

2016

Mathematics: Teaching, Theory & Applications Abstracts

Tenth Annual International
Conference on Mathematics:
Teaching, Theory &
Applications, 29-30 June 2016,
Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH



Mathematics: Teaching,
Theory & Applications
Abstracts

10th Annual International
Conference on Mathematics:
Teaching, Theory &
Applications, 27-30 June 2016,
Athens, Greece

Edited by Gregory T. Papanikos

First Published in Athens, Greece by the Athens Institute for Education and
Research.

ISBN: 978-960-598-089-4

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Preface

This abstract book includes all the abstracts of the papers presented at the *10th Annual International Conference on Mathematics: Teaching, Theory & Applications, 27-30 June 2016, Athens, Greece*, organized by the Athens Institute for Education and Research. In total there were 21 papers and 24 presenters, coming from 14 different countries (Australia, Burkina Faso, Canada, Czech Republic, China, India, Ireland, Mexico, Nigeria, Poland, Romania, Spain, Taiwan and USA). The conference was organized into seven sessions that included areas of Mathematics. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books and/or journals of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into four research divisions and nineteen research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM
**10th Annual International Conference on Mathematics: Teaching,
Theory & Applications, 27-30 June 2016**

Conference Venue: [Titania Hotel](#), 52 Panepistimiou Street, 10678
Athens, Greece

Monday 27 June 2016
(all sessions include 10 minutes break)

08:00-08:30 Registration and Refreshments

08:30-09:00 Welcome & Opening Address (ROOM B-Mezzanine Floor)

- Gregory T. Papanikos, President, ATINER.
- George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

09:00-10:30 Session I (ROOM C-Mezzanine Floor): Statistics: Teaching & Applications I

Chair: *Codruta Stoica, Associate Professor, Aurel Vlaicu University of Arad, Romania.

1. *Bahman Shafii, Professor and Director, University of Idaho, USA. Nonparametric Bayesian Estimation of an Unknown Dose.
2. *Madhu Paranjape, Associate Professor, University of Mumbai, India. Human Development and Substantive Employment: Perception and Reality - A Case Study of Raigad District of Maharashtra, India.
3. Yong Hu, Associate Professor, Jinling Institute of Technology, China & Sheng-Guo Chen, Professor, Jinling Institute of Technology, China. A Comparative Study of Shape and Texture Features for Finger Spelling Recognition.
4. Marta Malecka, Assistant Professor, University of Lodz, Poland. Nonparametric Methods of Statistical Inference in ES Testing.

10:30-12:00 Session II (ROOM C-Mezzanine Floor): Statistics

Chair: *Bahman Shafii, Professor and Director, University of Idaho, USA

1. Alan Ker, Professor and Director, Department of Food, Agricultural

and Resource Economics, University of Guelph, Canada. Bayesian Model Averaging of Nonparametric Densities with Applications to Rating Crop Insurance Contracts.

2. *Diarmuid O'Driscoll, Head, Department of Mathematics, Mary Immaculate College, Ireland & Donald Ramirez, Professor, University of Virginia, USA. Limitations of the Standard Linear Regression Model; A Teaching Perspective.
3. *Ampalavanar Nanthakumar, Professor, State University of New York at Oswego, USA. A Comparison of Quantile Regression and Copula based Conditional Regression Results for Body Mass Index.

12:00-13:30 Session III (ROOM C-Mezzanine Floor): Statistics: Teaching & Applications II

Chair: *Ampalavanar Nanthakumar, Professor, State University of New York at Oswego, USA.

1. *Smita Patgaonkar, Assistant Professor, University of Mumbai, India. Exploring the Predictors of Survival in HIV Positive Patients after Initiation of ART(Antiretroviral Retroviral Therapy) Treatment.
2. Stella Stylianou, Lecturer, RMIT University, Australia. Definitive Screening Experiments.
3. Jaroslav Sixta, Researcher/Teacher, University of Economics in Prague, Czech Republic & Martina Simkova, Researcher/Teacher, University of Economics in Prague, Czech Republic. Estimates of Czech GDP for The Period 1970-1990.

