WILEY ENCYCLOPEDIA OF

COMPUTER SCIENCE
AND ENGINEERING

VOLUME 1

WILEY ENCYCLOPEDIA OF COMPUTER SCIENCE AND ENGINEERING

WILEY ENCYCLOPEDIA OF

COMPUTER SCIENCE AND ENGINEERING

VOLUME 1

Benjamin W. Wah
Editor

PREFACE

This encyclopedia was developed with two goals in mind: first, to provide a thorough treatment of the core knowledge in this important discipline and, second, to offer a broad coverage on the latest advances in the area. A decade in the making, this comprehensive reference of 333 articles encompasses essentially every aspect of the fast-growing field of computer science and engineering. As a reference and an educational tool, it is meant to reinforce current knowledge and to provide a foundation for further understanding. It is our hope that it will serve as a useful source on the current state-of-the-art and guide readers in understanding classic concepts.

This compendium of information will serve readers from diverse backgrounds and training—from practicing engineers to researchers, from designers to managers, and from government officials to university students—all who wish to keep abreast of knowledge and techniques in this broad field. Each article was written without assuming an advanced background on computing, although a certain degree of sophistication and experience may be necessary when reading the articles. Casual readers will also be able to browse the high-level descriptions and illustrations to gain a more general understanding of subjects covered. In addition, each article not only highlights the most salient and important aspects of a topic, but also it provides a starting point for additional study through a comprehensive bibliography.

The articles were authored by experts in their respective areas, who provide both historical perspectives as well as a comprehensive treatment of up-to-date knowledge and evolving ideas. Each is intended to provide an overview of the individual topic, from conceptual as well as practical points of view, summarizing the crucial developments and standard practices of the past, along with new techniques and evolving ideas. The articles collectively cover broad concepts as well as fundamental theory, both generously illustrated with examples and diagrams. Although the articles eschew extensive development of theory and proofs, they provide pointers and references to specialized concepts and models.

An online version, complete with hyperlinks and color illustrations, complements the print edition, and with the inclusion of a powerful search engine, users can readily locate pertinent articles sorted by relevance. Because computing is a rapidly evolving area, the online version will be a growing project with new articles to be added and existing articles to be revised on a frequent basis.

The topics in computer science and engineering are grouped into the following ten areas:

Subject Area	Area Editor
Hardware and Architecture	Joseph R. Cavallaro
Parallel and Distributed Systems	Ten-Hwang (Steve) Lai
Intelligent Systems	Ning Zhong
Software	Farokh B. Bastani
Data	Jeffrey J. P. Tsai
Foundations and Theory	John Franco
Image Processing and Computer Vision	Mubarak Shah
Visualization	Rynson W. H. Lau
Applications	Michael Berry
Computing Milieux	John Impagliazzo

Drawing from various sources, including Webster's *Wiley Encyclopedia of Electrical and Electronics Engineering*, an initial list of topics was identified. The list was then enhanced by the area editors, who suggested authors and reviewers for the articles. We also solicited potential invitees from authors and reviewers themselves. Cassie Craig, Associate Editor at John Wiley & Sons, coordinated the actual invitations and reviews of the articles. Each article was read by two to three reviewers, and authors were generally asked to revise their articles to address reviewers' comments. In many cases, the articles were re-reviewed and revised a second time before they were formally accepted.

I am deeply indebted to the many people who have contributed to bringing this encyclopedia to fruition. The project was started almost ten years ago with the encouragement of Prof. C. V. Ramamoorthy, Professor Emeritus of the University of California, Berkeley, and George Telecki, Editor at John Wiley & Sons. I owe the encyclopedia's outstanding content to the hundreds of authors who contributed their works and to the numerous reviewers who helped refine the articles. I am grateful

to the ten area editors, who were instrumental in focusing the coverage of the encyclopedia and in identifying experts to invite. Cassie Craig and all the support staff at Wiley helped me tremendously in managing the logistics and the details of running the project. Cassie, in particular, communicated with the authors and reviewers to ensure a smooth submission process for their articles and reviews. My assistant, Meng-Fei Cheng, coordinated with students at my university to identify potential invitees. Lastly, I would like to thank Christine, my wife, and our twin daughters, Catherine and Elaine, for their never-ending support and encouragement. I am very fortunate to have had the support of my friends and family in realizing my goal of a comprehensive and authoritative resource on computer science and engineering.

BENJAMIN W. WAH

University of Illinois,
Urbana-Champaign

CONTENTS

CONTRIBUTORS

Robin Abraham, Microsoft Corporation, Redmond, Washington, *Spreadsheet Programming*

Rajesh Aggarwal, Department of Computer Information Systems, Middle Tennessee State University, Murfreesboro, Tennessee, *Electronic Data Interchange*

Robert Akl, University of North Texas, Denton, Texas, *Real-Time Systems: An Introduction and the State-of-the-Art*

Tatsuya Akutsu, Bioinformatics Center, Institute for Chemical Research, Kyoto University, Kyoto, Japan, *Bioinformatics*

Ahmet Oğuz Akyüz, University of Central Florida, Orlando, Florida, *Rendering*

Gita Alaghband, Department of Computer Science and Engineering, University of Colorado at Denver, Denver, Colorado, *Parallel Architectures*

P. S. C. Alencar, Department of Computer Science, University of Waterloo, Waterloo, Ontario, Canada, *Abstract Data Types*

Sergey Aleynikov, Department of Biomedical Engineering, Rutgers University, Piscataway, New Jersey, *Biologically Inspired Neural Computation*

Manual Alfonseca, Departamento de Ingeniería Informática, Universidad Autónoma de Madrid, *Program Interpreters*

Eric Allender, Department of Computer Science, Rutgers University, Piscataway, New Jersey, *Computational Complexity Theory*

Khalid S. Al-Olimat, Electrical and Computer Engineering and Computer Science Department, Ohio Northern University, Ada, Ohio, *Fuzzy Logic Control Systems*

Vishal Anand, The College at Brockport—State University of New York, Brockport, New York, *Fiber-Optic Communication Networks*

Alex M. Andrew, University of Reading, Berkshire, United Kingdom, *Cybernetics*

Lachlan L. H. Andrew, California Institute of Technology, Pasadena, California, *Transport Layer*

Rashid Ansari, University of Illinois at Chicago, Chicago, Illinois, *Data Compression*

Stephen Arndt, Nuclear Regulatory Commission, Washington, DC, *Nuclear Reactor Instrumentation and Control Systems*

Hossein Arsham, Department of Information Systems, University of Baltimore, Baltimore, Maryland, *Gradient-Based Optimization Techniques for Discrete Event Systems Simulation*

Jorge Luis Audy, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil, *Distributed Project Management*

David August, Department of Computer Science, Princeton University, Princeton, New Jersey, *Speculation*

Donald J. Bagert, Department of Computer Science, Southeast Missouri State University, Cape Girardeau, Missouri, *Education and Training in Software Engineering*

Nijaz Bajgoric, University of Sarajevo, School of Economics and Business, Sarajevo, Bosnia and Herzegovina, *Operating Systems: A Business Perspective*

Hujun Bao, Zhejiang University, Hangzhou, China, *Mesh Deformation*

Henk Barendregt, Institute for Computing and Information Sciences, Radboud University Nijmegen, Nijmegen, The Netherlands, *Proofs of Correctness in Mathematics and Industry*

Winona C. Barker, Protein Information Resource and Georgetown University Medical Center, Washington, DC, *Bioinformatic Databases*

Steven M. Barnhart, Rutgers, The State University of New Jersey, New Brunswick, New Jersey, *Behavioral Sciences and Computing*

Angel Barriga, University of Seville-Institute of Microelectronics, Seville, Spain, *Logic Synthesis*

Klaus Jürgen Bathe, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts, *Finite Element Model*

Michal Batko, Department of Computer Systems and Communications, Masaryk University, Brno, Czech Republic, *File Organizations*

Lee Belfore, Department of Electrical and Computer Engineering, Old Dominion University, Norfolk, Virginia, *Autonomous Test Generation*

Tim Bell, Department of Computer Science and Software Engineering, University of Canterbury, Christchurch, New Zealand, *Computing Pre-University: Primary Computing Education*

Calin Belta, Boston University, Brookline, Massachusetts, *Robot Motion Planning*

Alastair Beresford, Laboratory for Communication Engineering, University of Cambridge, Cambridge, United Kingdom, *Data Privacy*

Bernd A. Berg, Department of Physics, Florida State University, Tallahassee, Florida, *Markov Chain and Monte Carlo Simulations*

Elisa Bertino, Department of Computer Science, Purdue University, West Lafayette, Indiana, *Object-Oriented Databases*

Bir Bhanu, College of Engineering, University of California, Riverside, California, *Fingerprint Identification*

