Encyclopedia of Algorithms

Ming-Yang Kao (Ed.)

Encyclopedia of Algorithms

With 183 Figures and 38 Tables
With 4075 References for Further Reading

Springer

Ming-Yang Kao
Professor of Computer Science
Department of Electrical Engineering and Computer Science
McCormick School of Engineering and Applied Science
Northwestern University
Evanston, IL 60208
USA

Preface

The *Encyclopedia of Algorithms* aims to provide the researchers, students, and practitioners of algorithmic research with a mechanism to efficiently and accurately find the names, definitions, key results, and further readings of important algorithmic problems.

The work covers a wide range of algorithmic areas, and each algorithmic area is covered by a collection of entries. An encyclopedia entry is an in-depth mini-survey of an algorithmic problem and is written by an expert researcher. The entries for an algorithmic area are compiled by an area editor to survey the representative results in that area and can form the core materials of a course in the area.

The *Encyclopedia* does not use the format of a conventional long survey for several reasons. A conventional survey takes a handful of individuals too much time to write and is difficult to update. An encyclopedia entry contains the same kinds of information as in a conventional survey, but an encyclopedia entry is much shorter and is much easier for readers to absorb and for editors to update. Furthermore, an algorithmic area is surveyed by a collection of entries which together provide a considerable amount of up-to-date information about the area, while the writing and updating of the entries is distributed among multiple authors to speed up the work.

This reference work will be updated on a regular basis and will evolve towards primarily an Internet-based medium to allow timely updates and fast search. If you have feedback regarding a particular entry, please feel free to communicate directly with the author or the area editor of that entry. If you are interested in authoring an entry, please contact a suitable area editor. If you have suggestions on how to improve the Encyclopedia as a whole, please contact me at kao@northwestern.edu.

The credit of the Encyclopedia goes to the area editors, the entry authors, the entry reviewers, and the project editors at Springer, including Jennifer Evans and Jennifer Carlson.

Ming-Yang Kao
Editor-in-Chief

Table of Contents

About the Editor

Ming-Yang Kao is a Professor of Computer Science in the Department of Electrical Engineering and Computer Science at Northwestern University. He has published extensively in the design, analysis, and applications of algorithms. His current interests include discrete optimization, bioinformatics, computational economics, computational finance, and nanotechnology. He serves as the Editor-in-Chief of Algorithmica.

He obtained a B.S. in Mathematics from National Taiwan University in 1978 and a Ph.D. in Computer Science from Yale University in 1986. He previously taught at Indiana University at Bloomington, Duke University, Yale University, and Tufts University. At Northwestern University, he has served as the Department Chair of Computer Science. He has also co-founded the Program in Computational Biology and Bioinformatics and served as its Director. He currently serves as the Head of the EECS Division of Computing, Algorithms, and Applications and is a member of the Theoretical Computer Science Group.

For more information please see: www.cs.northwestern.edu/~kao

Area Editors

Online Algorithms
Approximation Algorithms

ALBERS, SUSANNE
University of Freiburg
Freiburg
Germany

External Memory Algorithms and Data Structures
Cache-Oblivious Algorithms and Data Structures