13:30-14:30 Lunch

14:30-16:30 Session IV (ROOM C-Mezzanine Floor): Mathematics

Chair: *Diarmuid O'Driscoll, Head, Department of Mathematics, Mary Immaculate College, Ireland.

1. *Codruta Stoica, Associate Professor, Aurel Vlaicu University of Arad, Romania. A Stochastic Approach of Dynamical Systems by Means of Cocycles.
2. Dongrui Wan, Lecturer, Shenzhen University, China. The Application of Closed Positive Currents to Quaternionic Pluripotential Theory.
3. Andri Lopez, Institute Polytechnic Leon, Spain. Demonstration Goldbach Conjecture.

21:00-23:00 Greek Night and Dinner (Details during registration)

Tuesday 28 June 2016

08:00-11:00 Educational and Cultural Urban Walk Around Modern and Ancient Athens (Details during registration)

11:00-12:30 Session V (ROOM C-Mezzanine Floor): Mathematics: Teaching & Applications

Chair: *Smita Patgaonkar, Assistant Professor, University of Mumbai, India.

1. *Sophie Chrysostomou, Associate Professor, University of Toronto Scarborough, Canada & *Zohreh Shahbazi, Associate Professor, University of Toronto Scarborough, Canada. The Difficulties Students Commonly Face in Engaging with Material in First Year University Calculus Courses.
2. Joyce Adjekukor, Lecturer, Delta State Otefe Oghara, Nigeria & Ikpere Ekerikeuwe, Lecturer, Delta State Otefe Oghara, Nigeria. Between some Maternal Characteristics and Birthweight of Neonates: Evidence from a Teaching Hospital in South-South Nigeria.

12:30-14:00 Session VI (ROOM C-Mezzanine Floor): Statistics: Teaching & Applications III

Chair: *Zohreh Shahbazi, Associate Professor, University of Toronto Scarborough, Canada.

1. *Rong-Tsorng Wang, Assistant Professor, Tunghai University, Taiwan. Multiple Failures in Software Reliability Models.
2. Stelios Georgiou, Senior Lecturer, RMIT University, Australia. Methodology for Applied Experimental Designs.
3. Luz Graciela Orozco Vaca, Ph.D. Student, CINVESTAV, IPN, Mexico. Self-Instructions for Applying Writing as a Metacognitive Tool in Problem Resolution.

14:00-15:00 Lunch

15:00-16:30 Session VII (ROOM C-Mezzanine Floor): Special Topics on Mathematics, Education & Statistics

Chair: *Sophie Chrysostomou, Associate Professor, University of Toronto Scarborough, Canada

1. Irini Papaieronymou, Lecturer, Michigan State Univeristy / University of Nicosia, USA / Cuprus. Teaching College Probability for Higher Achievement.
2. Jose Luis Lopez Hernandez, Ph.D. Student, Centro de Investigación y de Estudios Avanzados-IPN, Mexico. A Socio-Cultural Approach of Objectification Processes of the Concept of Variation.
3. Come J. A. Bere, Assistant Professor, University of Ouagadougou, Burkina Faso, Marie Françoise Ouedraogo, Assistant Professor, University of Ouagadougou, Burkina Faso & Moussa Ouattara, Professor, University of Ouagadougou, Burkina Faso. On Nilpotency in Leibniz Algebras.

21:00-22:30 Dinner (Details during registration)

Wednesday 29 June 2016
Cruise: (Details during registration)

Thursday 30 June 2016
Delphi Visit: (Details during registration)

Joyce Adjekukor

Lecturer, Delta State Otefe Oghara, Nigeria

&

Ikpere Ekerikeuwe

Lecturer, Delta State Otefe Oghara, Nigeria

**Between some Maternal Characteristics and Birthweight of
Neonates: Evidence from a Teaching Hospital in South-
South Nigeria**