Zhuming Bi, University of Ontario Institute of Technology, Oshawa, Ontario, Canada, *Robot Kinematics*

Giovanna M. Bianco, Faculty of Educational Science, University of Verona, Verona, Italy, *Computing Pre-University: Primary Computing Education*

Alain Billoire, Service de Physique Théorique, Gif-sur-Yvette, France, *Markov Chain and Monte Carlo Simulations*

Christina Björkman, Mälardalen University, Västerås, Sweden, *Women in Computing*

Bruce W. Bomar, The University of Tennessee Space Institute, Tullahoma, Tennessee, *Microprogramming*

Sami Brandt, Department of Electrical and Information Engineering, University of Oulu, Oulu, Finland, *Geometric Camera Calibration*

Johan Brichau, Université catholique de Louvain, Louvain-la-Neuve, Belgium, *Aspect-Oriented Software Development: An Introduction*

Selmer Bringsjord, Cognitive Science Department, Rensselaer Polytechnic Institute, Troy, New York, *Cognitive Systems and Cognitive Architectures*

Barrett R. Bryant, Department of Computer and Information Sciences, University of Alabama at Birmingham, Birmingham, Alabama, *Component-Based Software Engineering*

Bernd Burgstaller, Yonsei University, Seoul, Korea, *Program Assemblers*

Margaret Burnett, Oregon State University, Corvallis, Oregon, *Spreadsheet Programming*

Diana K. Byrne, Corvallis, Oregon, *Electronic Calculators*

Kai-Yuan Cai, Beijing University of Aeronautics and Astronautics, Beijing, China, *Software Cybernetics*

Xia Cai, Department of Computer Science and Engineering, The Chinese University of Hong Kong, Shatin, Hong Kong, *Fault-Tolerant Software*

João Cangussu, Department of Computer Science, University of Texas at Dallas, Richardson, Texas, *Software Cybernetics*

Fei Cao, Microsoft Corporation, Redmond, Washington, *Component-Based Software Engineering*

Jiannong Cao, Software Management and Development Lab, Department of Computing, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, *Visual Software Engineering*

Xiaojun Cao, Georgia State University, Atlanta, Georgia, *Fiber-Optic Communication Networks*

Oscar Castillo, Graduate Division, Tijuana Institute of Technology, Chula Vista, California, *Fuzzy Modeling Fundamentals*

M. Felipe Cátedra, Computer Sciences Department, Universidad de Alcalá, Alcalá de Henares, Spain, *Ray Tracing Acceleration Techniques*

Gianpiero Cattaneo, Università di Milano—Bicocca, Milano, Italy, *Posets and Lattices*

Joseph R. Cavallaro, Rice University, Houston, Texas, *Communication Processors for Wireless Systems*

Chang Chang, Microsoft Digital Media Group, Redmond, Washington, *Data Compression*

Barbara M. Chapman, Department of Computer Science, University of Houston, Houston, Texas, *Optimizing Compilers*

Arbee L. P. Chen, National Chengchi University, Taipei, Taiwan, *Data Analysis*

Baoquan Chen, University of Minnesota at Twin Cities, Minneapolis, Minnesota, *High-Quality Texture Mapping and Rendering of Point Models*

Chi Hau Chen, Department of Electrical and Computer Engineering, University of Massachusetts—Dartmouth, North Dartmouth, Massachusetts, *Remote Sensing Information Processing*

Min Chen, Swansea University, Swansea, Wales, United Kingdom, *Volume Graphics and Volume Visualization*

Shu-Heng Chen, Department of Economics, National Chengchi University, Taipei, Taiwan, *Financial Application: Stock Markets*

Albert Mo Kim Cheng, Department of Computer Science, University of Houston, Houston, Texas, *Embedded Operating Systems*

Kwang-Ting (Tim) Cheng, University of California, Santa Barbara, California, *Logic Testing*

Mung Chiang, Princeton University, Princeton, New Jersey, *Transport Layer*

Ruzanna Chitchyan, Lancaster University, Lancaster, United Kingdom, *Aspect-Oriented Software Development: An Introduction*

Olaf Chitil, University of Kent, Canterbury, United Kingdom, *Functional Programming*

Alok Choudhary, Northwestern University, Technological Institute, Evanston, Illinois, *Distributed Files Systems*

Wesley W. Chu, Computer Science Department, University of California, Los Angeles, Los Angeles, California, *Cooperative Database Systems*, *COXML: Cooperative XML Query Answering*

Davide Ciucci, Università di Milano—Bicocca, Milano, Italy, *Posets and Lattices*

J. McGrath Cohoon, University of Virginia, Charlottesville, Charlottesville, Virginia, *Women in Computing*

Luciano Colombo, Department of Physics, University of Cagliari, Cagliari, Italy, *Computational Materials Physics*

Annie Combelles, DNV, Arcueil, France, *Capability Maturity Models (CMM)*

Anne Condon, University of British Columbia, Vancouver, British Columbia, Canada, *Women in Computing*

Kendra Cooper, Department of Computer Science, University of Texas at Dallas, Richardson, Texas, *Object-Oriented Analysis and Design*

S. Barry Cooper, School of Mathematics, University of Leeds, Leeds, United Kingdom, *Computability*

Jeremy R. Cooperstock, McGill University, Montreal, Quebec, Canada, *Human–Computer Interaction*

David Cope, Department of Music, University of California, Santa Cruz, Santa Cruz, California, *Algorithmic Music; Computer Music Composition/Analysis*

Donald Cowan, Department of Computer Science, University of Waterloo, Waterloo, Ontario, Canada, *Abstract Data Types*

David A. Cox, Department of Mathematics and Computer Science, Amherst College, Amherst, Massachusetts, *Algebraic Geometry*

Philip T. Cox, Faculty of Computer Science, Dalhousie University, Halifax, Nova Scotia, Canada, *Visual Programming Languages*

Annemieke Craig, Deakin University, Geelong, Australia, *Women in Computing*

Annie Cuyt, Department of Mathematics and Computer Science, University of Antwerp (CMI), Antwerp, Belgium, *Approximation Theory*

Issam W. Damaj, School of Engineering, Dhofar University, Sultanate of Oman, *High-Level Synthesis; Programmable Logic Arrays*

Bhaskar DasGupta, Department of Computer Science, University of Illinois, Chicago, Illinois, *Biology Computing*

Manoranjan Dash, Nanyan Technological University, Singapore, *Dimensionality Reduction*

Rhian Davies, University of British Columbia, Vancouver, British Columbia, Canada, *Women in Computing*

Sabrina De Capitani di Vimercati, Università degli Studi di Milano, Crema, Italy, *Data Security*

Casimer DeCusatis, IBM Corporation, Poughkeepsie, New York, *Storage Area Networks*

Florent de Dinechin, École Normale Supérieure de Lyon, Université de Lyon, LIP (UMR 5688 CNRS-ENS Lyon-INRIA-UCBL), France, *Digital Arithmetic*

Richard De Lisi, Rutgers, The State University of New Jersey, New Brunswick, New Jersey, *Behavioral Sciences and Computing*

Šandor Dembitz, Faculty of Electrical Engineering and Computing, University of Zagreb, Zagreb, Croatia, *Spell Checker*

Derek Deng, Cambridge–Cranfield High Performance Computing Facility, Cranfield, Bedfordshire, United Kingdom, *Disk Storage*

Peter Denning, Computer Science Department, Naval Postgraduate School, Monterey, California, *Choice Uncertainty Principle; Computing Field: Structure: Great Principles in Computing; Kernel; Locality Principle; Monitor; Overhead; Queueing Networks; Swapping; Thrashing; Throughput; Virtual Memory; Working Set*

Mariangiola Dezani-Ciancaglini, Department of Computer Science, University of Turin, Turin, Italy, *Lambda-Calculus*

Theo D'Hondt, Vrije Universiteit Brussel, Brussels, Belgium, *Aspect-Oriented Software Development: An Introduction*

John F. Dillenberg, Department of Computer Science, University of Illinois at Chicago, Chicago, Illinois, *Data Handling in Intelligent Transportation Systems*

Vlastislav Dohnal, Department of Computer Systems and Communications, Masaryk University, Brno, Czech Republic, *File Organizations*

Josep Domingo-Ferrer, Rovira i Virgili University, Tarragona, Catalonia, Spain, *Statistical Databases*

Jing Dong, University of Texas at Dallas, Dallas, Texas, *Class and Object*

Shing-Hwang Doong, Shu-Te University, Kaohsiung, Taiwan, *Machine Learning*

Christos Douligeris, University of Piraeus, Piraeus, Greece, *Home Automation*

Dimitris C. Dracopoulos, University of Westminster, London, United Kingdom, *Evolutionary Learning*