ARGE, LARS
University of Aarhus
Aarhus
Denmark

Quantum Computing

© University of Latvia
Press Center

AMBAINIS, ANDRIS
University of Latvia
Riga
Latvia

Mechanism Design
Online Algorithms
Price of Anarchy

AZAR, YOSSI
Tel-Aviv University
Tel-Aviv
Israel

Compressed Text Indexing
Computational Biology

Lam, Tak-Wak
University of Hong Kong
Hong Kong
China

Mobile Computing

Li, Xiang-Yang
Illinois Institute of Technology
Chicago, IL
USA

Geometric Networks

Lingas, Andrzej
Lund University
Lund
Sweden

String Algorithms and Data Structures
Compression of Text
Data Structures

Navarro, Gonzalo
University of Chile
Santiago
Chile

Parameterized and Exact Algorithms

Neidermeier, Rolf
University of Jena
Jena
Germany

Probabilistic Algorithms
Average Case Analysis

Nikoletseas, Sotiris
Patras University
Patras
Greece

Graph Algorithms

PETTIE, SETH
University of Michigan
Ann Arbor, MI
USA

Graph Algorithms

RAMACHANDRAN, VIJAYA
University of Texas, Austin
Austin, TX
USA

Scheduling Algorithms

PRUHS, KIRK
University of Pittsburgh
Pittsburgh, PA
USA

Algorithm Engineering

RAMAN, RAJEEV
University of Leicester
Leicester
UK

Distributed Algorithms

RAJSBAUM, SERGIO
National Autonomous University of Mexico
Mexico City
Mexico

Computational Learning Theory

SERVEDIO, ROCCO
Columbia University
New York, NY
USA

Probabilistic Algorithms Average Case Analysis

Spirakis, Pavlos (Paul)
Patras University
Patras
Greece

VLSI CAD Algorithms

Zhou, Hai
Northwestern University
Evanston, IL
USA

Scheduling Algorithms

Stein, Clifford
Columbia University
New York, NY
USA

List of Contributors

AARDAL, KAREN
CWI
Amsterdam
The Netherlands
Eindhoven University of Technology
Eindhoven
The Netherlands

AKAVIA, ADI
MIT
Cambridge, MA
USA

ALBERS, SUSANNE
University of Freiburg
Freiburg
Germany

ALICHERRY, MANSOOR
Bell Labs
Murray Hill, NJ
USA

ALON, NOGA
Tel-Aviv University
Tel-Aviv
Israel

ALTSCHUL, STEPHEN F.
The Rockefeller University
New York, NY
USA
MIT
Cambridge, MA
USA

ALURU, SRINIVAS
Iowa State University
Ames, IA
USA

AMBAINIS, ANDRIS
University of Latvia
Riga
Latvia

AMBÜHL, CHRISTOPH
University of Liverpool
Liverpool
UK

AMIR, AMIHOOD
Bar-Ilan University
Ramat-Gan
Israel

ASODI, VERA
California Institute of Technology
Pasadena, CA
USA

AUER, PETER
University of Leoben
Leoben
Austria

AZIZ, ADNAN
University of Texas
Austin, TX
USA

BABAIOFF, MOSHE
Microsoft Research, Silicon Valley
Mountain View, CA
USA

BADER, DAVID A.
Georgia Institute of Technology
Atlanta, GA
USA

BAEZA-YATES, RICARDO
University of Chile
Santiago
Chile

BANSAL, NIKHIL
IBM
Yorktown Heights, NY
USA

BARBAY, JÉRÉMY
University of Chile
Santiago
Chile

BARUAH, SANJOY
University of North Carolina
Chapel Hill, NC
USA

BASWANA, SURENDER
IIT Kanpur
Kanpur
India

BECCHETTI, LUCA
University of Rome
Rome
Italy

BEIMEL, AMOS
Ben-Gurion University
Beer Sheva
Israel

BÉKÉSI, JÓZSEF
Juhász Gyula Teachers Training College
Szeged
Hungary

BERGADANO, FRANCESCO
University of Torino
Torino
Italy

BERRY, VINCENT
LIRMM, University of Montpellier
Montpellier
France

BHATIA, RANDEEP
Bell Labs
Murray Hill, NJ
USA

BJÖRKLUND, ANDREAS
Lund University
Lund
Sweden

BLANCHETTE, MATHIEU
McGill University
Montreal, QC
Canada

BLÄSER, MARKUS
Saarland University
Saarbrücken
Germany

BODLAENDER, HANS L.
University of Utrecht
Utrecht
The Netherlands

BORRADAILE, GLENCORA
Brown University
Providence, RI
USA

BSHOUTY, NADER H.
Technion
Haifa
Israel

BUCHSBAUM, ADAM L.
AT&T Labs, Inc.
Florham Park, NJ
USA

BUSCH, COSTAS
Lousiana State University
Baton Rouge, LA
USA

BU, TIAN-MING
Fudan University
Shanghai
China

BYRKA, JAROSLAW
CWI
Amsterdam
The Netherlands
Eindhoven University of Technology
Eindhoven
The Netherlands

CAI, MAO-CHENG
Chinese Academy of Sciences
Beijing
China

CALINESCU, GRUIA
Illinois Institute of Technology
Chicago, IL
USA

CECHLÁROVÁ, KATARÍNA
P.J. Šafárik University
Košice
Slovakia

CHAN, CHEE-YONG
National University of Singapore
Singapore
Singapore

CHANDRA, TUSHAR DEEPAK
IBM Watson Research Center
Yorktown Heights, NY
USA

CHAO, KUN-MAO
National Taiwan University
Taipei
Taiwan

CHARRON-BOST, BERNADETTE
The Polytechnic School
Palaiseau
France

CHATZIGIANNAKIS, IOANNIS
University of Patras and Computer Technology Institute
Patras
Greece

