Kantorovich in the former case, Hellinger and Kullback-Leibler in the latter) to measure the uncertainty induced by such classes. Finally, we present the application of the former class in the context of fault tree analysis for a spacecraft re-entry example, whereas the latter will be illustrated with an example about train door reliability.

George G. Roussas, ***Corresponding Member of the Academy of Athens, Univ. of California-Davis,*** **USA &** ***Univ. of Patras,*** **Greece**

Title: *On Some Stochastic Models and Relevant Statistical Inference*

Abstract: A brief discussion is presented of some stochastic models, both of theoretical and practical importance. Aspects of statistical inference are also alluded to. The discussion is not meant - nor can it be - exhaustive of the class of available models. Rather, it focuses on a selection of such models, which have been the subject of interest of this researcher throughout the years; also, in reference to which he - alone or in collaboration with others - have made some modest contributions. Due to limited presentation time, references to researchers and/or journals will, as a rule, be omitted.

SUNDAY MARCH 28 1st SESSION

Udo Kamps, ***RWTH Aachen University, Germany***

Title: *Inference in a Load-sharing Model with Weibull Components*

Abstract: Sequential order statistics can serve as a model for component lifetimes in a load-sharing system, such as a k-out-of-n system, where a component failure may cause a change of the underlying hazard rates of remaining system components. In a set-up of independent samples of sequential order statistics from Weibull distributions, statistical inference is considered for scale parameters and a common shape parameter. Multivariate tests are developed and analyzed, including tests on homogeneity of the scale parameters, which indicate whether the model of common order statistics has to be rejected, and tests on an underlying exponential distribution. In a load-sharing interpretation and within the model of sequential order statistics, the intention is to detect, confirm and quantify load-sharing effects based on multiple samples. Moreover, classification based on different divergence measures is addressed.

Sergey Utev, ***University of Leicester, UK***

Title: *The Cacoullos w-transform*

Abstract: This talk is an improvisation on the Cacoullos w-function identities, such as defined in Cacoullos, T. (1982), “On upper and lower bounds for the variance of a function of a random variable”, *The Annals of Probability*, v. 10, 799–809, and employed in Cacoullos, Papathanasiou and Utev, 1994, "Variational Inequalities with examples and an application to the central limit theorem", *The Annals of Probability*, v.22, 1607-1618.

Gilbert Saporta, ***Conservatoire National des Arts et Métiers, France***

Title: *Sparse Correspondence Analysis for Contingency Tables*

Abstract: Since the introduction of the lasso in regression, various sparse methods have been developed in an unsupervised context like sparse principal component analysis (s-PCA) and sparse singular value decomposition (s-SVD). One advantage of s-PCA is to simplify the interpretation of the (pseudo) principal components since each one is expressed as a linear combination of a small number of variables. The disadvantages lie on the one hand in the difficulty of choosing the number of non-zero coefficients in the absence of a well established criterion and on the other hand in the loss of orthogonality for the components and/or the loadings.
We propose s-CA, a sparse variant of correspondence analysis (CA) for large contingency tables like documents-terms matrices used in text mining, together with pPMD, a projected deflation technique already used in s-PCA. Since CA is a double weighted PCA (for rows and columns) or a weighted SVD, we apply s-SVD in order to sparsify both rows and columns weights. The user may tune the level of sparsity of rows and columns and optimize it according to some criterium, and even decide that no sparsity is needed for rows (or columns) by relaxing one sparsity constraint.

Leandro Pardo, ***Complutense University of Madrid, Spain***

Title: *A Robust Adaptive Variable Selection in Ultra-high Dimensional Linear Regression Models*

Abstract: We consider the problem of simultaneous variable selection and estimation of the corresponding regression coefficients in an ultra-high dimensional linear regression models. The adaptive penalty functions are used in this regard to achieve the oracle variable selection property with simpler assumptions and lesser computational burden. Noting the non-robust nature of the usual adaptive procedures (e.g., adaptive LASSO) based on the squared error loss function against data contamination, quite frequent with modern large-scale data sets (e.g., noisy gene expression data, spectra and spectral data, in this paper, we present a new adaptive regularization procedure using a robust loss function based on the density power divergence (DPD) measure under a general class of error distributions. We theoretically prove that the

proposed adaptive DPD-LASSO estimator of the regression coefficients are highly robust, consistent, asymptotically normal and lead to it robust oracle-consistent variable selection under easily variable assumptions. Numerical illustrations are provided for the mostly used normal error density. Finally, the proposal is applied to analyze an interesting spectral dataset, in the field of chemometrics, regarding the electron - probe X-ray microanalysis (EPXMA) of archaeological glass vessels from the 16th and 17th centuries.

