

Editors:

Subhas C. Misra, Harvard University, U.S.A.
Roberto Revetria, Univ. degli Studi di Genova, Italy
Les M. Sztandera, Philadelphia University, U.S.A.
Mihaela Iliescu, Politehnica University of Bucharest, Romania
Azami Zaharim, Universiti Kebangsaan Malaysia, Malaysia
Hamed Parsiani, University of Puerto Rico, Puerto Rico



RECENT ADVANCES IN APPLIED COMPUTER SCIENCE

**Recent Advances in Computer Engineering
A Series of Reference Books and Textbooks**

**Proceedings of the 8th WSEAS International Conference
on APPLIED COMPUTER SCIENCE (ACS'08)**

VENICE, ITALY, NOVEMBER 21-23, 2008

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Preface

This book contains the proceedings of the 8th WSEAS International Conference on APPLIED COMPUTER SCIENCE (ACS'08) which was held in Venice, Italy, November 21-23, 2008. This conference aims to disseminate the latest research and applications in Programming Languages, Software Engineering, Educational Software, Software Metrics, Object-Oriented Analysis and Design, Data Mining and other relevant topics and applications.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from <http://www.wseas.org/reports>. Your feedback encourages the society to go ahead as you can see in <http://www.worldses.org/feedback.htm>

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: www.worldses.org/indexes

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

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Keynote Lecture

Multivariate Data Completion or Addition on a Single Curve Representation of a Hyperrectangulargrid via Fluctuation Suppression



Professor Metin Demiralp

Istanbul Technical University, Informatics Institute,
Group for Science and Methods of Computing,
Istanbul, TURKIYE

Abstract: This work is somehow about multivariate interpolation. If an N -variate function is given at certain points of the cartesian space of the N independent variables and its value at a point which is outside the data given points is sought then various methods available in the literature can be used to find this value. However, there is almost no unique universal way to do so and each method has its own capability, efficiencies, deficiencies and pitfalls. Data completion and data mining techniques can also be considered amongst them.

The work focuses on a finite hypergrid in N -dimensional cartesian space first and then a multivariate function's values are assumed to be given at certain nodes (we call them full nodes) of this grid. The next step is the dimension reduction. To this end we construct a single continuous curve passing through all nodes of the grid with respect to an appropriately chosen ordering. Curve construction is not unique and depends on the ordering of the nodes. It is better to choose the curves whose mathematical definitions are rather simple. This construction leaves us to use just a single parameter to specify any location on the curve. Although the nodes are defined as N tuples in the N -dimensional cartesian space their locations can also be given in terms of the curve parameter. Hence, the data completion or addition problem is converted to a univariate interpolation which is rather simple.

The full nodes are now represented by ordered pairs whose first elements are the position parameter values on the constructed curve while the second elements are the multivariate function's values at those points. Data completion (to inject one or a few missing data to a data set which is almost full everywhere) or data addition (to evaluate the function's value at an empty node within a sparsely data given hypergrid) then becomes to seek the multivariate function's value at a specified node which corresponds to a unique position on the curve.

There are a lot of univariate interpolation methods, each of which can be used for the interpolation on the curve defined above depending on the nature of the demands and produces some unavoidable errors. Quite recently a new method of interpolation is developed by Demiralp. It uses the Fluctuationlessness Theorem (conjectured and proven by Demiralp recently). Theorem dictates us that the matrix representation of a function over a subspace of the Hilbert space for analytic and square integrable functions is equal to the image of the independent variable's matrix representation on the same subspace under the same function as long as the fluctuation terms (differences between the means of specified powers of the independent variable and the same specified power of the mean of the independent variable). This fact can be used to approximate an integral and a quadrature like formula (the linear combination of the function values at certain points with positive linear combination coefficients (we call weights) can be obtained. The quality of the approximation depends on the dimension of the subspace mentioned above and becomes better as the dimension increases. Hence the two sufficiently high consecutive dimension will give the same value for the integration under consideration within a prescribed accuracy.

The integrand of the abovementioned integral is chosen in such a way that it becomes a linear combination of given values of the multivariate function for, say, n dimensional subspace while the same value is expressed as another linear combination of the given function values and the single sought values of the same function for the $(n + 1)$ dimensional subspace. Since these two expressions should produce the same value it is possible to extract the sought value of the function under consideration. Presentation will focus on these topics and certain remarks.

Acknowledgment:

Author is grateful to Turkish Academy of Sciences for its support.

Brief Biography of the Speaker: Metin Demiralp was born in Turkey on 4 May 1948. His education from elementary school to university was all in Turkey. He got his BS, MS, and PhD from the same institution, Istanbul Technical University. He was originally chemical engineer, however, through theoretical chemistry, applied mathematics, and computational science years he is working on methodology for computational sciences. He has a group (Group for Science and Methods of Computing) in Informatics Institute of Istanbul Technical University (he is the founder of this institute).