CHAWLA, SHUCHI
University of Wisconsin–Madison
Madison, WI
USA

CHEKURI, CHANDRA
University of Illinois, Urbana-Champaign
Urbana, IL
USA

CHEN, DANNY Z.
University of Notre Dame
Notre Dame, IN
USA

CHENG, XIUZHEN
The George Washington University
Washington, D.C.
USA

CHEN, JIANER
Texas A&M University
College Station, TX
USA

CHEN, XI
Tsinghua University
Beijing, Beijing
China

CHIN, FRANCIS
University of Hong Kong
Hong Kong
China

CHOWDHURY, REZAUL A.
University of Texas at Austin
Austin, TX
USA

CHRISTODOULOU, GEORGE
Max-Planck-Institute for Computer Science
Saarbruecken
Germany

CHROBAK, MAREK
University of California at Riverside
Riverside, CA
USA

CHU, CHRIS
Iowa State University
Ames, IA
USA

CHU, XIAOWEN
Hong Kong Baptist University
Hong Kong
China

CHUZHOY, JULIA
Toyota Technological Institute
Chicago, IL
USA

CONG, JASON
UCLA
Los Angeles, CA
USA

COWEN, LENORE J.
Tufts University
Medford, MA
USA

CRISTIANINI, NELLO
University of Bristol
Bristol
UK

CROCHEMORE, MAXIME
King's College London
London
UK
University of Paris-East
Paris
France

CSŰRÖS, MIKLÓS
University of Montreal
Montreal, QC
Canada

CZUMAJ, ARTUR
University of Warwick
Coventry
UK

DASGUPTA, BHASKAR
University of Illinois at Chicago
Chicago, IL
USA

DÉFAGO, XAVIER
Japan Advanced Institute of Science and Technology
(JAIST)
Ishikawa
Japan

DEMAINE, ERIK D.
MIT
Cambridge, MA
USA

DEMETRESCU, CAMIL
University of Rome
Rome
Italy

DENG, PING
University of Texas at Dallas
Richardson, TX
USA

DENG, XIAOTIE
City University of Hong Kong
Hong Kong
China

DESPER, RICHARD
University College London
London
UK

DICK, ROBERT
Northwestern University
Evanston, IL
USA

DING, YUZHENG
Synopsys Inc.
Mountain View, CA
USA

DOM, MICHAEL
University of Jena
Jena
Germany

DUBHASHI, DEVDATT
Chalmers University of Technology and Gothenburg
University
Gothenburg
Sweden