Come J. A. Bere

Assistant Professor, University of Ouagadougou, Burkina Faso

Marie Françoise Ouedraogo

Assistant Professor, University of Ouagadougou, Burkina Faso

&

Moussa Ouattara

Professor, University of Ouagadougou, Burkina Faso

On Nilpotency in Leibniz Algebras

It is well known that an associative algebra A is nilpotent if for some positive integer n , every product of n or more elements of A vanishes. For a nonassociative algebra A we must indicate in which order the products are made. It follows that the products of n elements of A could be zero for a choice of arrangements of parentheses and different from zero for another choice. This fact led to the definition of various concepts of nilpotency, namely left nilpotency, right nilpotency, nilpotency and strong nilpotency.

It is proved that Malcev algebra is strongly nilpotent if and only if it is right nilpotent. It follows that all those concepts of nilpotency are equivalent in Malcev algebra. This result fails for Leibniz algebras. Nevertheless, we prove that for a right Leibniz algebra, the notions of right nilpotent, nilpotent and strongly nilpotent are equivalent. Similarly, for left Leibniz algebras, the notions of left nilpotent, nilpotent and strongly nilpotent are equivalent.

Notice that Zhevlakov et al. showed that when a non-associative commutative or anti-commutative algebra A is right nilpotent of index n then A is strongly nilpotent with index less or equal to 2^n . We improve this result for Leibniz algebras by reducing the boundary of the index to a polynomial of type $4n^2 - 2n + 1$.

Sophie Chrysostomou

Associate Professor, University of Toronto Scarborough, Canada
&

Zohreh Shahbazi

Associate Professor, University of Toronto Scarborough, Canada

The Difficulties Students Commonly Face in Engaging with Material in First Year University Calculus Courses

Creating an engaging learning atmosphere in first year university calculus courses is a challenging task. The authors of this paper have designed a number of experiments and measurement tools to examine the difficulties students commonly face in engaging with material in these courses. The study pays careful attention to student attitudes and study habits in order to gauge which academic counseling resources are most effective. The study also discusses the effectiveness of different teaching strategies, techniques and course design philosophies such as incorporating active learning methods.

Stelios Georgiou

Senior Lecturer, RMIT University, Australia

Methodology for Applied Experimental Designs

Experimental designs are particularly useful in performing statistical analysis in all scientific fields. The choice of a suitable and efficient experimental design will lead to the collection and statistical analysis of high quality data that will reveal hidden information. It is quite important to design your research based on an optimal experimental design rather than have to analyze data collected without a correct design structure.

In most cases practitioners do not give the needed emphasis in these processes and this result in difficulties in the analysis stage or in problematic data collected. In this work we recall some design principles that arise from the use of optimal design matrices and have applications in experiments in social sciences. A procedure and methodology for correctly approaching a research problem from the begging will be sketched. This will include an introduction of how to perform simple but useful observations about designing experiments. For example it will be illustrated how to choose the factors, the levels, and the ranges for a specific study. One other parameter of the design that needs attention is the selection of the response variable(s) of the study.

Focus and emphasis will be given on the choice of the design matrix for the experiment. This is one of the most important parameter that can really make a difference in the outcome of our data. Some different possible approaches will be presented and some alternative new techniques will be presented. At the final stage it will be discussed of how the experiment may be conducted in an efficient way. Basic statistical approaches that resulted from the chosen design matrix will also briefly mentioned.

Luz Graciela Orozco Vaca
Ph.D. Student, CINVESTAV, IPN, Mexico

Self-Instructions for Applying Writing as a Metacognitive Tool in Problem Resolution

The paper describes the results of a teaching experiment in which the purpose is to support secondary school students (9th grade) with their geometry problem resolution, by using writing as a metacognitive tool during the entire process. To design the teaching proposal, research was done on the work of Veenman (2012), who distinguishes between metacognitive knowledge and metacognitive skills in order to guide skill development in the sciences. The work of Hyde (2006) was also referenced, where the latter author applies the Braid Model -language, thought and mathematics- to problem solving in primary education. The authors of the paper at hand used certain useful foundations of those works to design their teaching experiment. The experiment consists of using self-instructions presented to students in the form of simple questions and through which they work on writing as a metacognitive tool for geometry problem resolution, for the purpose of organizing and monitoring the elements involved in the activity's process.

