
# Computer Science and Artificial Intelligence

Proceedings of the International Conference on Computer Science and Artificial Intelligence (CSAI2016)

Wen-Jer Chang
Editor

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Guilin, China, 13 – 14 August 2016

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Wen-Jer Chang

National Taiwan Ocean University, Taiwan

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**COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE**

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## Preface

Held in Guilin, Guangxi, China from August 13-14, 2016, CSAI2016 [The 2016 International Conference on Computer Science and Artificial Intelligence] hopes to provide an excellent international platform for all the invited speakers, authors, and participants. The conference enjoys a wide spread participation, and we sincerely wish that it would not only serve as an academic forum, but also a good opportunity to establish business cooperation. Any paper and topic around computer science and artificial intelligence would be warmly welcomed.

CSAI2016 proceeding tends to collect the most up-to-date, comprehensive, and worldwide state-of-art knowledge on computer science and artificial intelligence. All the accepted papers have been submitted to strict peer-review by 2-4 expert referees, and selected based on originality, significance and clarity for the purpose of the conference. The conference program is extremely rich, profound and featuring high-impact presentations of selected papers and additional late-breaking contributions. We sincerely hope that the conference would not only show the participants a broad overview of the latest research results on related fields, but also provide them with a significant platform for academic connection and exchange.

The Technical Program Committee members have been working very hard to meet the deadline of review. The final conference program consists of 116 papers divided into 3 sessions. The proceedings would be published in a volume by World Scientific Publishing Company.

We would like to express our sincere gratitude to all the TPC members and organizers for their hard work, precious time and endeavor preparing for the conference. Our deepest thanks also go to the volunteers and staffs for their

long-hours work and generosity they've given to the conference. The last but not least, we would like to thank each and every of the authors, speakers and participants for their great contributions to the success of CSAI2016.

CSAI2016 Organizing Committee

## Editor I

Prof. Wen-Jer Chang

*Department of Marine Engineering*
*National Taiwan Ocean University*

### Biography

Wen-Jer Chang received the B.S. degree from National Taiwan Ocean University, Taiwan, R.O.C., in 1986. The Marine Engineering is his major course and the Electronic Engineering is his minor one. He received the M.S. degree in the Institute of Computer Science and Electronic Engineering from the National Central University in 1990, and the Ph. D. degree from the Institute of Electrical Engineering of the National Central University in 1995. Since 1995, he has been with National Taiwan Ocean University, Keelung, Taiwan, R.O.C. He is currently the Vice Dean of Academic Affairs, Director of General Education Center, Director of Center for Teaching and Learning and a full Professor of the Department of Marine Engineering of National Taiwan Ocean University. He is now a life member of the IEEE, CIEE, CACS, CSFAT and SNAME. Since 2003, Dr. Chang was listed in the Marquis Who's Who in Science and Engineering. In 2003, he also won the outstanding young control engineers award granted by the Chinese Automation Control Society (CACS). In 2004, he won the universal award of accomplishment granted by ABI of USA. In 2005 and 2013, he was selected as an excellent teacher of the National Taiwan Ocean University. Dr. Chang has authored more than 110 published journal papers and 100 refereed conference papers. His recent research interests are fuzzy control, robust control, performance constrained control.

### Education

Ph.D.: Electrical Engineering, National Central University, 1995.
M.A.: Computer Science and Electronic Engineering, National Central University, 1990.

B.A.: Marine Engineering (major course) and Electronic Engineering (minor one), National Taiwan Ocean University, 1986.

**Experience**

Associate Professor Department of Marine Engineering, National Taiwan Ocean University, 1995.8 - 2001.7
Head Teaching Support Section of Computer Center, National Taiwan Ocean University, 2000.8 - 2002.7
Chairman Department of Marine Engineering, National Taiwan Ocean University, 2002.8 - 2004.7
Professor Department of Marine Engineering, National Taiwan Ocean University, 2001.8 - present
Director Center for Teaching and Learning, National Taiwan Ocean University, 2005.8 - present
Vice Dean Academic Affairs, National Taiwan Ocean University, 2008.8 - present
Director General General Education Center, National Taiwan Ocean University, 2014.8 – present