DU, DING-ZHU
University of Dallas at Texas
Richardson, TX
USA

EDMONDS, JEFF
York University
Toronto, ON
Canada

EFRAIMIDIS, PAVLOS
Democritus University of Thrace
Xanthi
Greece

EFTHYMIOU, CHARILAOS
University of Patras
Patras
Greece

ELKIN, MICHAEL
Ben-Gurion University
Beer-Sheva
Israel

EPSTEIN, LEAH
University of Haifa
Haifa
Israel

ERICKSON, BRUCE W.
The Rockefeller University
New York, NY
USA

EVEN-DAR, EYAL
University of Pennsylvania
Philadelphia, PA
USA

FAGERBERG, ROLF
University of Southern Denmark
Odense
Denmark

FAKCHAROENPHOL, JITTAT
Kasetsart University
Bangkok
Thailand

FANG, QIZHI
Ocean University of China
Qingdao
China

FATOUROU, PANAGIOTA
University of Ioannina
Ioannina
Greece

FELDMAN, JONATHAN
Google, Inc.
New York, NY
USA

FELDMAN, VITALY
Harvard University
Cambridge, MA
USA

FERNAU, HENNING
University of Trier
Trier
Germany

FERRAGINA, PAOLO
University of Pisa
Pisa
Italy

FEUERSTEIN, ESTEBAN
University of Buenos Aires
Buenos Aires
Argentina

FISHER, NATHAN
University of North Carolina
Chapel Hill, NC
USA

FLAXMAN, ABRAHAM
Microsoft Research
Redmond, WA
USA

FLEISCHER, RUDOLF
Fudan University
Shanghai
China

FOMIN, FEDOR
University of Bergen
Bergen
Norway

FOTAKIS, DIMITRIS
University of the Aegean
Samos
Greece

FRIEDER, OPHIR
Illinois Institute of Technology
Chicago, IL
USA

FÜRER, MARTIN
The Pennsylvania State University
University Park, PA
USA

GAGIE, TRAVIS
University of Eastern Piedmont
Alessandria
Italy

GALAMBOS, GÁBOR
Juhász Gyula Teachers Training College
Szeged
Hungary

GAO, JIE
Stony Brook University
Stony Brook, NY
USA

GARAY, JUAN
Bell Labs
Murray Hill, NJ
USA

GAROFALAKIS, MINOS
University of California – Berkeley
Berkeley, CA
USA

GASCUEL, OLIVIER
National Scientific Research Center
Montpellier
France

GĄSIENIEC, LESZEK
University of Liverpool
Liverpool
UK

GIANCARLO, RAFFAELE
University of Palermo
Palermo
Italy

GOLDBERG, ANDREW V.
Microsoft Research – Silicon Valley
Mountain View, CA
USA

GRAMM, JENS
Tübingen University
Tübingen
Germany

GROVER, LOV K.
Bell Labs
Murray Hill, NJ
USA

GUDMUNDSSON, JOACHIM
National ICT Australia Ltd
Alexandria
Australia

GUERRAOUI, RACHID
EPFL
Lausanne
Switzerland

GUO, JIONG
University of Jena
Jena
Germany

GURUSWAMI, VENKATESAN
University of Washington
Seattle, WA
USA

HAJIAGHAYI, MOHAMMADTAGHI
University of Pittsburgh
Pittsburgh, PA
USA

HALLGREN, SEAN
The Pennsylvania State University
University Park, PA
USA

HALPERIN, DAN
Tel-Aviv University
Tel Aviv
Israel

HARIHARAN, RAMESH
Strand Life Sciences
Bangalore
India

HELLERSTEIN, LISA
Polytechnic University
Brooklyn, NY
USA

HE, MENG
University of Waterloo
Waterloo, ON
Canada

HENZINGER, MONIKA
Google Switzerland & Ecole Polytechnique Federale de
Lausanne (EPFL)
Lausanne
Switzerland

HERLIHY, MAURICE
Brown University
Providence, RI
USA

HERMAN, TED
University of Iowa
Iowa City, IA
USA

HE, XIN
University at Buffalo The State University of New York
Buffalo, NY
USA

HIRSCH, EDWARD A.
Steklov Institute of Mathematics at St. Petersburg
St. Petersburg
Russia