The intention is for writing to assist in triggering among the students a process of analysis concerning their mathematics concepts and work techniques. To achieve this, the authors designed questions that involve students in a detailed procedure, that is, in a plan of action that arises on a step-by-step basis in problem resolution. Through the questions, the students are helped in the task of identifying comprehension difficulties, as well as of applying their capacities to compare and reasonably organize the information, of predicting inferences and reaching conclusions. During the entire process, the students use cognitive and metacognitive strategies that are useful to them in the problem resolution procedure. Moreover, the writing helps them to analyze and reflect upon the path development in order to obtain the answer and prove that it is indeed correct.

Yong Hu

Associate Professor, Jinling Institute of Technology, China

&

Sheng-Guo Chen

Professor, Jinling Institute of Technology, China

**A Comparative Study of Shape and Texture Features for
Finger Spelling Recognition**

Alan Ker

Professor and Director, Department of Food, Agricultural and Resource
Economics, University of Guelph, Canada

Bayesian Model Averaging of Nonparametric Densities with Applications to Rating Crop Insurance Contracts

Some forms of risk are plagued by a paucity of data from which to estimate premium rates. However, extraneous data from possibly similar data generating processes often exists. Crop and weather-based index insurance are notable examples; very little historical data on the unit of interest (e.g. farm, weather station) but there are many units of interest with data exist (neighboring farms, weather stations). The purpose of this manuscript is to develop an improved estimator which uses extraneous data without assumptions about independence between and similarities amongst the data generating processes. Novel interpretations of Bayesian Model Averaging (across space rather than form) and kernel estimators (as mixture densities) are used to nonparametric ally estimate a set of \text it{possibly} similar densities that offers greater efficiency if the set of densities are similar while seemingly not losing any if the set of densities are dissimilar. Simulations (density and premium rate) indicate finite sample performance $\{-\}\{-\}$ in particular small sample performance $\{-\}\{-\}$ is quite promising. We use the proposed approach to estimate U.S. crop insurance premium rates for area-type programs. An out-of-sample game between private insurance companies and the federal government highlights the policy implications for a variety of crop-state combinations and sample sizes. Consistent with the simulation results, the performance of the proposed approach with respect to rating area-type insurance $\{-\}\{-\}$ in particular small sample performance $\{-\}\{-\}$ is quite promising. The proposed approach does not require knowledge of the form or extent of any possible similarities, is relatively easy to implement, admits correlated data, and can be used with nonparametric methods.

Andri Lopez
Institute Polytechnic Leon, Spain

Demonstration Goldbach Conjecture

In this article I resolve the strong Goldbach conjecture, applying mathematical logic. **Proving thay:** $\forall 2n = [p + pn; p + (2e + 1); (2a + 1) + (2e + 1); (2a + 1 + pn)]$.

we know the existence of two sets for odd numbers, one for non-primes and other of primes.

$$\begin{aligned} Zp &= [p1; p2; p3.....] = 2N \\ Znp &= [(2a + 1); (2b + 1); (2c + 1).....] = 2N \end{aligned}$$

If we add every prime number by the rest of the primes, we have all the pairs that are sum of two prime numbers; i.e. that $\forall (p \neq 2)$ we have.

$$\begin{aligned} p1 + [p2; p3; p5.....] \\ p3 + [p5;.....] \end{aligned}$$

If $(2k; 2b) = \in (2N)$ then will be of the set of odd numbers $(2B)$.