Mark S. Drew, Simon Fraser University, Vancouver, British Columbia, Canada, *Color Models; Color Perception*

Adam Dunkels, Swedish Institute of Computer Science, Kista, Sweden, *Operating Systems for Wireless Embedded Devices*

Howard Eisner, The George Washington University, Washington, DC, *The Information Age*

Rimon Elias, Computer Science and Engineering Department, The German University in Cairo, New Cairo City, Egypt, *Geometric Modeling in Computer Vision: An Introduction to Projective Geometry*

Miloš D. Ercegovac, Computer Science Department, University of California at Los Angeles, *Digital Arithmetic*

Martin Erwig, Oregon State University, Corvallis, Oregon, *Spreadsheet Programming*

Atilla Eryilmaz, Department of Electrical and Computer Engineering, The Ohio State University, Columbus, Ohio, *Network Flow and Congestion Control*

Jeffrey J. Evans, Department of Electrical and Computer Engineering Technology, Purdue University, West Lafayette, Indiana, *Parallel Programming Tools*

Bart Everett, SPAWAR Systems Center San Diego, San Diego, California, *Autonomous Surveillance Systems*

Wolfgang Faber, Department of Mathematics, University of Calabria, Rende, Italy, *Answer Set Programming*

Xiaocong Fan, School of Engineering, The Pennsylvania State University, Erie, Pennsylvania, *Multi-Agent Systems*

Laurene V. Fausett, Department of Mathematical Sciences, Georgia State University, Statesboro, Georgia, *Hopfield Neural Networks*

Wu-chi Feng, Department of Computer Science, Portland State University, Portland, Oregon, *Video Conferencing and IP Telephony*

John S. Fitzgerald, Newcastle University, Newcastle upon Tyne, United Kingdom, *Vienna Development Method*

Michael Flynn, Department of Electrical Engineering, Stanford University, Stanford, California, *Computer Architecture*

Xinwen Fu, Dakota State University, College of Business and Information Systems, Madison, South Dakota, *Network Security Fundamentals*

Xiuju Fu, Division of Information Engineering, Nanyang Technological University, Singapore, *Artificial Neural Networks*

Paula Gabbert, Furman University, Greenville, South Carolina, *Women in Computing*

Vashti Galpin, University of the Witwatersrand, Johannesburg, South Africa, *Women and Computing*

Vijay Gandhi, Department of Computer Science and Engineering, University of Minnesota, Minneapolis, Minnesota, *Spatial Databases*

Lei Gao, Institute for Integrated Signal Processing Systems, RWTH Aachen University, Aachen, Germany, *Software Instrumentation*

Wei Gao, Department of Computer Science and Engineering, Arizona State University, Tempe, Arizona, *Mobile and Ubiquitous Computing*

Zhen Gao, University of Science and Technology of China, Hefei, China, *Robot Kinematics*

Devendra P. Garg, Duke University, Durham, North Carolina, *Neural Controllers*

Vijay Garg, Department of Electrical and Computer Engineering, University of Texas at Austin, Austin, Texas, *Time and State in Asynchronous Distributed Systems*

David Garlan, School of Computer Science, Carnegie Mellon University, Pittsburgh, Pennsylvania, *Software Architecture*

Minos Garofalakis, Intel Research Berkeley, Berkeley, California, *Very Large Databases*

Mitsuo Gen, Waseda University, Kitakyushu, Japan, *Genetic Algorithms*

Gordan Gledec, Faculty of Electrical Engineering and Computing, University of Zagreb, Zagreb, Croatia, *Spell Checker*

Manfred Glesner, Darmstadt University of Technology, Institute of Microelectronic Systems, Darmstadt, Germany, *Hardware Based Rapid Prototyping*

Amrit Goel, Syracuse University, Syracuse, New York, *Software Effort Prediction; Software Quality Classification Models*

Maya B. Gokhale, Lawrence Livermore National Laboratory, Livermore, California, *Instruction Sets*

Swapna S. Gokhale, Department of Computer Science and Engineering, University of Connecticut, Storrs, Connecticut, *Software Reliability*

Hassan Gomaa, Department of Information and Software Engineering, George Mason University, Fairfax, Virginia, *Concurrent Programming*

Iván González, Computer Sciences Department, Universidad de Alcalá, Alcalá de Henares, Spain, *Ray Tracing Acceleration Techniques*

Steven Graham, Dakota State University, College of Business and Information Systems, Madison, South Dakota, *Network Security Fundamentals*

John Grant, Towson University, Towson, Maryland, *Deductive Databases*

Jeff Gray, Department of Computer and Information Sciences, University of Alabama at Birmingham, Birmingham, Alabama, *Component-Based Software Engineering*

Jozef Gruska, Faculty of Informatics, Masaryk University, Brno, Czech Republic, *Quantum Computing*

Yunghong Gu, National Center for Data Mining, University of Illinois at Chicago, Chicago, Illinois, *Wide Area Networks*

Giovanna Guerrini, Università degli Studi di Genova, Genova, Italy, *Object-Oriented Databases*

Lei Guo, Department of Computer Science and Engineering, The Ohio State University, *Peer-to-Peer Communication*

Indranil Gupta, Department of Computer Science, University of Illinois at Urbana-Champaign, Urbana, Illinois, *Coordination and Synchronization: Designing Practical Detectors for Distributed Systems*

Denise Gurer, TerraVert, Scotts Valley, California, *Women in Computing*

Oscar Gutiérrez, Computer Sciences Department, Universidad de Alcalá, Alcalá de Henares, Spain, *Ray Tracing Acceleration Techniques*

Bruria Haberman, Holon Institute of Technology and Davidson Institute of Science Education, Weizmann Institute of Science, Rehovot, Israel, *Computing Pre-University: Challenges in K-12 Computing Education*

Mohamed Hamada, The University of Aizu, Language Processing Lab, Aizu-Wakamatsu, Japan, *Computer Engineering Education*

Leonard G. C. Hamey, Department of Computing, Macquarie University, Sydney, Australia, *Radiometric Camera Calibration*

Jianchao Han, California State University, Dominguez Hills, Carson, California, *Class and Object*

Allan Hanbury, Vienna University of Technology, Vienna, Austria, *Image Segmentation by Region-Based and Watershed Algorithms*

Mark Hancock, University of British Columbia, Vancouver, British Columbia, Canada, *Women in Computing*

Heather K. Harton, Clemson University, Clemson, South Carolina, *Formal Program Verification*

Hai He, State University of New York, Binghamton, New York, *Data Search Engine*

Janne Heikkilä, Department of Electrical and Information Engineering, University of Oulu, Oulu, Finland, *Geometric Camera Calibration*

Na Helian, Department of Computer Science, University of Hertfordshire, Hatfield, Hertfordshire, United Kingdom, *Disk Storage*

Tor Helleseth, Department of Informatics, University of Bergen, Bergen, Norway, *Algebraic Coding Theory*

Katherine G. Herbert, Montclair State University, Montclair, New Jersey, *Bioinformatic Databases*

Dominikus Herzberg, Department of Software Engineering, Heilbronn University, Heilbronn, Germany, *Software Engineering for Telecommunications Systems*

J. Roger Hindley, Department of Mathematics, Swansea University, Swansea, Wales, United Kingdom, *Lambda-Calculus*

Thomas Hollstein, Darmstadt University of Technology, Institute of Microelectronic Systems, Darmstadt, Germany, *Hardware Based Rapid Prototyping*

Clyde W. Holsapple, University of Kentucky, Lexington, Kentucky, *Decision Support Systems: Foundations and Variations*

Michael Horsch, Department of Computer Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada, *Bayesian Belief Networks*

Gábor Horvath, Budapest University of Technology and Economics, Budapest, Hungary, *Cerebellar Model Arithmetic Computer*

Harry Hsu, Compal Communications, Inc., Taipei, Taiwan, *Robot Path Planning*

Zhang-Zhi Hu, Protein Information Resource and Georgetown University Medical Center, Washington, DC, *Bioinformatic Databases*

Kien A. Hua, School of Electrical Engineering and Computer Science, University of Central Florida, Orlando, Florida, *Parallel Database Management Systems*

Xian-Sheng Hua, Microsoft Research Asia, Beijing, China, *Content-Based Multimedia Retrieval*

Dazhi Huang, Department of Computer Science and Engineering, Arizona State University, Tempe, Arizona, *Mobile and Ubiquitous Computing*

K. C. Hui, The Chinese University of Hong Kong, Shatin, Hong Kong, *Surface Modeling; Surface Deformation; Solid Modeling*

Patrick Hung, Department of Electrical Engineering, Stanford University, Stanford, California, *Computer Architecture*