HON, WING-KAI
National Tsing Hua University
Hsin Chu
Taiwan

HOWARD, PAUL G.
Microway, Inc.
Plymouth, MA
USA

HUANG, LI-SHA
Tsinghua University
Beijing, Beijing
China

HUANG, YAOCUN
University of Texas at Dallas
Richardson, TX
USA

HÜFFNER, FALK
University of Jena
Jena
Germany

HUSFELDT, THORE
Lund University
Lund
Sweden

ILIE, LUCIAN
University of Western Ontario
London, ON
Canada

IRVING, ROBERT W.
University of Glasgow
Glasgow
UK

ITAI, ALON
Technion
Haifa
Israel

ITALIANO, GIUSEPPE F.
University of Rome
Rome
Italy

IWAMA, KAZUO
Kyoto University
Kyoto
Japan

JACKSON, JEFFREY C.
Duquesne University
Pittsburgh, PA
USA

JACOB, RIKO
Technical University of Munich
Munich
Germany

JAIN, RAHUL
University of Waterloo
Waterloo, ON
Canada

JANSSON, JESPER
Ochanomizu University
Tokyo
Japan

JIANG, TAO
University of California at Riverside
Riverside, CA
USA

JOHNSON, DAVID S.
AT&T Labs
Florham Park, NJ
USA

KAJITANI, YOJI
The University of Kitakyushu
Kitakyushu
Japan

KAPORIS, ALEXIS
University of Patras
Patras
Greece

KARAKOSTAS, GEORGE
McMaster University
Hamilton, ON
Canada

KÄRKKÄINEN, JUHA
University of Helsinki
Helsinki
Finland

KELLERER, HANS
University of Graz
Graz
Austria

KENNINGS, ANDREW A.
University of Waterloo
Waterloo, ON
Canada

KEUTZER, KURT
University of California at Berkeley
Berkeley, CA
USA

KHULLER, SAMIR
University of Maryland
College Park, MD
USA

KIM, JIN WOOK
HM Research
Seoul
Korea

KIM, YOO-AH
University of Connecticut
Storrs, CT
USA

KING, VALERIE
University of Victoria
Victoria, BC
Canada

KIROUSIS, LEFTERIS
University of Patras
Patras
Greece

KIVINEN, JYRKI
University of Helsinki
Helsinki
Finland

KLEIN, ROLF
University of Bonn
Bonn
Germany

KLIVANS, ADAM
University of Texas at Austin
Austin, TX
USA

KONJEVOD, GORAN
Arizona State University
Tempe, AZ
USA

KONTOGIANNIS, SPYROS
University of Ioannina
Ioannina
Greece

KRANAKIS, EVANGELOS
Carleton
Ottawa, ON
Canada

KRATSCH, DIETER
Paul Verlaine University
Metz
France

KRAUTHGAMER, ROBERT
Weizmann Institute of Science
Rehovot
Israel
IBM Almaden Research Center
San Jose, CA
USA