Axiom: All even numbers are broken down into pairs of summands.

$$\begin{aligned} (2a - 1) + 1 &= 2B \\ (2a - 2) + 2 &= 2B \\ \\ (2a - n) + n &= 2B \end{aligned}$$

$$\begin{aligned} (2n - 1) + 1 &= 2N \\ (2n - 2) + 2 &= 2N \\ \\ (2n - n) + n &= 2N \end{aligned}$$

We note that in the right column of the pairs of summands always have values $[2a; (2a + 1); p]$

This results generally in:

$$(2b - x) + x = 2B \text{ or } (2n - x) + x = 2N$$

For.

$$\begin{aligned} \forall x &= (1; 2; 3; 4; 5; 6..... (2b - 1)) \\ \forall x &= (1; 2; 3; 4; 5; 6.....(2n - 1)) \end{aligned}$$

And therefore on $[\forall(2N; 2B)]$ we have:

$$(2b - x) = [(2a; (2a + 1); p)]$$

proof 1; for a value of $[x = (2a + 1); p]$ we have:

$$2b - p = \left| \frac{Pn}{2a + 1} \right|$$

$$2b - p_k = \left| \frac{p'}{(2e + 1)} \right|$$

At this point we have two options.

The first one:

$2b - p = pn$ which corroborate the conjecture.

Now if we assume as possible this is not fulfilled (i.e. along values (x) in the rows not we have values of two primes); the conjecture would be false. Before of will affirm, check it with the 2nd option, if:

$$2b - p = (2a + 1)$$

$$2b - p_k = (2e + 1)$$

Then:

$$2b = (2a + 1) + p$$

$$2b = (2e + 1) + p_k$$

Where by:

$$(2a + 1) + p = (2e + 1) + p_k$$

ie that:

$$(2a + 1) - (2e + 1) = p - p_k = 2(a - e) < 2b$$

And.

$$(2a + 1) + p + (2e + 1) + p_k = 2(2b)$$

Therefore always exist a:

$$p + p_k = (2a + 1) + (2e + 1) = 2b$$

It is demonstrated that, $\forall(2N; 2B)$ always we have:

$$(2n; 2b) = [p + p_k; p + (2e + 1); (2a + 1) + (2e + 1); (2a + 1) + p]$$

All even numbers is the sum of two primes; Goldbach's conjecture is true.

Jose Luis Lopez Hernandez

Ph.D. Student, Centro de Investigación y de Estudios Avanzados-IPN,
Mexico

A Socio-Cultural Approach of Objectification Processes of the Concept of Variation

The concept of variation has drawn attention in mathematics education at all educational levels (Carlson, Jacobs, Coe, Larsen, & Hsu, 2002; Vasco, 2006, among others), it is related to others mathematical concepts and appears in various areas of mathematics and others disciplines. About the concepts of variable and variation have been developed and used different computing environments, for instance the dynamic geometry software (DGS) that help in solving tasks that are not always easy to understand in the traditional paper-and-pencil environment (cf, Laborde, 2001; González & Herbst, 2009; among others). In this article, we seek to answer the question: How do tasks designed in paper-and-pencil and technological environments influence the argumentation and validation processes, fundamentals in the processes of objectification of students, to solve geometric problems involving the concept of variation? This is a qualitative research which is supported on the socio-cultural Theory of Objectification (Radford, 2006, 2008, 2014).

The participants were 12 high-school students (16 and 17 years old) from different classes in Mexico City, Mexico, who were taking the analytical geometry subject at same time of data collection. They worked in teams of two members each and were video recorded while they solved the Activities related with the concept of variation about the quadrature problem, that were solved in paper-and-pencil and technological environments (GeoGebra), with the purpose of observing and analyzing how the concept of variation is objectified by students through the processes of argumentation and validation that they made to justify their conjectures and solutions. Our results provide evidence that students in solving Activities are able to give solid arguments on the concept of variation in mathematics inherent in the quadrature problem.

