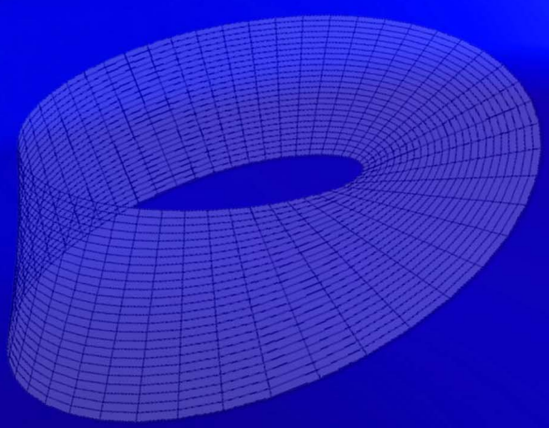
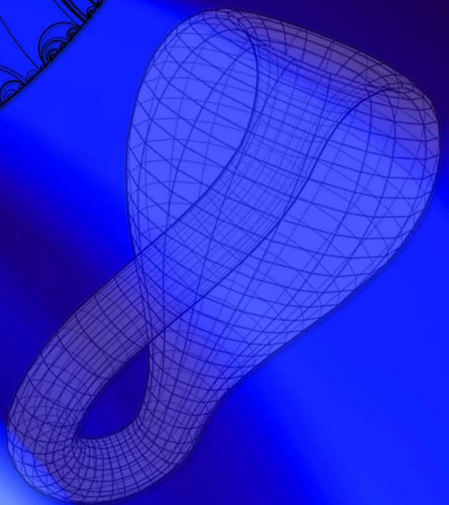
Mathematical Models and Computational Methods

2nd Edition

- Proceedings of the International Conference on Applied Mathematics, Computational Science & Engineering (AMCSE 2015)
- Proceedings of the International Conference on Mathematical Models and Methods in Applied Sciences (MMMAS 2015)
- Proceedings of the International Conference on Economics and Applied Statistics (EAS 2015)

Agios Nikolaos, Crete, Greece, October 17-19, 2015





Edited by

Imre J. Rudas

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Mathematics and Computers in Science and Engineering Series | 55

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All papers of the present volume were peer reviewed by no less than two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.

Series: Mathematics and Computers in Science and Engineering Series | 55

ISSN: 2227-4588
ISBN: 978-1-61804-350-4

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Plenary Lecture 1

A Comparison of Evolutionary Algorithms to Construct Phylogenetic Trees and Language Families

Professor Peter Z. Revesz
Department of Computer Science and Engineering
University of Nebraska-Lincoln
USA
E-mail: revesz@cse.unl.edu

Abstract: Computer algorithms for the reconstruction of phylogenetic trees based on genome data have greatly facilitated the study of biological evolution. However, the existing phylogenetic tree algorithms often give implausible and sometimes clearly incorrect reconstructions. We present some novel phylogenetic tree algorithms that give biologically more acceptable reconstructions. We also describe how the phylogenetic tree algorithms can be adapted to the study of other types of evolution. In particular, we study the evolution of languages and reconstruct language evolutionary trees. We discuss the similarities and differences in trying to reconstruct phylogenetic trees and language families.

Brief Biography of the Speaker: Peter Z. Revesz holds a Ph.D. degree in Computer Science from Brown University. He was a postdoctoral fellow at the University of Toronto before joining the University of Nebraska-Lincoln, where he is a professor in the Department of Computer Science and Engineering. Dr. Revesz is an expert in databases, data mining, big data analytics and bioinformatics. He is the author of Introduction to Databases: From Biological to Spatio-Temporal (Springer, 2010) and Introduction to Constraint Databases (Springer, 2002). Dr. Revesz held visiting appointments at the IBM T. J. Watson Research Center, INRIA, the Max Planck Institute for Computer Science, the University of Athens, the University of Hasselt, the U.S. Air Force Office of Scientific Research and the U.S. Department of State. He is a recipient of an AAAS Science & Technology Policy Fellowship, a J. William Fulbright Scholarship, an Alexander von Humboldt Research Fellowship, a Jefferson Science Fellowship, a National Science Foundation CAREER award, and a “Faculty International Scholar of the Year” award by Phi Beta Delta, the Honor Society for International Scholars.

