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Recent Researches in Applied Informatics

Proceedings of the 6th International Conference on Applied Informatics and Computing Theory (AICT '15)

Salerno, Italy, June 27-29, 2015

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Plenary Lecture 1

Boundary Value Problems and a Class of Functional Equations Arising in the Queuing Theory

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Abstract:
During the past five decades numerous researchers investigated a class of functional equations (FEs), with many important applications (e.g., in communication and networks). The general form of equations from that class is

$$C_1(x,y)P(x,y) = C_2(x,y)P(x,0) + C_3(x,y)P(0,y) + C_4(x,y)P(0,0), \tag{1}$$

where $C_i(x,y)$, $i = 1,2,3,4$, are given functions in two complex variables x, y. The main unknown function $P(x,y)$ is a probability generating function (PGF) and therefore it is defined and analytic in the unit disc of the complex plane.

Particular examples of functional equations of form (1) arise, e.g., in some models of a 2×2 switch [1], an asymmetric switch [2], a queueing system which has applications in the inventory control of database systems [6], the wireless networks [7], a gateway linking two ethernet local area networks [9], a switch transmitting two-class traffic over unreliable channels [10], a multimedia multiplexer [11], and of some other systems [12].

Unfortunately, there is no universal solution method known for such FEs, so far. The most popular technique is a reduction to a boundary value problem, which was pioneered by Malyshev [8] (cf. [4]). An ample discussion on related issues can be found in [3, 5].

For instance, the equation in [9] has the form

$$\begin{aligned}(M(x,y)-xy)\,P(x,y) = {}& (1-y)(M(x,0)+\overline{r}_1\xi_2 xy)P(x,0)\\ &+ (1-x)(M(0,y)+\overline{r}_2\xi_1 xy)P(0,y)\\ &- (1-x)(1-y)M(0,0)P(0,0)\end{aligned} \tag{2}$$

with

$$P(x,y) = \sum_{m,n=0}^{\infty} p_{m,n}x^m y^n, \quad x,y \in \overline{D},$$

being PGF of a sequence of nonnegative real numbers $p_{m,n}$ $(m,n = 0,1,2,\ldots)$ with the normalization condition

$$\sum_{m,n=0}^{\infty} p_{m,n} = 1, \tag{3}$$

and

$$M(x,y) = (\overline{r}_1 + r_1\overline{s}_1 y + \xi_1 xy)(\overline{r}_2 + r_2\overline{s}_2 x + \xi_2 xy),$$

where $0 < r_j, s_j, \xi_j < 1$ for $j = 1,2$ are fixed real numbers and $\overline{q} = 1-q$ for every q.

The lecture concerns possible descriptions (involving also boundary value problem techniques) of solutions to some of equations of type (1); in particular, solutions to (2).

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Brief Biography of the Speaker: Present permanent employment: Department of Mathematics, Pedagogical University, Kraków, Poland;
position of professor
1983 – Master of Science in Mathematics, Jagiellonian University, Kraków, Poland
1991 – PhD in Mathematics
2000 – Habilitation in Mathematics
Major research interests: functional equations and inequalities with their applications, Ulam's type stability (e.g., of difference, differential, functional, integral and operator equations), real and functional analysis, fixed point theory.
Author of over 100 papers that are already printed or accepted for publication.
Chairman of the Scientific Committee of the series of conferences: International Conference on Functional Equations and Inequalities (ICFEI) (http://uatacz.up.krakow.pl/icfei/15ICFEI/)
Chairman of the Organizing Committees of 10th (2005), 11th (2006), 12th (2008), 13th (2009), 14th (2011), 15th (2013), and 16th (2015) ICFEIs (http://uatacz.up.krakow.pl/icfei/15ICFEI/prev.php)
Chairman of the Scientific and Organizing Committees of the conference: Conference on Ulam's Type Stability, Ustron (Poland), June 2-6, 2014 (http://cuts.up.krakow.pl/)
Member of the Programm or Scientific Committees of several other international conferences
Editor (jointly with Th.M. Rassias) of the monograph Functional Equations in Mathematical Analysis (nearly 750 pages; collection of 47 papers of 67 authors), volume 52 (2013) of Springer Optimization and Its Applications series, dedicated to the 100th anniversary of S.M. Ulam
Lead Editor of Banach Center Publications volume 99 (2013) titled: Recent Developments in Functional Equations and Inequalities. Selected Topics
Lead Guest Editor of Abstract and Applied Analysis annual special issues: Ulam's Type Stability (http://www.hindawi.com/journals/aaa/type.stability/) in the years 2012, 2013
Lead Guest Editor of Journal of Function Spaces (formerly: Journal of Function Spaces and Applications) special issue: Ulam's Type Stability and Fixed Points Methods (http://www.hindawi.com/journals/jfs/si/329604/cfp/)
Lead Guest Editor of Discrete Dynamics in Nature and Society special issue: Approximate and Iterative Methods (http://www.hindawi.com/journals/ddns/si/473241/)
Supervisor of four promoted PhD students.
Editor of several international journals.