He collaborated with the Prof. H. A. Rabitz's group at Princeton University (NJ, USA) at summer and winter semester breaks during the period 1985--2003 after his 14 months long postdoctoral visit to same group in 1979--1980.

Metin Demiralp has roughly 70 papers in well known scientific journals and is the full member of Turkish Academy of Sciences ince 1994. He is also a member of European Mathematical Society and the chief--editor of WSEAS Transactions on Mathematics currently. He has also two important awards of Turkish scientific establishments.

Plenary Lecture I

Computational Design of Optical Fibers with Desirable Consumer Characteristics



Professor Les M. Sztandera

Based on research project with Xi Chen and Hugh Cartwright

Computer Information Systems,
Philadelphia University,
Philadelphia, PA 19144,
U.S.A.

Phone: +12159515356,
Fax: +12159512652,

Email: SztanderaL@PhilaU.edu

Abstract: Taking advantage of techniques from the field of Artificial Intelligence, the goal of our research is to construct systems that can computationally design polymer optical fiber formulations with specified desirable consumer characteristics. Polymers can offer cost effective and easily handled and installed optical components provided that materials are found that possess the necessary optical properties and reliability, so as not to be a barrier to commercial insertion. In this research we are focusing on two of the parameters, glass transition temperature and refractive index that influence a desired outcome in polymer optical fibers. Previous research indicated that performance can be optimized by engineering a polymer that exhibits a lower refractive index and glass transition temperature.

Brief Biography of the Speaker: Les M. Sztandera is a Professor of Computer Information Systems at Philadelphia University and served as Distinguished Fulbright FLAD Chair in Information Systems. He earned an MS from University of Missouri, MO, and a PhD from the University of Toledo, OH. His research interests focus on computational intelligence, while teaching areas encompass information systems, data mining and decision support systems. He has been involved in a variety of research activities.

Plenary Lecture II

Adopting Agile Software Project Management Practices: Success Factors, Changes Required, and Challenges



Dr. Subhas C. Misra

Harvard University, Boston,
U.S.A.

Email: s_c_misra@yahoo.com

Abstract: Agile software development (ASD) is an emerging approach in software engineering, initially proposed and promoted by a group of seventeen software professionals who practice a set of “lightweight” methods, and share a common set of values of software development. They consolidated their thoughts, and defined these methods as “agile”. The approaches are based on experiences and best practices from the past by the above-mentioned group of seventeen software professionals. ASD practices give importance to development around motivated individuals, give them the freedom and flexibility to make them productive, and “think outside of the box”. The agile philosophy believes in project implementation around motivated individuals. Motivated individuals should be provided the environment, and support needed for them to make them successful. As an emerging approach of this century, agile software development has undergone limited number of empirical studies. In this keynote lecture, I advance the state-of-the-art of the research in this area by conducting survey-based ex-post-facto empirical (quantitative) studies by identifying the success factors from the perspective of software practitioners in agile software development projects. In this keynote lecture, I also suggest a ranked list of changes required and challenges involved in adopting agile software development methodologies by projects practicing plan-driven software development.

Brief Biography of the Speaker: Dr. Subhas C. Misra is currently a V. Scientist at Harvard University, Boston, USA. He received his Ph.D. degree from Carleton University, in Ottawa, Canada, and M.S. and M.Tech. degrees respectively from the University of New Brunswick, in Fredericton, Canada, and the Indian Institute of Technology (IIT), at Kharagpur, India. Dr. Misra has several years of experience working in the academia, and the public and private sectors in research, teaching, consulting, project management, architecture, software design and product engineering roles. His current research interests include the areas of software management, software quality management, and information systems security, which are multidisciplinary, combining the fields of software engineering, information systems, organizational behavior, and technology and operations management. Dr. Misra has authored over 50 scholarly research papers and published 5 books.

He has won Best Research Paper Award in an international conference held in the United States. He was also the recipient of more than 15 academic awards and fellowships such as the Achievement Award at the 2007 World Congress held in Las Vegas in the United States for “contribution and dedication” to his field, and the Canadian Government’s NSERC Post Doctoral Fellowship. A mention about him and his work has also appeared in the June 8, 2007 issue of the Carleton Now newspaper. His biography has also been selected to appear in the Cambridge Blue Book, Cambridge, England, 2008.

Dr. Misra is the Managing Editor/Associate Editor of more than ten international journals. He was invited to serve as Program chair, Organizing Chair, and Session Chair in different international conferences. He has been serving in the program committees of over a dozen international conferences.