Plenary Lecture 2

Knowledge Processing through Parameter Identification and Computer Aided Scale Up/Down in Engineering

Professor Fragiskos Batzias
Laboratory of Simulation of Industrial Processes
Department of Industrial Management and Technology
School of Maritime and Industry
University of Piraeus
Greece
E-mail: fbatzi@unipi.gr

Abstract: Knowledge Processing is a modern domain, forming part of (but not limited to) the Computer Science and Information Technology discipline. On the other hand, 'Parameter Identification' is a method for transforming implicit to explicit knowledge by top-down penetration from surface/empirical to deeper/scientific phenomenological levels. Herein, we present a methodological framework under the form of an algorithmic procedure for optimizing the 'depth' of this penetration by means of techno-economic criteria, since depth increase implies non-linear (due to the validity of the 'Law of Diminishing Returns') increase of Research and Development (R&D) cost. Implementation of this methodology is presented in several topics of Environmental and Chemical Engineering, from the point of view of interdisciplinary R&D. The dimension of such an interdisciplinarity should be emphasized when a Research Programme (especially if concerning environmental or energy issues) is submitted by a consortium to EU or member State authorities for financial support. Finally, the problems, appearing when heterogeneous data/information processing takes place within a Knowledge Base, are analyzed/discussed and certain solutions, through simulation and Model Based Reasoning (MBR), are suggested.

Brief Biography of the Speaker: Prof. Fragiskos Batzias holds a 5years Diploma and a PhD degree in Chemical Engineering, and a BSc in Economics. He has also studied Mathematics and Philosophy. He designed/developed the Laboratory of Simulation of Industrial Processes and the Research Group on Systems Analysis at the Department of Industrial Management and Technology of the University of Piraeus, Greece. He is teaching at the postgraduate courses (i) Systems of Energy Management and Protection of the Environment, running by the University of Piraeus, and (ii) Techno-Economic Systems, running by the Electr. & Comp. Eng. Dept. of the Nat. Tech. Univ. of Athens in cooperation with the University of Athens and the University of Piraeus. His research interests are in chemical engineering systems analysis and knowledge based decision making. He has >100 publications in highly ranked journals and conference proceedings, including 29 research monographs in collective volumes, with 652 citations and an h-index of 13 (Scopus). He has participated (and chaired after invitation from the organizers) in

prestigious international conferences, such as those organized periodically by the IEEE, the European Federation of Chemical Engineering (EFCE), the DECHEMA, CHISA, WSEAS Organizations. He organizes the annual Symposium on Industrial and Environmental Case Studies running successfully since 2004 within the International Conference of Computational Methods in Sciences and Engineering (ICCMSE).

Plenary Lecture 3

Approach to Electric Power Equipment Modelling through Sustainability Key Concepts

Professor Cornelia Aida Bulucea
Faculty of Electrical Engineering
University of Craiova
ROMANIA
E-mail: abulucea@em.ucv.ro

Abstract: Since electrical power is used all over the world, the standards of life and development of civilization are often interpreted in correlation with the use of electricity. Nonetheless, concerns and questions have been raised regarding how to achieve a sustainable industrial metabolism. Integrating technical and ecological aspects should represent a significant challenge to humanity within the present industrial world. In line with this idea, sustainability concepts linked to mathematical models can improve understanding of the efficiencies of electric power equipment and systems and guide improvement efforts. Over the last few decades, international legislation have required environmental impact assessment be carried out for all phases of electric power equipment life, according to Life Cycle Assessment tool, which includes the production phase, operation phase and end-of-life phase. Modelling of all these life stages of electric power equipment might offer solutions for further improvement potential, focusing on patterns that reduce the electricity losses during the use phase, and on alternative technologies for reducing human health and environmental impacts. This lecture addresses some aspects illustrating energy conversion processes during the operation of power transformers and induction motors, as modeling examples of sustainable electric equipment. Taking a holistic view, this study focuses on highlighting that industrial ecology permits an alternate view of anthropogenic applications, related both to technical and environmental reference systems. Modelling of an electric power transformer in the use phase, and of an induction motor operating within an electrically driven system according to an industrial ecosystem pattern enhances thinking that anthropogenic activities can and should be viewed in concert with the entire system on Earth.