Marta Malecka

Assistant Professor, University of Lodz, Poland

Nonparametric Methods of Statistical Inference in ES Testing

The idea behind Expected Shortfall (ES) - a coherent risk measure introduced as an extension to the VaR model - is to give information about the possible loss in case of extreme events. The wide variety of ES-based risk models, introduced in the recent literature, created the need for relevant testing procedures. In the general case, the distribution of a sample average of extreme observations is unknown, thus classic statistical methods are unfeasible for ES value testing. Since scarcity of observations is inherent to extreme events, the statistical inference cannot be based on the central limit theorem either. The aim of the paper was to provide a review and evaluate statistical properties of available ES testing procedures. Test assessment included their size and power. The analysis of the test properties was preceded by the overview of statistical inference methods proposed in the literature for ES models. The statistical properties of the considered tests were evaluated through the Monte Carlo method. The size and power evaluation experiments were designed in a way that they reflected volatility clustering phenomenon, which hinders volatility prediction and is commonly regarded as a key issue in risk control.

Ampalavanar Nanthakumar

Professor, State University of New York at Oswego, USA

A Comparison of Quantile Regression and Copula based Conditional Regression Results for Body Mass Index

Here in this paper, I will be comparing two approaches for estimating the $100\tau^{\text{th}}$ quantile of the Body Mass Index at a particular age. The Body Mass Index (BMI) is defined as $\text{BMI} = \frac{4.88 \cdot (\text{Mass}(lb))}{(\text{Height}(ft))^2}$. In this study, age (X) is the predictor variable and the Body Mass Index (Y) is the response variable.

The first approach uses the Quantile Regression for estimating the the $100\tau^{\text{th}}$ quantile of the Body Mass Index at a particular age. The first approach uses the following equation for the estimation.

$$L = \text{Min} \left\{ \sum_{i \in \{i: y_i \geq x_i \cdot \beta\}} \tau \cdot |y_i - x_i \cdot \beta| + \sum_{i \in \{i: y_i < x_i \cdot \beta\}} (1 - \tau) \cdot |y_i - x_i \cdot \beta| \right\}$$

Note that τ is the proportion associated with the quantile percentage. For example, in the case of the 90^{th} percentile, $\tau = 0.9$.

The second approach uses the Copula based conditional Regression for the $100\tau^{\text{th}}$ quantile of the Body Mass Index at a particular age. The second approach uses the following mathematical result to derive the conditional distribution of Y given X .

$$\text{Theorem: If } C(u_1, u_2) = C(F(x), G(y)) = \int_{-\infty}^x \int_{-\infty}^y h(s, t) ds dt .$$

Then, $\frac{\partial C}{\partial u_1} = F_1(y \setminus x)$, where, F_1 is the conditional cumulative distribution of Y given X . Note that $u_1 = F(x)$ is the marginal distribution function of X .

$u_2 = G(y)$ is the marginal distribution function of Y .

$h(s, t)$ is the joint density function of X and Y .

Diarmuid O'Driscoll

Head, Department of Mathematics, Mary Immaculate College, Ireland

&

Donald Ramirez

Professor, University of Virginia, USA

Limitations of the Standard Linear Regression Model; A Teaching Perspective

The standard linear regression model can be written as $\mathbf{Y} = \mathbf{X}\beta + \varepsilon$ with \mathbf{X} a full rank $n \times p$ matrix and $L(\varepsilon) = N(\mathbf{0}, \sigma^2 \mathbf{I}_n)$. The least squares estimator is $\hat{\beta}_L = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{Y}$ with variance-covariance matrix $Cov(\hat{\beta}_L) = \sigma^2(\mathbf{X}'\mathbf{X})^{-1}$, where $Var(\varepsilon_i) = \sigma^2$. The diagonal terms of the matrix $Cov(\hat{\beta}_L)$ are the variances of the Least Squares estimators $\hat{\beta}_i, 0 \leq i \leq p-1$ and the Gauss-Markov Theorem states $\hat{\beta}_L$ is the best linear unbiased estimator. However, the OLS solutions require that $(\mathbf{X}'\mathbf{X})^{-1}$ be accurately computed and ill conditioning can lead to very unstable solutions. Tikhonov, A.N. (1943) first introduced the idea of regularisation to solve ill-posed problems by introducing additional information which constrains (bounds) the solutions. Specifically, Hoerl, A.E. (1959) added the constraint term to the least squares problem as follows: minimize $\|Y - X\beta\|^2$ subject to the constraint $\|\beta\|^2 = r^2$ for fixed r and dubbed this procedure as ridge regression. This paper gives a brief overview of ridge regression and examines the performance of three different types of ridge estimators; namely the ridge estimators of Hoerl, A.E. (1959), the surrogate estimators of Jensen, D.R. and Ramirez, D.E. (2008) and the raise estimators of Garcia, C.B., Garcia, J. and Soto, J. (2011).