A. R. Hurson, University of Missouri-Rolla, Rolla, Missouri, *Dataflow Computers: Their History and Future; Real-Time Systems: An Introduction and the State-of-the-Art, Transaction Processing in Mobile, Heterogeneous Database Systems*

San-Yih Hwang, National Sun Yat-sen University, Kaohsiung, Taiwan, *Analytical Customer Relationship Management*

Seokjoong Hwang, School of Electrical Engineering, Korea University, Seoul, Korea, *Virtual Memory and Buffer Storage*

Robert Inkol, Defence R & D Canada, Ottawa, Ontario, Canada, *Electronic Warfare*

Sushil Jajodia, George Mason University, Fairfax, Virginia, *Data Security*

Sandip Jassar, Electronic Engineer, Cambridge, United Kingdom, *Pen-Based Computing*

T. R. Jefferson, University of California, Irvine, Irvine, California, *Geometric Programming*

X. Jia, School of Computer Science and Mathematics, Victoria University, Melbourne, Australia, *Transaction Processing*

Y. Jiao, The Pennsylvania State University, State College, Pennsylvania, Transaction Processing in Mobile, *Heterogeneous Database Systems*

Carlos J. Jimenez, University of Seville-Institute of Microelectronics, Seville, Spain, *Logic Synthesis*

Xiaolong Jin, Hong Kong Baptist University, Hong Kong, *Autonomy-Oriented Computing (AOC)*

Adam M. Johansen, Department of Mathematics, University of Bristol, Bristol, United Kingdom, *Markov Chains*

James Johnson, Western Washington University, Bellingham, Washington, *Probability and Statistics*

Bharat Joshi, University of North Carolina—Charlotte, Charlotte, North Carolina, *Fault-Tolerant Computing*

Eric Juan, University of Illinois at Chicago, Chicago, Illinois, *Knowledge Verification*

Martti Juholoa, Department of Computer Sciences, University of Tampere, Tampere, Finland, *Data Classification*

Michael Jurczyk, University of Missouri—Columbia, Columbia, Missouri, *Interconnection Networks for Parallel Computers*

Dimitri Kagaris, Department of Electrical and Computer Engineering, Southern Illinois University, Carbondale, Illinois, *Graph Theory and Algorithms*

Sukumar Kamalasadan, Department of Engineering and Computer Technology, University of West Florida, Pensacola, Florida, *Fuzzy Logic Control Systems*

Magdi N. Kamel, Department of Information Science, Naval Postgraduate School, Monterey, California, *Knowledge Acquisition*

James Kang, Department of Computer Science and Engineering, University of Minnesota, Minneapolis, Minnesota, *Spatial Databases*

Juho Kannala, Department of Electrical and Information Engineering, University of Oulu, Oulu, Finland, *Geometric Camera Calibration*

Jarkko Kari, University of Turku, Turku, Finland, Data Compression Codes, *Lossy*

E. Ertugrul Karsak, Galatasaray University, Ortakoy, Istanbul, Turkey, *Expert Decision System for Robot Selection*

Kingshuk Karuri, Institute for Integrated Signal Processing Systems, RWTH Aachen University, Aachen, Germany, *Software Instrumentation*

Ashraf Kassim, National University of Singapore, Singapore, *Medical Image Processing*

Johnathan Katz, Department of Computer Science, University of Maryland, College Park, College Park, Maryland, *Cryptography*

Krishna M. Kavi, The University of North Texas, Denton, Texas, *Dataflow Computers: Their History and Future; Real-Time Systems: An Introduction and the State-of-the-Art*

Torsten Kempf, Institute for Integrated Signal Processing Systems, RWTH Aachen University, Aachen, Germany, *Software Instrumentation*

Erum Khan, University of Central Florida, Orlando, Florida, *Rendering*

Latifur Khan, University of Texas at Dallas, Dallas, Texas, Managing and Mining Multimedia Data, *Animations and Annotations*

Taghi M. Khoshgoftaar, Department of Computer Science and Engineering, Florida Atlantic University, Boca Raton, Florida, *Software Module Risk Analysis; Software Quality Modeling as a Reliability Tool*

Andrea Kienle, Fraunhofer IPSI, Darmstadt, Germany, *Computer-Supported Asynchronous Learning: The Relevance of Communication and Facilitation*

Jong-Kook Kim, School of Electrical Engineering, Korea University, Seoul, Korea, *Virtual Memory and Buffer Storage*

Seon Kim, School of Electrical Engineering, Korea University, Seoul, Korea, *Virtual Memory and Buffer Storage*

Soo Dong Kim, Department of Computer Science, Soongsil University, Seoul, Korea, *Software Reusability*

Willis King, University of Houston, Houston, Texas, *Assembly Language*

Atshushi Kitazawa, NEC Soft, Ltd., Japan, *Database Languages*

Torleiv Kløve, Department of Informatics, University of Bergen, Bergen, Norway, *Algebraic Coding Theory*

Jürg Kohlas, Univeristy of Fribourg, Fribourg, Switzerland, *Information Algebra*

Lutz Kolbe, University of St. Gallen, St. Gallen, Switzerland, *Home Computing Services*

Taku Komura, University of Edinburgh, Edinburgh, Scotland, *Computer Animation*

Jun Kong, Department of Computer Science, The North Dakota State University, Fargo, North Dakota, *Visual Software Engineering*

Andrew J. Kornecki, Embry Riddle Aeronautical University, Daytona Beach, Florida, *Software Safety*

Appa Rao Korukonda, Department of Management Information Systems and Computer Information Systems, College of Business, Bloomsburg University of Pennsylvania, Bloomsburg, Pennsylvania, *Information Systems and Computer Science and Engineering*

Samuel Kounev, University of Cambridge, Cambridge, United Kingdom, *Software Performance Evaluation*

Joan Krone, Denison University, Granville, Ohio, *Formal Program Verification*

Cyril S. Ku, William Paterson University, Wayne, New Jersey, *Design Patterns*

Gregory Kulczycki, Virginia Polytechnic Institute, Blacksburg, Virginia, *Formal Specification*

Manish Kumar, Duke University, Durham, North Carolina, *Neural Controllers*

Santosh Kumar, Department of Computer Science, University of Memphis, Memphis, Tennessee, *Ad Hoc and Sensor Networks; Queueing Theory*

David Kung, University of Texas at Arlington, Arlington, Texas, *Software Verification and Validation*

Tosiyasu L. Kunii, Kanazawa Institute of Technology, Tokyo, Japan, *Visual Database*

Jaroslav Křivánek, Czech Technical University in Prague, Prague, Czech Republic, *Lighting*

Stephane Lafortune, Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, Ann Arbor, Michigan, *Discrete Event Systems: Untimed Models and Their Analysis*

Chih-Chin Lai, National University of Tainan, Tainan, Taiwan, *Machine Learning*

Peter Gorm Larsen, Engineering College of Aarhus, Aarhus, Denmark, *Vienna Development Method*

Dominique Laurent, Département d'informatique, Université de Cergy-Pontoise, Cergy-Pontoise, France, *Relational Databases*

Joseph J. LaViola Jr., University of Central Florida, Orlando, Florida, *Input Devices*

David Leake, Department of Computer Science, Indiana University, Bloomington, Indiana, *Knowledge-Based Computation*

Ho Woo Lee, Sungkyunkwan University, Suwon, Korea, *Queueing Theory*

Jang Ho Lee, Hogik University, Seoul, Korea, *Distributed and Collaborative Development*

Mong Li Lee, National University of Singapore, School of Computing, Singapore, *Entity Relationship Model*

V. C. S. Lee, City University of Hong Kong, Kowloon, Hong Kong, *Transaction Processing*

Ernst L. Leiss, Department of Computer Science, University of Houston, Houston, Texas, *Optimizing Compilers*

Stathis Leondopulos, Department of Electrical and Computer Engineering, Rutgers University, Piscataway, New Jersey, *Biologically Inspired Neural Computation*

Nicola Leone, Department of Mathematics, University of Calabria, Rende, Italy, *Answer Set Programming*

Frederick W. B. Li, Department of Computer Science, University of Durham, Durham, United Kingdom, *Parametric Surface Rendering; Computer Games*

Qing Li, City University of Hong Kong, Kowloon, Hong Kong, China, *Video Databases*

Jennifer Light, Northwestern University, Evanston, Illinois, *Women in Computing*

Ee-Peng Lim, Nanyang Technological University, Singapore, *Analytical Customer Relationship Management*

Hojung Lim, Korea Electronics Technology Institute (KETI), Sungnam, Korea, *Software Effort Prediction*