KRIZANC, DANNY
Wesleyan University
Middletown, CT
USA

KRYSTA, PIOTR
University of Liverpool
Liverpool
UK

KUCHEROV, GREGORY
LIFL and INRIA
Villeneuve d'Ascq
France

KUHN, FABIAN
ETH Zurich
Zurich
Switzerland

KUMAR, V.S. ANIL
Virginia Tech
Blacksburg, VA
USA

KUSHILEVITZ, EYAL
Technion
Haifa
Israel

LAM, TAK-WAH
University of Hong Kong
Hong Kong
China

LANCIA, GIUSEPPE
University of Udine
Udine
Italy

LANDAU, GAD M.
University of Haifa
Haifa
Israel

LANDAU, ZEPH
City College of CUNY
New York, NY
USA

LANGBERG, MICHAEL
The Open University of Israel
Raanana
Israel

LAVI, RON
Technion
Haifa
Israel

LECROQ, THIERRY
University of Rouen
Rouen
France

LEE, JAMES R.
University of Washington
Seattle, WA
USA

LEONARDI, STEFANO
University of Rome
Rome
Italy

LEONE, PIERRE
University of Geneva
Geneva
Switzerland

LEUNG, HENRY
MIT
Cambridge, MA
USA

LEVCOPOULOS, CHRISTOS
Lund University
Lund
Sweden

LEWENSTEIN, MOSHE
Bar-Ilan University
Ramat-Gan
Israel

LI, LI (ERRAN)
Bell Labs
Murray Hill, NJ
USA

LI, MING
University of Waterloo
Waterloo, ON
Canada

LI, MINMING
City University of Hong Kong
Hong Kong
China

LINGAS, ANDRZEJ
Lund University
Lund
Sweden

LI, XIANG-YANG
Illinois Institue of Technology
Chicago, IL
USA

LU, CHIN LUNG
National Chiao Tung University
Hsinchu
Taiwan

LYNGSØ, RUNE B.
Oxford University
Oxford
UK

MA, BIN
University of Western Ontario
London, ON
Canada

MAHDIAN, MOHAMMAD
Yahoo! Research
Santa Clara, CA
USA

MÄKINEN, VELI
University of Helsinki
Helsinki
Finland

MALKHI, DAHLIA
Microsoft, Silicon Valley Campus
Mountain View, CA
USA

MANASSE, MARK S.
Microsoft Research
Mountain View, CA
USA

MANLOVE, DAVID F.
University of Glasgow
Glasgow
UK

MANZINI, GIOVANNI
University of Eastern Piedmont
Alessandria
Italy

MARATHE, MADHAV V.
Virginia Tech
Blacksburg, VA
USA

MARCHETTI-SPACCAMELA, ALBERTO
University of Rome
Rome
Italy

MARKOV, IGOR L.
University of Michigan
Ann Arbor, MI
USA

MCGEOCH, CATHERINE C.
Amherst College
Amherst, MA
USA

MCGEOCH, LYLE A.
Amherst College
Amherst, MA
USA

MCKAY, BRENDAN D.
Australian National University
Canberra, ACT
Australia

MENDEL, MANOR
The Open University of Israel
Raanana
Israel

MESTRE, JULIÁN
University of Maryland
College Park, MD
USA

MICCIANCIO, DANIELE
University of California, San Diego
La Jolla, CA
USA

MIKLÓS, ISTVÁN
Eötvös Lóránd University
Budapest
Hungary

MIRROKNI, VAHAB S.
Microsoft Research
Redmond, WA
USA

MIYAZAKI, SHUICHI
Kyoto University
Kyoto
Japan

MOFFAT, ALISTAIR
University of Melbourne
Melbourne, VIC
Australia

MOIR, MARK
Sun Microsystems Laboratories
Burlington, MA
USA

MOR, TAL
Technion
Haifa
Israel

MOSCA, MICHELE
University of Waterloo
Waterloo, ON
Canada
St. Jerome's University
Waterloo, ON
Canada

MOSCIBRODA, THOMAS
Microsoft Research
Redmond, WA
USA

MUCHA, MARCIN
Institute of Informatics
Warsaw
Poland

MUNAGALA, KAMESH
Duke University
Durham, NC
USA

MUNRO, J. IAN
University of Waterloo
Waterloo, ON
Canada

NA, JOONG CHAE
Sejong University
Seoul
Korea

NARASIMHAN, GIRI
Florida International University
Miami, FL
USA

NAVARRO, GONZALO
University of Chile
Santiago
Chile

NAYAK, ASHWIN
University of Waterloo and Perimeter Institute for
Theoretical Physics
Waterloo, ON
Canada

NEWMAN, ALANTHA
Max-Planck Institute for Computer Science
Saarbrücken
Germany

NIEDERMEIER, ROLF
University of Jena
Jena
Germany

NIKOLETSEAS, SOTIRIS
University of Patras
Patras
Greece

OKAMOTO, YOSHIO
Toyohashi University of Technology
Toyohashi
Japan

OKUN, MICHAEL
Weizmann Institute of Science
Rehovot
Israel

PAGH, RASMUS
IT University of Copenhagen
Copenhagen
Denmark

PANAGOPOULOU, PANAGIOTA
Research Academic Computer Technology Institute
Patras
Greece