Irini Papaieronymou

Lecturer, Michigan State Univeristy / University of Nicosia, USA /
Cuprus

Teaching College Probability for Higher Achievement

This study examined the role of particular tasks implemented through two instructional methods on college students' achievement in probability. A mixed methods design that utilized a pre-test (with multiple-choice items) and post-test (with multiple-choice and open-ended items) was used. This included treatment and control groups in an introductory statistics course taught by the researcher at a college in Cyprus.

An initial analysis of pre-test scores indicated that students in the control and treatment groups had comparable initial probability knowledge. The results of the Wilcoxon Signed-Ranks test indicated that the multiple-choice scores of students in the control group were significantly lower on the post-test compared to the pre-test. In the case of the treatment group, student scores on the multiple-choice items did not increase significantly from the pre-test to the post-test. Possible explanations to this phenomenon are provided. In addition, an analysis of *normalized* gain scores was carried out. The Mann-Whitney test showed that the normalized gain scores of the treatment group were significantly different from those of the control group. Relative to the open-ended post-test items, the Mann-Whitney test resulted in a p-value of 0.001 indicating that the scores of the treatment group on these items were significantly higher than the scores of the control group. Therefore, the treatment method was successful in producing significantly better achievement scores than the method used in the control group.

Madhu Paranjape

Associate Professor, University of Mumbai, India

Human Development and Substantive Employment: Perception and Reality - A Case Study of Raigad District of Maharashtra, India

It is a generally accepted fact that in an ideal situation higher economic growth would lead to higher levels of employment and subsequently result in higher level of human development. The Human Development Reports of the UNDP have been ranking nations based on Human Development Index (HDI). It is expected that HDI would be positively associated with parameters of substantive employment. The aim of present case-study is to understand whether in a hierarchical development canvas, such ideal situation prevails uniformly or an inter- or intra-regional paradoxical situation emerges. If so, the objective is to identify the socio-economic conditions under which such contrasting situation develops, especially in the periphery of a Metropolitan region in a developing nation like India.

It is necessary to conduct many micro-level studies before arriving at generalisations. The present study is a step in that direction. Selecting a small administrative subdivision of Raigad district, adjacent to city of Mumbai in the State of Maharashtra in India, a micro level database on employment related characteristics and educational status of the resident population is created. Adopting a stratified two-stage sample design, the patterns and trends of economic activities of a sample of households (HHs) and individuals, their income distributions along with patterns of educational attainment is examined and analyzed.

A Binary Logistic model is used to identify the determinants of odds of high substantive employment. Findings confirm that besides inter-district variations there is significant intra-district unevenness which adversely affects substantive employment and consequently various indicators of human development.

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Exploring the Predictors of Survival in HIV Positive Patients after Initiation of ART (Antiretroviral Retroviral Therapy) Treatment

In HIV positive persons the level of immunity decreases drastically, if they do not receive drugs or if they missed particular dose or if they are irregular in taking prescribed drug. The lower the immunity greater are the chances of infected getting other opportunistic infections. India has managed to control HIV cases over the past five to six years by bringing in more patients under treatment and by starting counselling and testing centers across the country with many private laboratories apart from the government centers.

Estimates by National AIDS Control Organization (NACO) show that the number of patients surviving and on ART increased from 1, 37, 958 (Year:2013) to 2,19,103 (Year:2014). Thus life expectancy has increased for HIV positive patients since the treatment of ART (Antiretroviral Retroviral Therapy). However, there is a need to better understand the characteristics of long-term survival in HIV-positive patients. The aim of this case study is to explore the factors which cause changes in mortality of HIV positive patients.