J. B. Lim, MJL Technology, Seoul, South Korea, *Transaction Processing in Mobile, Heterogeneous Database Systems*

Lin Lin, Waseda University, Kitakyushu, Japan, *Genetic Algorithms*

Qingping Lin, Information Communication Institute of Singapore, School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, *Collaborative Virtual Environment: Applications; Collaborative Virtual Environment: System Architectures; Collaborative Virtual Environment: Web-Based Issues*

Yi-Bing Lin, National Chiao Tung University, Hsinchu, Taiwan, R.O.C., *WiMAX Networks*

Tony Lindeberg, KTH (Royal Institute of Technology), Stockholm, Sweden, *Scale-Space*

Jan Lindström, IBM Corporation, Helsinki, Finland, *Real Time Database System*

Tok Wang Ling, National University of Singapore, School of Computing, Singapore, *Entity Relationship Model*

John Linn, Texas Instruments, Inc., Dallas, Texas, *Embedded Software*

Chengfei Liu, Faculty of Information and Computer Technology, Swinburne University of Technology, Melbourne, Australia, *Distributed Databases*

Huan Liu, Arizona State University, Tempe, Arizona, *Dimensionality Reduction*

Jiming Liu, Hong Kong Baptist University, Hong Kong, *Autonomy-Oriented Computing (AOC); Web Intelligence (WI)*

Shaorong Liu, Computer Science Department, University of California, Los Angeles, Los Angeles, California, *COXML: Cooperative XML Query Answering*

Xiao Wei Liu, Department of Computer Science, University of Regina, Telecommunications Research Laboratories (TRLabs-Regina), Regina, Saskatchewan, Canada, *Algorithm Based Fault Tolerant Cryptography*

Xinguo Liu, Zhejiang University, Hangzhou, China, *Mesh Deformation*

Yanhong A. Liu, Indiana University, Bloomington, Indiana, *System Monitoring*

Yonghuai Liu, Department of Computer Science, Aberystwyth University, Cerdigion, Wales, United Kingdom, *3-D Point Correspondence and Registration*

Haik Lorenz, University of Potsdam, Potsdam, Germany, *Graphical User Interfaces*

John Paul Loucky, Seinan JoGakun University, Fukuokaken, Japan, *Computerized Dictionaries*

Michael C. Loui, University of Illinois at Urbana-Champaign, Urbana, Illinois, *Ethics and Professional Responsibility in Computing*

Steven H. Low, California Institute of Technology, Pasadena, California, *Transport Layer*

Lorena Lozano, Computer Sciences Department, Universidad de Alcalá, Alcalá de Henares, Spain, *Ray Tracing Acceleration Techniques*

Bin Lu, Department of Computer Science, West Chester University of Pennsylvania, West Chester, Pennsylvania, *Network Security Fundamentals*

Shih-Lien Lu, Intel Corporation, Santa Clara, California, *Carry Logic*

Christiane Luible, University of Geneva, Geneva, Switzerland, *Virtual Clothing*

Luqi, Department of Computer Science, Naval Postgraduate School, Monterey, California, *Rapid Prototyping; Software Component Repositories*

Ines Lynce, INESC-ID/IST, Technical University of Lisbon, Lisbon, Portugal, *Backtracking*

Michael R. Lyu, Department of Computer Science and Engineering, The Chinese University of Hong Kong, Shatin, Hong Kong, *Fault-Tolerant Software*

Anthony Maciejewski, Electrical and Computer Engineering Department, Colorado State University, Fort Collins, Colorado, *Robust Resource Allocation in Heterogeneous Parallel and Distributed Computing Systems*

Nadia Magnenat-Thalmann, University of Geneva, Geneva, Switzerland, *Virtual Clothing*

Ronal K. Maier, School of Management Information Systems, University of Innsbruck, Innsbruck, Austria, *Knowledge Management Application*

Benedita Malheiro, Departamento de Engenharia Electrotécnica, Instituto Superior de Engenharia do Porto, Porto, Portugal, *Reason Maintenance Systems: Tools for Foundations-Based Belief Revision*

Roberto Mancuso, Philips Semiconductors, Zurich, Switzerland, *LCD Design Techniques*

R. Manmatha, Department of Computer Science, University of Massachusetts-Amherst, Amherst, Massachusetts, *Document Image Analysis and Recognition*

Bruce Mann, Memorial University, St. John's, Newfoundland, Canada, *Computer Aided Instruction*

Vasco Manquinho, INESC-ID/IST, Technical University of Lisbon, Lisbon, Portugal, *Backtracking*

Joao Marques-Silva, University of Southampton, Southampton, United Kingdom, *Backtracking*

Ursula Martin, Queen Mary University of London, London, United Kingdom, *Women in Computing*

Simon Maskell, QinetiQ, Worcester, United Kingdom, *Statistical Methods for Target Tracking*

Aditya P. Mathur, Purdue University, West Lafayette, Indiana, *Software Cybernetics*

N. F. Maxemchuk, Department of Electrical Engineering, Columbia University, New York, New York, *Metropolitan Area Networks*

Andrew McGettrick, Department of Computer and Information Sciences, University of Strathclyde, Glasgow, Scotland, United Kingdom, *Quality in Computer Science and Computer Engineering Education*

Robert R. McLeod, Department of Electrical and Computer Engineering, University of Colorado, Boulder, Colorado, *Optical Disk Data Storage, Distribution, and Retrieval*

Deepankar Medhi, University of Missouri—Kansas City, Kansas City, Missouri, *Network Reliability and Fault-Tolerance*

Patricia Melin, Graduate Division, Tijuana Institute of Technology, Chula Vista, California, *Fuzzy Modeling Fundamentals*

P. M. Melliar-Smith, Department of Electrical and Computer Engineering, University of California—Santa Barbara, Santa Barbara, California, *Service-Oriented Architecture and Web Services*

Franklin Mendivil, Department of Mathematics and Statistics, Acadia University, Wolfville, Nova Scotia, Canada, *Fractals*

Weiyi Meng, State University of New York, Binghamton, New York, *Data Search Engine*

John-Jules Ch. Meyer, Utrecht University, Utrecht, The Netherlands, *Agent Technology*

Evangelia Micheli-Tzanakou, Department of Biomedical Engineering, Rutgers University, Piscataway, New Jersey, *Biologically Inspired Neural Computation*

Milan D. Mihajlović, School of Computer Science, University of Manchester, Manchester, United Kingdom, *Multigrid Methods*

Slobodan Ž. Mijalković, Silvaco Technology Centre, Cambridge, United Kingdom, *Multigrid Methods*

Alexander Milenkovic, University of Alabama, Huntsville, Huntsville, Alabama, *Addressing: Direct and Indirect*

Keith W. Miller, University of Illinois at Urbana-Champaign, Urbana, Illinois, *Ethics and Professional Responsibility in Computing*

Scott D. Miller, Purdue University, West Lafayette, Indiana, *Software Cybernetics*

Jack Minker, University of Maryland at College Park, College Park, Maryland, *Deductive Databases*

Eduardo R. Miranda, University of Plymouth, Interdisciplinary Centre for Computer Music Research, Plymouth, United Kingdom, *Digital Sound Synthesis for Multimedia Audio*

Neeraj Mittal, Department of Computer Science, The University of Texas at Dallas, Richardson, Texas, *Time and State in Asynchronous Distributed Systems*

Kinji Mori, Tokyo Institute of Technology, Tokyo, Japan, *Autonomous Decentralized Systems*

Louise E. Moser, Department of Electrical and Computer Engineering, University of California—Santa Barbara, Santa Barbara, California, *Service-Oriented Architecture and Web Services*

Henry Mucini, Department of Computer Science, University of L'Aquila, L'Aquila, Italy, *Software Testing: Testing New Software Paradigms and New Artifacts*

Jean-Michel Muller, CNRS, Université de Lyon, LIP (UMR 5688 CNRS-ENS Lyon-INRIA-UCBL), France, *Digital Arithmetic*

Norbert Mundorf, University of Rhode Island, Kingston, Rhode Island, *Home Computing Services*

Tudor Murgan, Darmstadt University of Technology, Institute of Microelectronic Systems, Darmstadt, Germany, *Hardware Based Rapid Prototyping*

Yi Lu Murphey, University of Michigan-Dearborn, Dearborn, Michigan, *Edge Detection in Grayscale, Color, and Range Issues*

Peter C. Nelson, Department of Computer Science, University of Illinois at Chicago, Chicago, Illinois, *Data Handling in Intelligent Transportation Systems*

Eric Neufeld, Department of Computer Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada, *Bayesian Belief Networks*

Chong-Wah Ngo, City University of Hong Kong, Kowloon, Hong Kong, China, *Video Databases*

Minh X. Nguyen, University of Minnesota at Twin Cities, Minneapolis, Minnesota, *High-Quality Texture Mapping and Rendering of Point Models*