Claude Lefèvre, ***Université Libre de Bruxelles, Belgium***

Title: *On Branching Models with Alarm Triggering*

Abstract: This paper discusses a continuous-time Markov branching model in which each individual can trigger an alarm according to a Poisson process. The model is stopped when a given number of alarms is triggered or when there are no more individuals present. Our goal is to determine the distribution of the state of the population at this stopping time. In addition, the state distribution at any fixed time is also obtained. The model is then modified to take into account a possible influence of death cases. All distributions are derived using probability generating functions, and the approach followed is based on the construction of families of martingales.

This is a joint work with Ph. Picard (Université de Lyon 1, ISFA) and S. Utev (University of Leicester, Dept. of Mathematics).

SUNDAY MARCH 28 2nd SESSION

Narayanaswamy Balakrishnan, ***McMaster University*****, Canada**

Title: *Family of Mean-Mixtures of Multivariate Normal Distributions*

Abstract: In this talk, I will introduce the family of distributions which are mean-mixtures of multivariate normal distributions. I will then discuss associated properties and inferential methods, and finally illustrate with some data sets.

Aris Perperoglou, ***AstraZeneca & Newcastle University*****, UK**

Title: *Modelling Time Varying Recruitment Rates and Site Activation Prediction in Multicentre Clinical Trials*

Abstract: Multicentre Phase II/III clinical trials are large scale operations that often include hundreds of recruiting sites (centres) in several countries. Planning of operational aspects of a clinical trial requires selection of sites and countries to adhere to study protocol and recruitment requirements. It is thus critical to accurately predict site activation and recruitment timelines, to optimize success of a trial. Such predictions occurring prior to trial initiation assist study teams with trial monitoring progress, and also assist them to take proper actions during the trial when recruitment data indicate deviations from the study plan.

In this work we showcase our experience from modelling recruitment in clinical trials sponsored by AstraZeneca between 2010-2020. We show that recruitment rates tend to vary during a trial, depending on therapeutic area and country. However, industry standard has often employed a homogeneous Poisson model (Anisimov et al 2007) which models patient recruitment rates as a time-constant function. Instead, we illustrate a non-homogenous Poisson modelling approach (Urbas et al 2020) that accounts for time-varying recruitment rates. The latter approach utilises an ensemble of five models, four of which explicitly model time-varying recruitment rate and one assuming a homogenous process. Bayesian modelling averaging is used to combine estimations from models.

Maria Kateri, ***RWTH Aachen University, Germany***

Title: *Bivariate Discrete Distribution with Given Marginals and Given Dependence Structure*

Abstract: Dependence models for contingency tables are revisited in the light of copulas. Correlation models are linked to the bivariate discrete Sarmanov distribution and associated properties are discussed, including a characterization of the Sarmanov distribution that specifies the scale on which interactions between the levels of the classification variables are measured. Controlling this scale and the type of logit (e.g., local, global) considered for the row and column classification variables, generalized interactions are introduced that lead to a flexible class of generalized association models. In particular, it is shown that given the marginals, the generalized interactions introduced in this paper determine uniquely the bivariate distribution. Furthermore, it is shown that when all generalized interactions in a table are non-negative, a specific kind of positive dependence is implied, corresponding to the type of logit used for each classification variable.

Ioannis Ntzoufras, ***University of Economics & Business Athens, Greece***

Title: *Basic Principles of Objective Bayesian Model Comparison*

Abstract: In this talk I will provide a review of prior distributions for objective Bayesian model comparisons. The general principles, criteria and tools/mechanisms that can be used in order to ensure a sensible Bayesian model comparison/selection procedure under the absence of any prior information will be presented and discussed. Focus will be given in the most popular model selection case: the variable selection problem. Some recent contributions in the area of objective priors on model space will be also discussed. Hopefully, after this talk you will have some guidance how to work to build sensible priors for Bayesian model comparisons.

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