Dr. Misra was also invited to offer keynote lectures in more than a dozen international conferences in different countries of North America, Europe, and Asia. Recently, he was invited to deliver a keynote lecture in the World Congresses held in UC Berkeley (California, USA) and Imperial College (London, USA).

Plenary Lecture III

Artificial Intelligence Methods in the Interpretation of Statistical Testing of Genes under Hypothetical Balancing Selection



Professor Krzysztof A. Cyran

Institute of Informatics,
Silesian Univ. of Technology,
Gliwice,
POLAND

Email: Krzysztof.Cyran@polsl.pl

Abstract: The detection of natural selection at the molecular level is one of the crucial problems in contemporary population genetics. There exists a number of statistical tests designed for it, however the interpretation of the outcomes is often obscure, because of the existence of factors like: population growth, migration and recombination. The author has proposed the multi-null methodology, and he applied it for four genes implicated in human familial cancer: ATM, RECQL, WRN and BLM. Because of high computational effort required for estimating critical values under nonclassical nulls, mentioned methodology is not appropriate for selection screening. Therefore, the author in this plenary lecture presents novel, artificial intelligence based methodology, helpful in the interpretation of the tests outcomes applied only versus classical null hypotheses. This method does not require long-lasting simulations and, as it is shown in a lecture, it gives reliable results. As examples of artificial intelligence methods the rough set theory and artificial neural networks are used in the aforementioned problem.

Brief Biography of the Speaker: Krzysztof Cyran was born in 1968, in Cracow, Poland. He received MSc degree in computer science (1992) and PhD degree (with honours) in technical sciences with specialty in computer science (2000) from the Silesian University of Technology SUT, Gliwice, Poland. His PhD dissertation addresses the problem of image recognition with the use of computer generated holograms applied as ring-wedge detectors. In 2003-2004 he was a Visiting Scholar in Department of Statistics at Rice University in Houston, US. He is currently the Assistant Professor and the Vice-Head of the Institute of Informatics at SUT.

Dr Cyran has received several awards of the Rector of the SUT for his scientific achievements. In 2004-2005 he was a member of International Society for Computational Biology. He is a member of the Editorial Board of Journal of Biological Systems and a reviewer for Optoelectronic Review, Mathematical Biosciences and Engineering, and Studia Informatica.

He has been an author and co-author of more than 60 technical papers in journals (several of them indexed by Thomson Scientific) and conference proceedings, and has been involved in numerous statutory projects led at the Institute and some scientific grants awarded by the State Committee for Scientific Research. His current research interests are in image recognition and processing, artificial intelligence, digital circuits, decision support systems, rough sets, computational population genetics and bioinformatics.

Plenary Lecture IV

A Risk Management Model for Software Project Management



Professor Khairuddin Hashim

Department of Software Engineering,
Tenaga Nasional University
MALAYSIA

Email: Khairuddin@uniten.edu.my

Abstract: Risk management is an important element in software project management due to increase in budget investments of software development projects and stiff business competition requiring urgent deadlines. The presentation will discuss a risk management model to support software project management that includes risk identification, risk analysis, risk prioritization, risk monitoring and risk control. The model incorporates problem analysis of historical data of projects which gives a good basis for risk projection of future projects.

Brief Biography of the Speaker: Prof. Dr. Khairuddin is currently professor at the Department of Software Engineering, Tenaga Nasional University, Malaysia. He graduated with a Ph.D. in computing science from the University of Bath, United Kingdom, in 1989. He has research interest, publications and international conference presentations on requirements engineering, software reuse, software risk management, software project management, human computer interaction and adaptive learning.

Dr. Khairuddin has over 20 years experience in academia spread over three academic institutions - University of Malaya, Tun Abdul Razak University and Tenaga Nasional University. He was a visiting professor at McGill University in 1995 and a research scholar at Kyoto University in 1993. Dr. Khairuddin was consultant for SIDA (Swedish International Development Agency) in 2003. He was also a member of several international conference paper committees. He held top level administrative university posts such as Deputy President (Academic), Vice President (Technology) and Dean of Faculty.

Apart from university related work, Prof. Dr. Khairuddin is/was also involved in being: panel member of Open System Expert Group for the Public Sector, Chief Editor of the Malaysian Journal of Computer Science, Software Engineering Consultant to Malaysian Institute of Microelectronic Systems (MIMOS), panel assessor for DAGS (Demonstrator Application Grant Scheme) for National IT Council, panel assessor for the Industry Research and Development Grant Scheme (IGS), member of Expert Group Service Sector (Information Technology) for IRPA (Intensified Research in Priority Areas), MSC Research & Development Grant Scheme Technology Assessment Consultant, Science Fund ICT Assessor and TechnoFund ICT Cluster Technology Assessment Consultant.

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