Tien N. Nguyen, Electrical and Computer Engineering Department, Iowa State University, Ames, Iowa, *Software Configuration Management*

Ann Nowe, Vrije Universiteit Brussel, Brussels, Belgium, *Introduction to Game Theory*

Masahiro Ohka, Nagoya University, Nagoya, Japan, *Robotic Tactile Sensors*

Ryuichi Oka, Graduate School of Computer Science and Engineering, University of Aizu, Aizu-Wakamatsu, Japan, *Dynamic Programming*

Vojin G. Oklobdzija, Integration Corporation, Berkeley, California, *Reduced Instruction Set Computing*

Daniel E. O'Leary, University of Southern California, Los Angeles, California, *Expert Systems*

Carlos A. S. Oliveira, School of Industrial Engineering and Management, Oklahoma State University, Stillwater, Oklahoma, *Data Structures and Algorithms*

Mauro Olivieri, ''La Sapienza,'' University of Rome, Rome, Italy, *LCD Design Techniques*

Lukasz Opyrchal, Department of Computer Science and Systems Analysis, Miami University, Oxford, Ohio, *Large Scale Group Collaboration Systems*

Miguel Palomino, Departamento de Sistemas Informáticos y Computación, Universidad Complutense, Madrid, Spain, *Formal Logic*

Manish Parashar, Department of Electrical and Computer Engineering, Rutgers, The State University of New Jersey, Piscataway, New Jersey, *Shared Memory Multiprocessors*

Panos M. Pardalos, Department of Industrial and Systems Engineering, University of Florida, Gainesville, Florida, *Data Structures and Algorithms*

Jung Me Park, University of Michigan-Dearborn, Dearborn, Michigan, *Edge Detection in Grayscale, Color, and Range Issues*

Sumanta Pattanaik, University of Central Florida, Orlando, Florida, *Lighting; Radiosity*

Wayne Patterson, Department of Systems and Computer Sciences, Howard University, Washington, DC, *Computational Number Theory*

Gheorge Păun, Institute of Mathematics of the Romanian Academy, Bucharest, Romania, *Chomsky Hierarchy*

Zdzisław Pawlak, Institute of Theoretical and Applied Informatics, Polish Academy of Sciences, and University of Information Technology and Management, Warsaw, Poland, *Rough Set Theory*

Witold Pedrycz, Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Alberta, Canada, *Computational Intelligence; Neural Net Architectures*

Doron Peled, Department of Computer Science, The University of Warwick, Coventry, United Kingdom; Department of Computer Science, Bar Ilan University, Ramat Gan, Israel, *Model Checking*

Patrizio Pelliccione, Dipartimento di Informatica, Universitá dell'Aquila, L'Aquila, Italy, *Model Checking*

Anna Perini, Fondazione Bruno, Kessler—IRST, Trento, Italy, *Agent-Oriented Software Engineering*

James Peters, Department of Electrical and Computer Engineering, University of Manitoba, Winnipeg, Manitoba, Canada, *Computational Intelligence*

William H. Piel, Peabody Museum of Natural History, Yale University, New Haven, Connecticut, *Bioinformatic Databases*

Keshav Pingali, Cornell University, Ithaca, New York, *Parallel and Vector Programming Languages*

S. N. Piramanayagam, Data Storage Institute, Singapore, *Data Storage on Magnetic Disks*

David A. Plaisted, Department of Computer Science, University of North Carolina, Chapel Hill, Chapel Hill, North Carolina, *Automated Theorem Proving*

Margi Pohl, Vienna University of Technology, Vienna, Austria, *Women in Computing*

Lech Polkowski, Polish–Japanese Institute of Information Technology, Warsaw, Poland; University of Warmia and Mazury, Olsztyn, Poland, *Rough Set Theory*

George C. Polyzos, Athens University of Economics and Business, Athens, Greece, *Multicast Protocols and Algorithms*

Neoklis Polyzotis, University of California, Santa Cruz, Santa Cruz, California, *Very Large Databases*

Marc Pouly, Univeristy of Fribourg, Fribourg, Switzerland, *Information Algebra*

B. Prabhakaran, University of Texas at Dallas, Dallas, Texas, *Managing and Mining Multimedia Data, Animations and Annotations*

Dhiraj Pradhan, University of Bristol, Bristol, United Kingdom, *Fault-Tolerant Computing*

Atul Prakash, Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, Michigan, *Distributed and Collaborative Development; Large Scale Group Collaboration Systems*

Rafael Prikladnicki, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil, *Distributed Project Management*

Rodu Prodan, Institute of Computer Science, University of Innsbruck, Innsbruck, Austria, *Clusters and Grids*

Oleg A. Prokopyev, Department of Industrial and Systems Engineering, University of Florida, Gainesville, Florida, *Data Structures and Algorithms*

J. Mark Pullen, Department of Computer Science, George Mason University, Fairfax, Virginia, *Distance Education in Computer Science*

Chunming Qiao, SUNY Buffalo, Buffalo, New York, *Fiber-Optic Communication Networks*

Eric Quinnell, Advanced Micro Devices, Austin, Texas, *Floating-Point Computer Arithmetic*

Noa Ragonis, Beit Berl College, Kfar Saba, Israel; Technion—Israel Institute of Technology, Haifa, Israel, *Computing Pre-University: Secondary Level Computing Criteria*

Sridhar Rajagopal, WiQuest Communications, Inc. Allen, Texas, *Communication Processors for Wireless Systems*

Ravichandran Ramachandran, National Semiconductor Corporation, Santa Clara, California, *Carry Logic*

Rajeev Ramanath, Texas Instruments Incorporated, Plano, Texas, *Color Models; Color Perception*

J. Raul Ramirez, The Ohio State University, Columbus, Ohio, *Geographic Information Systems*

Mirko Randić, Faculty of Electrical Engineering and Computing, University of Zagreb, Zagreb, Croatia, *Spell Checker*

Gregory N. Ranky, Ridgewood, New Jersey, *CD-ROMs and Computer Systems*

Mick F. Ranky, Ridgewood, New Jersey, *CD-ROMs and Computer Systems*

Paul G. Ranky, New Jersey Institute of Technology, Newark, New Jersey, *CD-ROMs and Computer Systems*

Awais Rashid, Lancaster University, Lancaster, United Kingdom, *Aspect-Oriented Software Development: An Introduction*

Arnab Ray, Fraunhofer Center for Experimental Software Engineering, College Park, Maryland, *Authorization, Access Control, Information Flow*

Michel Raynal, IRISA, Université de Rennes, Rennes Cedex, France, *Failure Detectors for Asynchronous Distributed Systems: An Introduction*

Tim Reichert, Department of Software Engineering, Heilbronn University, Heilbronn, Germany, *Software Engineering for Telecommunications Systems*

Han Reichgelt, Southern Polytechnic State University, Marietta, Georgia, *Computing Accreditation: Evolution and Trends Associated with U.S. Accrediting Agencies*

Thomas Reichherzer, Department of Computer Science, Indiana University, Bloomington, Indiana, *Knowledge-Based Computation*

Erik Reinhard, University of Bristol, Bristol, United Kingdom, *Rendering*

Nathalie Revol, INRIA, Université de Lyon, LIP (UMR 5688 CNRS-ENS Lyon-INRIA-UCBL), France, *Digital Arithmetic*

William Reynolds Jr., ITT Space Systems Division, Vienna, Virginia, *Data Compression*

Francesco Ricca, Department of Mathematics, University of Calabria, Rende, Italy, *Answer Set Programming*

Stefano Rizzi, DEIS, University of Bologna, Bologna, Italy, *Data Warehouse*

Kimberly Roche, Clemson University, Clemson, South Carolina, *Formal Specification*

Roshanak Roshandel, Department of Computer Science and Software Engineering, Seattle University, Seattle, Washington, *Software Dependability*

William B. Rouse, Georgia Institute of Technology, Atlanta, Georgia, *Information Technology*

Yong Rui, Microsoft Advance Technology Center, Beijing, China, *Content-Based Multimedia Retrieval*

Amr Sabry, Department of Computer Science, Indiana University, Bloomington, Indiana, *Side Effects*

Andrew P. Sage, George Mason University, Fairfax, Virginia, *Information Technology*

Avinash Sahay, University of Illinois at Chicago, Chicago, Illinois, *Knowledge Verification*

Andrea Salgian, Department of Computer Science, The College of New Jersey, Ewing, New Jersey, *Theory and Algorithms of Perceptual Grouping*

Pierangela Samarati, Università degli Studi di Milano, Crema, Italy, *Data Security*

Sachin Sapatnekar, Department of Electrical and Computer Engineering, University of Minnesota, Minneapolis, Minnesota, *Convex Optimization*