PANIGRAHI, DEBMALYA
MIT
Cambridge, MA
USA

PAN, PEICHEN
Magma Design Automation, Inc.
Los Angeles, CA
USA

PAPADOPOULOU, VICKY
University of Cyprus
Nicosia
Cyprus

PARK, KUNSOO
Seoul National University
Seoul
Korea

PARTHASARATHY, SRINIVASAN
IBM T.J. Watson Research Center
Hawthorne, NY
USA

PĂTRAȘCU, MIHAI
MIT
Cambridge, MA
USA

PATT-SHAMIR, BOAZ
Tel-Aviv University
Tel-Aviv
Israel

PATURI, RAMAMOHAN
University of California at San Diego
San Diego, CA
USA

PELC, ANDRZEJ
University of Québec-Ottawa
Gatineau, QC
Canada

PETTIE, SETH
University of Michigan
Ann Arbor, MI
USA

POWELL, OLIVIER
University of Geneva
Geneva
Switzerland

PRAKASH, AMIT
Microsoft, MSN
Redmond, WA
USA

PRUHS, KIRK
University of Pittsburgh
Pittsburgh, PA
USA

PRZYTYCKA, TERESA M.
NIH
Bethesda, MD
USA

PUDLÁK, PAVEL
Academy of Science of the Czech Republic
Prague
Czech Republic

RAGHAVACHARI, BALAJI
University of Texas at Dallas
Richardson, TX
USA

RAHMAN, NAILA
University of Leicester
Leicester
UK

RAJARAMAN, RAJMOHAN
Northeastern University
Boston, MA
USA

RAJSBAUM, SERGIO
National Autonomous University of Mexico
Mexico City
Mexico

RAMACHANDRAN, VIJAYA
University of Texas at Austin
Austin, TX
USA

RAMAN, RAJEEV
University of Leicester
Leicester
UK

RAMOS, EDGAR
National University of Colombia
Medellín
Colombia

RAO, SATISH
University of California at Berkeley
Berkeley, CA
USA

RAO, S. SRINIVASA
IT University of Copenhagen
Copenhagen
Denmark

RAPTOPOULOS, CHRISTOFOROS
University of Patras
Patras
Greece

RASTOGI, RAJEEV
Lucent Technologies
Murray Hill, NJ
USA

RATSABY, JOEL
Ariel University Center of Samaria
Ariel
Israel

RAVINDRAN, KAUSHIK
University of California at Berkeley
Berkeley, CA
USA

RAYNAL, MICHEL
University of Rennes 1
Rennes
France

REICHARDT, BEN W.
California Institute of Technology
Pasadena, CA
USA

RENNER, RENATO
Institute for Theoretical Physics
Zurich
Switzerland

RICCI, ELISA
University of Perugia
Perugia
Italy

RICHTER, PETER
Rutgers, The State University of New Jersey
Piscataway, NJ
USA

ROLIM, JOSÉ
University of Geneva
Geneva
Switzerland

ROSAMOND, FRANCES
University of Newcastle
Callaghan, NSW
Australia

RÖTTELER, MARTIN
NEC Laboratories America
Princeton, NJ
USA

RUBINFELD, RONITT
MIT
Cambridge, MA
USA

RUDRA, ATRI
University at Buffalo, State University of New York
Buffalo, NY
USA

RUPPERT, ERIC
York University
Toronto, ON
Canada

RYTTER, WOJCIECH
Warsaw University
Warsaw
Poland

SAHINALP, S. CENK
Simon Fraser University
Burnaby, BC
USA

SAKS, MICHAEL
Rutgers, State University of New Jersey
Piscataway, NJ
USA

SCHÄFER, GUIDO
Technical University of Berlin
Berlin
Germany

SCHIPER, ANDRÉ
EPFL
Lausanne
Switzerland

SCHMIDT, MARKUS
University of Freiburg
Freiburg
Germany

SCHULTES, DOMINIK
University of Karlsruhe
Karlsruhe
Germany

SEN, PRANAB
Tata Institute of Fundamental Research
Mumbai
India

SEN, SANDEEP
IIT Delhi
New Delhi
India

SERNA, MARIA
Technical University of Catalonia
Barcelona
Spain

SERVEDIO, ROCCO
Columbia University
New York, NY
USA

SETHURAMAN, JAY
Columbia University
New York, NY
USA

SHALEV-SHWARTZ, SHAI
Toyota Technological Institute
Chicago, IL
USA

SHARMA, VIKRAM
New York University
New York, NY
USA

SHI, YAOYUN
University of Michigan
Ann Arbor, MI
USA

SHRAGOWITZ, EUGENE
University of Minnesota
Minneapolis, MN
USA

SITTERS, RENÉ A.
Eindhoven University of Technology
Eindhoven
The Netherlands

SMID, MICHIEL
Carleton University
Ottawa, ON
Canada

SOKOL, DINA
Brooklyn College of CUNY
Brooklyn, NY
USA

SONG, WEN-ZHAN
Washington State University
Vancouver, WA
USA

SPECKMANN, BETTINA
Technical University of Eindhoven
Eindhoven
The Netherlands

SPIRAKIS, PAUL
Patras University
Patras
Greece

SRINIVASAN, ARAVIND
University of Maryland
College Park, MD