Long-term survival in HIV-positive patients receiving ART in Godrej Hospital, ART Center, Vikroli, and Mumbai is examined by using quota sampling method. The data was available on fifty deceased patients therefore fifty living patients were selected randomly. HIV cases were further classified on the basis of gender with 25 males and 25 females in living and deceased patients respectively. Therefore from the recorded data, the information is collected for 100 patients. The overall data depends on time, therefore Kaplan-Meier model is used to estimate survival period during ART care and log rank test to compare survival curves among different groups. Cox proportional hazards model is used to identify independent predictors of mortality and to calculate hazard ratios of predictors.

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Nonparametric Bayesian Estimation of an Unknown Dose

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Estimates of Czech GDP for the Period 1970-1990

Modern macroeconomic statistics is fully dependent on statistical standards. Although figures are once computed, estimated and published, they are always a subject of change. This is mainly the case of measurement of economy and its main outcome, gross domestic product. The paper describes our estimates of gross domestic product for the Czech economy between 1970 and 1990 by most recent national accounts' standard ESA 2010. That time the Czech Socialist Republic was a part of federative Czechoslovakia using Marx based statistical system called Material Product System. These figures are not officially published and they come from our own research. The main issues are connected with the scope of productive activities and recording modern issues compared to previous standard ESA 1995. The amount of non-productive sphere, non-market activities and national accounts methodical adjustments were estimated. The emphasis is put on the recent issues covering research and development, military equipment and the definition of capital formation. These adjustments are put together and resulting gross domestic product should be fully comparable with official data published by the Czech Statistical Office from 1990 onwards. Complete Account of Goods and Services is prepared both at current and previous years' prices. Finally, chain-linked figures are computed and it is possible to compare real economic development from longer perspective.

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A Stochastic Approach of Dynamical Systems by Means of Cocycles

As not all systems of differential equations that describe real world phenomena are deterministic, their approach has to combine the classic study with methods of stochastic analysis, which also provide sharp instruments for the study of deterministic ordinary infinite dimensional equations. A remarkable aspect is that of using analytic method of evolution equations theory, such as the cocycles approach, in order to study the existence problems, and long-time behavior, for the stochastic differential equations.

The aim of this paper is to emphasize some asymptotic behaviors in mean square for stochastic cocycles. Our approach is based on the extension of some techniques from the deterministic framework constructed for skew-evolution semiflows on Banach spaces.

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Definitive Screening Experiments

Design and analysis of experiments is a field that can be very important in sociology, psychology and generally in social sciences. Screening designs are used in the initial stage of experiments to identify the influential factors in a complicated experiment. These experiments are much cheaper than full factorial designs and in some cases they can eventually lead to very good models for the collected data. The main idea behind screening designs is to optimize the cost of the experiment and to improve the quality of the model that will be fitted in a second stage. Screening designs can be very useful in conducting the needed experiments in psychological setups. The main drawback of such experiments is that follow up experiments are needed and further experimentation is required for building good statistical models for our data.

In this work we recall some traditional screening designs and present their properties. We further introduce the latest screening design matrices (the definitive screening design matrices) that were developed the last few years and have additional good fitting properties for building good statistical models for our data. Details of the new designs and their properties are presented and illustrated. An example based comparison of the traditional screening designs and the new definitive screening designs is included in this work.

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The Application of Closed Positive Currents to Quaternionic Pluripotential Theory

In this paper, we establish the quaternionic versions of several results in the complex pluripotential theory by using the quaternionic closed positive currents. We show that quasicontinuity, one of the most important properties of complex plurisubharmonic functions, holds also for quaternionic plurisubharmonic functions in quaternionic space. Moreover, we prove an equivalent characterization of the maximality, which is central to the pluripotential theory. Finally, we study the viscosity solutions to the Dirichlet problem for quaternionic Monge-Ampere equations, which have recently been studied intensively by using the pluripotential method.

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Multiple Failures in Software Reliability Models