Charles P. Satterthwaite, AFRL/IFTA Embedded Information System Engineering Branch, United States Air Force, Wright-Patterson AFB, Ohio, *Aircraft Computers*

Robert J. Schalkoff, Department of Electrical and Computer Engineering, Clemson University, Clemson, South Carolina, *Pattern Recognition*

Richard E. Schantz, BBN Technologies, Cambridge, Massachusetts, *Middleware for Distributed Systems*

Peter Scheuermann, Department of Electrical Engineering and Computer Science, Northwestern University, Evanston, Illinois, *Active Database Systems*

Judith D. Schlesinger, IDA Center for Computing Science, Bowie, Maryland, *Instruction Sets*

Douglas C. Schmidt, Department of Electrical Engineering and Computer Science, Vanderbilt University, Nashville, Tennessee, *Middleware for Distributed Systems*

Cesar Schneuwly, Univeristy of Fribourg, Fribourg, Switzerland, *Information Algebra*

Bernhard Scholz, The University of Sydney, Sydney, Australia, *Program Assemblers*

C. H. Scott, University of California, Irvine, Irvine, California, *Geometric Programming*

David Scott, Laboratory for Communication Engineering, University of Cambridge, Cambridge, United Kingdom, *Data Privacy*

Bran Selic, Malina Software Corporation, Nepean, Ontario, Canada, *Unified Modeling Language (UML)*

Naeem Seliya, University of Michigan—Dearborn, Dearborn, Michigan, *Software Module Risk Analysis, Software Quality Modeling as a Reliability Tool*

Sami Sheeshia, American University of Science and Technology, Beirut, Lebanon, *Fiber-Optic Communication Networks*

Shashi Shekhar, Department of Computer Science and Engineering, University of Minnesota, Minneapolis, Minnesota, *Spatial Databases*

Phillip C.-Y. Sheu, University of California, Irvine, Irvine, California, *Database Languages*

Hyong-Sop Shim, Applied Research, Telcordia Technologies, Piscataway, New Jersey, *Distributed and Collaborative Development*

Miyoung Shin, Kyungpook National University, Daegu, Korea, *Software Quality Classification Models*

Howard Siegel, Electrical and Computer Engineering Department, Colorado State University, Fort Collins, Colorado, *Robust Resource Allocation in Heterogeneous Parallel and Distributed Computing Systems*

Howard Jay Siegel, Purdue University, West Lafayette, Indiana, *Interconnection Networks for Parallel Computers*

Avik Sinha, IBM T. J. Watson Research Center, Hawthorne, New York, *Software Metrics*

Murali Sitaraman, Clemson University, Clemson, South Carolina, *Formal Program Verification; Formal Specification*

Andrzej Skowron, Institute of Mathematics, Warsaw University, Warsaw, Poland, *Rough Set Theory*

Anthony M. Sloane, Department of Computing, Macquarie University, Sydney, Australia, *Program Compilers*

Carol Smidts, Center for Reliability Engineering, University of Maryland, College Park, Maryland, *Nuclear Reactor Instrumentation and Control Systems*

Jay Smith, Digital Globe, Longmont, Colorado, *Robust Resource Allocation in Heterogeneous Parallel and Distributed Computing Systems*

Simone Smorfa, ''La Sapienza,'' University of Rome, Rome, Italy, *LCD Design Techniques*

Lawrence Snyder, Department of Computer Science and Engineering, University of Washington-Seattle, Seattle, Washington, *Fluency with Information Technology*

Nir Sochen, School of Mathematics, Tel-Aviv University, Tel-Aviv, Israel, *Shape from Shading*

Angela Sodan, School of Computer Science, University of Windsor, Windsor, Ontario, Canada, *Time-Sharing Systems*

Daniel Solow, Department of Operations, Weatherhead School of Management, Case Western University, Cleveland, Ohio, *Linear and Nonlinear Programming*

Ellen Spertus, Mills College, San Francisco, California, *Women in Computing*

Junilda Spiorollari, New Jersey Institute of Technology, Newark, New Jersey, *Bioinformatic Databases*

Paola Spoletini, Dipartimento della Cultura, Politiche e dell'Informazione, Universitá dell'Insurbia, Como, Italy, *Model Checking*

Jaideep Srivastava, University of Minnesota, Minneapolis, Minnesota, *Analytical Customer Relationship Management*

Zbigniew Stachniak, Department of Computer Science and Engineering, York University, Toronto, Canada, *Microcomputers*

Alexandra Stadler, Technische Universität Berlin, Berlin, Germany, *Graphical User Interfaces*

Luca Sterpone, Politecnico di Torino, Torino, Italy, *FPGA PAL Design Tools*

Jack Stiffler, Reliable Technologies, Inc., Weston, Massachusetts, *Fault-Tolerant Computing*

Charles E. Stroud, Auburn University, Auburn, Alabama, *Logic Testing*

Craig Stunkel, IBM T. J. Watson Research Center, Yorktown Heights, New York, *Interconnection Networks for Parallel Computers*

Narayanan Subramanian, Department of Computer Science, University of Texas at Tyler, Tyler, Texas, *Requirements Specification and Analysis*

Tatsuya Suda, University of California, Irvine, Irvine, California, *Asynchronous Transfer Mode Networks*

Ron Sun, Cognitive Science Department, Rensselaer Polytechnic Institute, Troy, New York, *Cognitive Systems and Cognitive Architectures*

M. Suriya, Annamalai University, Annamalai Nagar, India, *Women in Computing*

Earl E. Swartzlander Jr., Department of Electrical and Computer Engineering, University of Texas at Austin, Austin, Texas, *Fixed-Point Computer Arithmetic; Floating-Point Computer Arithmetic*

Ao Tang, Cornell University, Ithaca, New York, *Transport Layer*

Ariel Tankus, Division of Neurosurgery, University of California, Los Angeles, Los Angeles, California, *Shape from Shading*

Abdullah Uz Tansel, Baruch College and the Graduate Center, City University of New York, New York, New York, *Temporal Databases*

Wallapak Tavanpong, Department of Computer Science, Iowa State University, Ames, Iowa, *Parallel Database Management Systems*

Daniel Thalmann, Swiss Federal Institute of Technology, Lausanne, Switzerland, *Crowd Simulation*

J. Barrie Thomspson, School of Computing and Technology, University of Sunderland, Sunderland, United Kingdom, *Perspectives on Software Engineering Professionalism*

Bhavani Thuraisingham, University of Texas at Dallas, Dallas, Texas, *Managing and Mining Multimedia Data, Animations and Annotations*

Walter F. Tichy, University of Karlsruhe, Karlsruhe, Germany, *Monitor*

Gloria Childress Townsend, DePauw University, Greencastle, Indiana, *Women in Computing*

Spyros Tragoudas, Department of Electrical and Computer Engineering, Southern Illinois University, Carbondale, Illinois, *Graph Theory and Algorithms*

Goce Trajcevski, Department of Electrical Engineering and Computer Science, Northwestern University, Evanston, Illinois, *Active Database Systems*

Kishor S. Trivedi, Pratt School of Engineering, Duke University, Durham, North Carolina, *Software Aging and Rejuvenation*

Jeffrey J. P. Tsai, University of Illinois at Chicago, Chicago, Illinois, *Knowledge Verification; System Monitoring*

Jichiang Tsai, National Chung Hsing University, Taichung, Taiwan, *Communication-Induced Checkpointing Protocols and Rollback-Dependency Trackability*

Shiao-Li Tsao, National Chiao Tung University, Hsinchu, Taiwan, R.O.C., *WiMAX Networks*

Kwok Ching Tsui, Hong Kong Baptist University, Hong Kong, *Autonomy-Oriented Computing (AOC)*

Karl Tuyls, Department of Computer Science, Eindhoven University of Technology, Eindhoven, The Netherlands, *Introduction to Game Theory*

Neil Vachharajani, Department of Computer Science, Princeton University, Princeton, New Jersey, *Speculation*

Kalyanaraman Vaidyanathan, Scalable Systems Group, Sun Microsystems, Inc., San Diego, California, *Software Aging and Rejuvenation*

Zita Vale, Polytechnic of Porto, Institute of Engineering, Porto, Portugal, *Intelligent Power System*

Manuel Valencia, University of Seville-Institute of Microelectronics, Seville, Spain, *Logic Synthesis*

Wil M. P. van der Aalst, Department of Mathematics and Computer Science, Eindhoven University of Technology, Eindhoven, The Netherlands, *Process-Aware Information Systems: Design, Enactment, and Analysis*

Marc Van Hulle, Laboratorium voor Neuro- & Psychopysiologie, K.U. Leuven, Campus Gasthuisberg, Leuven, Belgium, *Kernel-Based Topographic Maps: Theory and Applications*