USA

SRINIVASAN, VENKATESH
University of Victoria
Victoria, BC
Canada

STEE, ROB VAN
University of Karlsruhe
Karlsruhe
Germany

STØLTING BRODAL, GERTH
University of Aarhus
Århus
Denmark

STOYE, JENS
University of Bielefeld
Bielefeld
Germany

SU, CHANG
University of Liverpool
Liverpool
UK

SUN, ARIES WEI
City University of Hong Kong
Hong Kong
China

SUNDARARAJAN, VIJAY
Texas Instruments
Dallas, TX
USA

SUNG, WING-KIN
National University of Singapore
Singapore
Singapore

SVIRIDENKO, MAXIM
IBM
Yorktown Heights, NY
USA

SZEGEDY, MARIO
Rutgers, The State University of New Jersey
Piscataway, NJ
USA

SZEIDER, STEFAN
Durham University
Durham
UK

TAKAOKA, TADAO
University of Canterbury
Christchurch
New Zealand

TAKEDA, MASAYUKI
Kyushu University
Fukuoka
Japan

TALWAR, KUNAL
Microsoft Research, Silicon Valley Campus
Mountain View, CA
USA

TAMON, CHRISTINO
Clarkson University
Potsdam, NY
USA

TAMURA, AKIHISA
Keio University
Yokohama
Japan

TANNIER, ERIC
University of Lyon
Lyon
France

TAPP, ALAIN
University of Montréal
Montreal, QC
Canada

TATE, STEPHEN R.
University of North Carolina at Greensboro
Greensboro, NC
USA

TAUBENFELD, GADI
Interdiciplinary Center Herzlia
Herzliya
Israel

TELIKEPALLI, KAVITHA
Indian Institute of Science
Bangalore
India

TERHAL, BARBARA M.
IBM Research
Yorktown Heights, NY
USA

THILIKOS, DIMITRIOS
National and Kapodistrian University of Athens
Athens
Greece

TREVISAN, LUCA
University of California at Berkeley
Berkeley, CA
USA

TROMP, JOHN
CWI
Amsterdam
Netherlands

UKKONEN, ESKO
University of Helsinki
Helsinki
Finland

VAHRENHOLD, JAN
Dortmund University of Technology
Dortmund
Germany

VARRICCHIO, STEFANO
University of Roma
Rome
Italy

VIALETTE, STÉPHANE
University of Paris-East
Descartes
France

VILLANGER, YNGVE
University of Bergen
Bergen
Norway

VITÁNYI, PAUL
CWI
Amsterdam
Netherlands

VITTER, JEFFREY SCOTT
Purdue University
West Lafayette, IN
USA

VÖCKING, BERTHOLD
RWTH Aachen University
Aachen
Germany

WANG, CHENGWEN CHRIS
Carnegie Mellon University
Pittsburgh, PA
USA

WANG, FENG
Arizona State University
Phoenix, AZ
USA

WANG, LUSHENG
City University of Hong Kong
Hong Kong
China

WANG, WEIZHAO
Google Inc.
Irvine, CA
USA

WANG, YU
University of North Carolina at Charlotte
Charlotte, NC
USA

WAN, PENG-JUN
Illinois Institute of Technology
Chicago, IL
USA

WERNECK, RENATO F.
Microsoft Research Silicon Valley
La Avenida, CA
USA

WILLIAMS, RYAN
Carnegie Mellon University
Pittsburgh, PA
USA

WONG, MARTIN D. F.
University of Illinois at Urbana-Champaign
Urbana, IL
USA

WONG, PRUDENCE
University of Liverpool
Liverpool
UK

WU, WEILI
University of Texas at Dallas
Richardson, TX
USA

YANG, HONGHUA HANNAH
Intel Corporation
Hillsboro
USA

YAP, CHEE K.
New York University
New York, NY
USA

YE, YIN-YU
Stanford University
Stanford, CA
USA

YI, CHIH-WEI
National Chiao Tung University
Hsinchu City
Taiwan

YI, KE
Hong Kong University of Science and Technology
Hong Kong
China

YIU, S. M.
The University of Hong Kong
Hong Kong
China

YOKOO, MAKOTO
Kyushu University
Nishi-ku
Japan

YOUNG, EVANGELINE F. Y.
The Chinese University of Hong Kong
Hong Kong
China

YOUNG, NEAL E.
University of California at Riverside
Riverside, CA
USA

YUSTER, RAPHAEL
University of Haifa
Haifa
Israel

ZANE, FRANCIS
Lucent Technologies
Murray Hill, NJ
USA

ZAROLIAGIS, CHRISTOS
University of Patras
Patras
Greece

ZEH, NORBERT
Dalhousie University
Halifax, NS
Canada

ZHANG, LI
HP Labs
Palo Alto, CA
USA

ZHANG, LOUXIN
National University of Singapore
Singapore
Singapore

ZHOU, HAI
Northwestern University
Evanston, IL
USA

ZILLES, SANDRA
University of Alberta
Edmonton, AB
Canada

ZOLLINGER, AARON
University of California at Berkeley
Berkeley, CA
USA

ZWICK, URI
Tel-Aviv University
Tel-Aviv
Israel