Brief Biography of the Speaker: Cornelia Aida Bulucea is currently an Associate Professor in Electrotechnics, Electrical Machines and Environmental Electric Equipment in the Faculty of Electrical Engineering, University of Craiova, Romania. She is graduate from the Faculty of Electrical Engineering Craiova and she received the Ph.D degree from Bucharest Polytechnic Institute. In Publishing House she is author of four books in electrical engineering area. Research work is focused on improved solutions for electrical networks on basis of new electric equipment, and environmental impact assessment of electric transportation systems. She has extensive experience in both experimental and theoretical research work, certified by over 70 journal and conference research papers and 15 research projects from industry. Due to WSEAS

recognition as huge scientific Forum she participated over time in nineteen WSEAS International Conferences, presenting papers and chairing sessions. She was Plenary Speaker in the 13th International Conference on Electric Power Systems, High Voltages, Electric Machines (POWER'13), Chania, Crete Island, Greece, August 27-29, 2013, in the 5th IASME/WSEAS International Conference on ENERGY&ENVIRONMENT (EE'10), held by the University of Cambridge, UK, February 23-25, 2010, in the 4th IASME/WSEAS International Conference on ENERGY&ENVIRONMENT (EE'09),), held by the University of Cambridge, Cambridge UK, February 24-26, 2009, in the 8th WSEAS International Conference on POWER SYSTEMS (PS'08), held by the University of Cantabria, Santander, Spain, September 23-25, 2008. She is very proud by her over 30 papers published in the WSEAS Conferences Books and in the WSEAS TRANSACTIONS ON ENVIRONMENT AND DEVELOPMENT, WSEAS TRANSACTIONS ON POWER SYSTEMS, WSEAS TRANSACTIONS ON CIRCUITS AND SYSTEMS and WSEAS TRANSACTIONS ON ADVANCES IN ENGINEERING EDUCATION.

Plenary Lecture 4

Short Term and Asymptotic Properties of Minimal-Exploration Sequential Allocation Rules

Professor Michael N. Katehakis
Rutgers University
NJ, USA
E-mail: mkatehakis@gmail.com

Abstract: Consider the problem of sampling sequentially from a finite number of N ≥ 2 populations or 'bandits', where each population i is specified by a sequence of random variables {Xki}k≥1, Xki representing the reward received the kth time population i is sampled. For each i, the {Xki }k≥1 are taken to be i.i.d. random variables with finite mean. For any slowly increasing function g, subject to mild regularity constraints, we construct two policies (the g-Forcing, and the g-Inflated Sample Mean) that achieve a measure of regret of order O(g(n)) almost surely as n → ∞. Additionally, asymptotic probability one bounds on the remainder term are established. In our constructions, the function g effectively controls the 'exploration' of the classical 'exploration/exploitation' tradeoff.
When additional parametric assumptions can be made, one can construct policies that are asymptotically optimal in the sense of achieving the lower bound on the logarithmic rate of increase of the regret of Burnetas and Katehakis (1996). We present such asymptotically optimal policies for the cases in which {Xki} are: a) Normal with unknown means and unknown variances and b) Uniform with unknown supports.

Brief Biography of the Speaker: Dr. Katehakis is a Professor in the Management Science and Information Systems Department at Rutgers University and chair of the Department. He holds a courtesy appointment in Rutgers' New Brunswick Department of Mathematics Graduate Faculty, and he is a member of DIMACS the Center for Discrete Mathematics and Theoretical Computer Science, he is a Primary Investigator of CDDA the Rutgers Center for Dynamic Data Analytics, and a member of RUTCOR, the Rutgers Center for Operations Research.
Much of his work has been on the interaction between optimization and statistical inference.
Professor Katehakis joined the Rutgers University faculty after receiving his doctorate in Operations Research at Columbia University under the supervision of Cyrus Derman, and after being a faculty member at SUNY Stony Brook and at the Technical University of Crete. In addition, professor Katehakis was a member of the technical staff at the Operations Research Center of Bell - Laboratories, West Long Branch and a consultant at Brookhaven National Laboratory and he has held visiting appointments and taught at Columbia University, Stanford University and the National and Kapodistrian University of Athens, Greece.
Dr. Michael N. Katehakis is a Fellow of the Institute for Operations Research and the Management Sciences (INFORMS), an Elected Member of the International Statistical Institute (ISI) and a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE).
Dr. Michael N. Katehakis is the President of the College of Service Operations, Production and Operations Management Society (POMS).