Robbert van Renesse, Cornell University, Ithaca, New York, *Programming Models: Client-Server, Process Groups, and Peer-to-Peer*

Jashmid A. Vayghan, IBM Corporation, Rochester, Minnesota, *Analytical Customer Relationship Management*

Marcel Verhoef, CHESS, Haarlem, The Netherlands, *Vienna Development Method*

Jeffrey Voas, SAIC, Arlington, Virginia, *Software Product Certification*

Pascal Volino, University of Geneva, Geneva, Switzerland, *Virtual Clothing*

Mladen Vouk, Department of Computer Science, North Carolina, State University, Raleigh, North Carolina, *Agile Software Development*

Sanja Vranes, The Mihalio Pupin Institute, Belgrade, Serbia and Montenegro, *Artificial Intelligence Languages*

R. H. Walden, The Aerospace Corporation Electronics and Photonics Laboratory, Los Angeles, California, *Analog-to-Digital Conversion in the Early Twenty-First Century*

Bin Wang, Wright State University, Dayton, Ohio, *Optical Communication*

Farn Wang, Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan, *Specification Formalisms and Models*

Frank Zhigang Wang, Cambridge–Cranfield High Performance Computing Facility, Cranfield, Bedfordshire, United Kingdom, *Disk Storage*

George (Taehyung) Wang, California State University, Northridge, Northridge, California, *Database Languages*

Jason T. L. Wang, New Jersey Institute of Technology, Newark, New Jersey, *Bioinformatic Databases*

Jau-Hwang Wang, Central Police University, Taoyuan, Taiwan, *Analytical Customer Relationship Management*

Lan Wang, Department of Computer Science, University of Memphis, Memphis, Tennessee, *Ad Hoc and Sensor Networks*

Laung-Terng (L.-T.) Wang, SynTest Technologies, Inc., Sunnyvale, California, *Logic Testing*

Lei Wang, University of Texas at Dallas, Dallas, Texas, Managing and Mining Multimedia Data, *Animations and Annotations*

Lipo Wang, Division of Information Engineering, Nanyang Technological University, Singapore, *Artificial Neural Networks*

Lusheng Wang, Department of Computer Science, City University of Hong Kong, Kowloon, Hong Kong, China, *Biology Computing*

Rong Wang, College of Engineering, University of California, Riverside, California, *Fingerprint Identification*

Yi-Min Wang, Microsoft Corporation, Redmond, Washington, *Communication-Induced Checkpointing Protocols and Rollback-Dependency Trackability*

Sanford Weisberg, University of Minnesota, School of Statistics, Minneapolis, Minnesota, *Regression Analysis*

Mark Allen Weiss, Florida International University, Miami, Florida, *Parameter Passing*

John Westbrook, Protein Data Bank and Rutgers, The State University of New Jersey, Piscataway, New Jersey, *Bioinformatic Databases*

Laurie Williams, Department of Computer Science, North Carolina, State University, Raleigh, North Carolina, *Agile Software Development*

Sylvia Wiltner, Vienna University of Technology, Vienna, Austria, *Women in Computing*

Victor L. Winter, Department of Computer Science, University of Nebraska at Omaha, Omaha, Nebraska, *Program Transformation: What, How, and Why*

Laurence A. Wolsey, Département d'Ingénierie Mathématique, Université Catholique de Louvain, Louvain-la-Neuve, Belgium, *Mixed Integer Programming*

Cathy H. Wu, Protein Information Resource and Georgetown University Medical Center, Washington, DC, *Bioinformatic Databases*

Chih-Hung Wu, National University of Kaohsiung, Kaohsiung, Taiwan, *Machine Learning*

Sining Wu, Cambridge–Cranfield High Performance Computing Facility, Cranfield, Bedfordshire, United Kingdom, *Disk Storage*

Xiao Wu, City University of Hong Kong, Kowloon, Hong Kong, China, *Video Databases*

Xindong Wu, University of Vermont, Burlington, Vermont, *Data Mining*

Yi-Hung Wu, Chung Yuan Christian University, Chungli, Taiwan, *Data Analysis*

Chunsheng Xin, Norfolk State University, Norfolk, North Carolina, *Fiber-Optic Communication Networks*

Dianxiang Xu, North Dakota State University, Fargo, North Dakota, *Software Security*

Ruifeng Xu, Department of Computer Science, University of Central Florida, Orlando, Florida, *Radiosity*

George Xylomenos, Athens University of Economics and Business, Athens, Greece, *Multicast Protocols and Algorithms*

Hiroshi Yamaguchi, NEC Soft, Ltd., Japan, *Database Languages*

Shuntaro Yamazaki, National Institute of Advanced Industrial Science and Technology, Tokyo, Japan, *Warping and Morphing*

Pingkun Yan, National University of Singapore, Singapore, *Medical Image Processing*

Li Yang, Western Michigan University, Kalamazoo, Michigan, *Visual Database*

Yiyu Yao, Department of Computer Science, University of Regina, Regina, Saskatchewan, Canada, *Granular Computing; Web Intelligence (WI)*

Nighat Yasmin, The University of Mississippi, University, Mississippi, *Formal Specification*

David Yau, Department of Computer Science, Purdue University, West Lafayette, Indiana, *OS for Graphics and Multimedia*

Stephen S. Yau, Department of Computer Science and Engineering, Arizona State University, Tempe, Arizona, *Mobile and Ubiquitous Computing*

Gayle J. Yaverbaum, Penn State Harrisburg, Harrisburg, Pennsylvania, *Computing Accreditation: Evolution and Trends Associated with U.S. Accrediting Agencies*

Yehezkel Yeshurun, School of Computer Science, Tel-Aviv University, Tel-Aviv, Israel, *Shape from Shading*

Alper Yilmaz, The Ohio State University, Columbus, Ohio, *Active Contours: Snakes; Level Set Methods; Contour Tracking*

Cemal Yilmaz, IBM T. J. Watson Research Center, Hawthorne, New York, *Software Metrics*

Yin Yin, Department of Computer Science and Engineering, Arizona State University, Tempe, Arizona, *Mobile and Ubiquitous Computing*

Oliver Yu, Department of Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, Illinois, *Data Communication*

Xiaoru Yuan, University of Minnesota at Twin Cities, Minneapolis, Minnesota, *High-Quality Texture Mapping and Rendering of Point Models*

Pavel Zezula, Department of Computer Systems and Communications, Masaryk University, Brno, Czech Republic, *File Organizations*

Chenqi Zhang, University of Technology, Sydney, Australia, *Intelligent Agent*

C. N. Zhang, Department of Computer Science, University of Regina, Telecommunications Research Laboratories (TRLabs-Regina), Regina, Saskatchewan, Canada, *Algorithm Based Fault Tolerant Cryptography*

Dan Zhang, University of Ontario Institute of Technology, Oshawa, Ontario, Canada, *Robot Kinematics*

Du Zhang, California State University, Sacramento, California, *Knowledge Verification*

Hongxin Zhang, Zhejiang University, Hangzhou, China, *Mesh Deformation*

Kang Zhang, Visual Computing Lab, Department of Computer Science, The University of Texas at Dallas, Richardson, Texas, *Visual Software Engineering*

Li Zhang, Department of Electrical and Computer Engineering, Rutgers, The State University of New Jersey, Piscataway, New Jersey, *Shared Memory Multiprocessors*

Liang Zhang, Information Communication Institute of Singapore, School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, *Collaborative Virtual Environment: Web-Based Issues; Collaborative Virtual Environment: Applications; Collaborative Virtual Environment: System Architectures*

Lihong Zhang, Memorial University of Newfoundland, St. John's, Newfoundland, Canada, *VLSI Circuit Layout*

Lin Zhang, Beijing University of Aeronautics and Astronautics, Beijing, China, *Software Component Repositories*

Xiaodong Zhang, Department of Computer Science and Engineering, The Ohio State University, *Peer-to-Peer Communication*

Yan Zhang, University of Vermont, Burlington, Vermont, *Data Mining*

Yanchun Zhang, School of Computer Science and Mathematics, Victoria University, Melbourne, Australia, *Distributed Databases; Transaction Processing*

Zili Zhang, Deakin University, Geelong, Australia, *Intelligent Agent*

Wenyi Zhao, Intuitive Surgical, Inc., Mountain View, California, *Face Recognition Techniques*

Ning Zhong, Maebashi Institute of Technology, Maebashi-City, Japan, *Granular Computing; Web Intelligence (WI)*

Hong Zhu, Oxford Brookes University, Oxford, United Kingdom, *Software Verification and Validation*

Xingquan Zhu, Florida Atlantic University, Boca Raton, Florida, *Data Mining*

Zahari Zlatev, National Environmental Research Institute, Aarhus University, Roskilde, Denmark, *Environmental Science Computing*