Plenary Lecture 2

Bayesian Network Approach to Health Informatics: Its Performance and Implications

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Abstract: Health informatics has received a great deal of attentions from both practitioners and academicians due to its huge impact on people's wellness and health policy. However, it has still suffered from lack of sophisticated information technology theory to fulfill rising demands in accuracy and timeliness of health-related policies in many advanced and developing countries. Furthermore, health problems and issues are plagued by many types of complicated causalities among factors affecting health performance. Therefore, to fill the research void like this, I suggest Bayesian network theory as an effective and robust alterative. To show performance of the Bayesian network, I used six years of KNHANES (Korea National Health and Nutrition Examination Survey) dataset (2008~2013) to apply the Bayesian network to investigate how the depression in the elderly is influenced by a number of related explanatory variables such as demographic factors, objective & subjective health-related well-being factors. I could derive a set of useful and meaningful rules from doing a number of what-if and goal-seeking simulations with the resulted Bayesian network models. Through a series of structured interview with health professionals, I found that the causal rules obtained from the Bayesian network possess a great deal of implications for the health practitioners and researchers as well. I hope that this study may shed more practical lights on future studies on health informatics focusing on the usage of IT (information technology).

Brief Biography of the Speaker: Dr. Kun Chang Lee is a full professor of MIS at SKKU Business School in Sungkyunkwan University, South Korea. He is a Distinguished Professor holding SKKU Fellowship. He received his PhD degree in artificial intelligence-based decision making MIS from KAIST (Korea Advanced Institute of Science and Technology). He is on the editorial board at several international journals such as Online Information Review (SSCI), Scientia (SCIE), Journal of Universal Computer Science (SCIE), and Information (SCIE). He conducted as a guest editor in Decision Support Systems, Online Information Review (SSCI), Electronic Commerce Research and Applications (SSCI), and Computers in Human Behavior (SSCI). He has presented papers regularly in a number of prestigious international conferences like HICSS (Hawaii International Conference on System Sciences), AMCIS (Americas Conference on Information Systems), and ICIS (International Conference on Information Systems). Professor Lee is an internationally recognized authority on decision making & support, ubiquitous computing, intelligent systems, creativity science, human-robot interaction, human-computer interaction, and health mining. His publication records include over 200 articles in scholarly and professional journals. Refer to http://scholar.google.co.kr/citations?user=i2B1Rj8AAAAJ&hl=en for more details on Professor Lee's academic records. He has contributed to a number of international conferences as a program committee member, including CONTEXT (International and Interdisciplinary Conference on Modeling and Using Context), ACIIDS (Asia Conference on Intelligent Information and Database), WORLDCOMP (World Congress in Computer Science, Computer Engineering, and Applied Computing), UCMA (International Conference Ubiquitous Computing and Multimedia Applications), UBICOMM (International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies), PACIS (Pacific Conference on Information Systems), IASTED International Conference on Artificial Intelligence and Applications, International Conference on Intelligent Systems and Control, International Conference on Ubiquitous Information Management and Communication, IASTED International Conference on Computational Intelligence, International Workshop on Improved Mobile User Experience (IMUx), and IADIS International Conference on Information Systems, among others.