Plenary Lecture 5

Artificial Intelligence Technology in Health Informatics

Prof. Abdel-Badeeh M. Salem
Faculty of Computer and Information sciences
Ain Shams University
Cairo, Egypt
E-mail: absalem@cis.asu.edu.eg

Abstract: Artificial intelligence (AI) is science and technology and is based on many disciplines such as: computer science, philosophy, psychology, mathematics, biology, linguistics, knowledge computing and engineering. AI has been mainly studied as computer based technologies. Various intelligent methodologies, computational techniques and knowledge-based systems have been developed for automated reasoning and learning. AI technologies are robust, can be successfully applied to complex problems, efficiently adaptive, and usually have a parallel computational architecture. For those reasons they have been proved to be effective and efficient in developing intelligent systems for many tasks in health sciences.
The aim of this talk is to make an overview of some of AI techniques and approaches and their applications in medical informatics and health care. The talk covers the following applications: (a) expert systems using the case-based reasoning approach for cancer and heart diagnosis, (b) ontological engineering approach for breast cancer knowledge management, and (c) mining patient data using rough sets theory to determine thrombosis disease.

Brief Biography of the Speaker: Prof. Dr. Abdel-Badeh M Salem is a professor emeritus of Computer Science since September 2007 till now. He was a former Vice Dean of the Faculty of Computer and Information Sciences at Ain Shams University, Cairo-Egypt (1996-2007). He was a professor of Computer Science at Faculty of Science, Ain Shams University from 1989 to 1996. He was a Director of Scientific Computing Center at Ain Shams University (1984-1990). His research includes intelligent computing, expert systems, medical informatics, and intelligent e-learning technologies. He has published around 350 papers in refereed journals and conference proceedings in these areas. He has been involved in more than 400 conferences and workshops as an Int. Program Committee , organizer and Session Chair. He is author and co-author of 15 Books in English and Arabic Languages.
He was one of the founders of the following events, First Egyptian Workshop on Expert Systems 1987, Int. Cairo Conference on Artificial Intelligence Applications in 1992 and Int. Conf. on Intelligent Computing and Information Systems 2002, and one of the main sustainers of annual Int. Romanian Internet Learning Workshop Project (RILW), 1997. In addition he was Secretary of Egyptian Computer Society (1984-1990), Member of National Committee in Informatics – Academy of Scientific Research and Technology (1992-200), Member of Egyptian Committee in the Inter-Governmental Informatics Program, IIP-UNISCO, Paris (1988-1990) and Coordinator of

the Annual International Conference for Statistics, Scientific Computing, and Social and Demographic Research (1983-1990). In addition he was a partner of a MEDCAMPUS Projects on Methodologies and Technologies for Distance Education in Mediterranean (1993-1995)

He is a member of the Editorial Board of the following Journals: Int. Journal of Computing and Information Sciences(IJCIS), Canada; Egyptian Computer Science Journal, EC Newsletter, Education in Computing and Computers in Education, Italy; Scientific Journal of Studia Universitatis Babes-Bolyai, Series Informatica, Cluj – Napoca, Romania; International Journal of intelligent computing in medical sciences and image processing (IC- MED), Japan; Egyptian Journal for Specialized Studies, Faculty of Specific Education,Ain Shams University,Egypt; Int. Journal of Intelligent Computing & Information Science",IJICIS, Egypt; Enformatika Transactions on Engineering, Computing and Technology, World Enformatika Society, Turkey; and Int. Journal of Soft Computing Approaches (IJSCA), Eurojournals.

He is a member of Int. Scientific Societies: American Association of Artificial Intelligence (AAAI), USA; British Computer Society, Expert Systems Specialist Group (SGES), Int. Neural Network Society (INNS), USA; Association for the Advancement of Computing Education (AACE), USA; Int. Society for Computers and their Applications ((ISCA), NC, USA, Dec. 95); Int. Society for Telemedicine & eHealth ISfTeH,, Switzerland; Member of Int. Federation for Information Processing (IFIP) Technical Committee WG 12.5, Knowledge-Oriented Development of Applications, Austria (2000 till now), Member of Int. Association for Science and Technology for Development (IASTED), TC on AI and Expert Systems, Int. Association for Science and Technology for Development, Canada, (2000 till now).