**Professional honors and awards**

1. 1997, 1998, 1999, 2001 Grade "A" Research Awards, National Science Council, Taiwan, R.O.C.
2. 2003-present Listed in *Marquis Who's Who in Science and Engineering*
3. 2003 Outstanding Young Control Engineers Award, Chinese Automatic Control Society, Taiwan, R.O.C.
4. 2003 Outstanding Paper Award, Taiwan Society of Naval Architects and Marine Engineers, Taiwan, R.O.C.
5. 2003 Outstanding Student Paper Award, CACS Automatic Control Conference (Adviser), Taiwan, R.O.C.
6. 2003 Best Thesis Award for Outstanding M.S. Thesis Supervision, Chinese Fuzzy Systems Association (Adviser), Taiwan, R.O.C.
7. 2004 Winner of International Scientist of the Year 2004, International Biographical Centre.
8. 2004 Winner of 2004 Universal Award of Accomplishment, American Biographical Institute.
9. 2005 Outstanding Teaching Award, National Taiwan Ocean University, Taiwan, R.O.C.

## Editor II

Prof. João Manuel Ribeiro da Silva Tavares

*Departamento de Engenharia Mecânica*
*Faculdade de Engenharia da Universidade do Porto*

### Education

Habilitation: Mechanical Engineering, University of Porto – Portugal, 2015.
PhD: Electrical and Computer Engineering, University of Porto – Portugal, 2001 (Computational Vision).
MSc: Electrical and Computer Engineering, University of Porto – Portugal, 1995 (Industrial informatics).
BSc (5 years): Mechanical Engineering, University of Porto – Portugal, 1993.

### Actual position

Associate Professor (with Habilitation) at the Faculty of Engineering of the University of Porto, Department of Mechanical Engineering, since December 2011. (www.fe.up.pt).

### Areas of Research:

- Computational Vision, Image processing and analysis, Medical imaging;
- Computer Graphics, Scientific Visualization;
- Biomedical Engineering;
- Modelling and Simulation;
- Product development.

### Awards

1. Paper more downloaded in 2014 of the journal Computer Methods in Biomechanics and Biomedical Engineering: Medical image registration: a review, Francisco P.M. Oliveira, João Manuel R.S. Tavares.

2. Award of Scientific Excellence Award 2015 from the Faculdade de Engenharia da Universidade do Porto, Portugal, in January 2015.
3. Award of Incentive to Research - Publications from the Faculty of Engineering of University of Porto, Portugal, in January 2015.
4. Award of Incentive to Research - Publications from the Faculty of Engineering of University of Porto, Portugal, in January 2014.
5. Best paper published in 2012 in the journal Pattern Recognition award: Efficient Supervised Optimum-Path Forest Classification for Large Datasets, João P. Papa, Alexandre X. Falcão, Victor Hugo C. de Albuquerque, João Manuel R. S. Tavares, Pattern Recognition, Elsevier, ISSN: 0031-3203, DOI: 10.1016/j.patcog.2011.07.013, Volume 45, Issue 1, pp. 512-520, January 2012.
6. Award of Incentive to Research - Publications from the Faculty of Engineering of University of Porto, Portugal, in January 2013.
7. Award of Incentive to Research - Publications from the Faculty of Engineering of University of Porto, Portugal, in January 2012.
8. Award of Incentive to Research - Publications from the Faculty of Engineering of University of Porto, Portugal, in November 2010.
9. Award of Incentive to Research - Patents from the Faculty of Engineering of University of Porto, Portugal, in November 2009.
10. Award of Incentive to Research - Publications from the Faculty of Engineering of University of Porto, Portugal, in November 2009.
11. Best paper award: Magnetic resonance imaging of the vocal tract: techniques and applications, Sandra M. Rua Ventura, Diamantino Rui S. Freitas, João Manuel R. S. Tavares, 1st International Conference on Imaging Theory and Applications (IMAGAPP), ISBN: 978-989-8111-68-5, INSTICC Press, pp. 105-110, 5-8 February 2009, Lisboa, Portugal.
12. Award of Incentive to Research – Patents from Faculty of Engineering of University of Porto, Portugal, November 2008. João Manuel R. S. Tavares Curriculum Vitae 151.
13. Project awarded for 2003/2004 of the Scientific Research in Pre-Graduation Program in the field of Engineering, Title: "ANDAR – System of Acquisition for Analysis of Data of the Gait of People with Prosthesis Devices in the Inferior Limbs", participant Institutions: FEUP – Faculty of Engineering of University of Porto, INEB – Institute of Biomedical Engineering, Responsible Research: Miguel V. Correia from the Department of Electrical and Computer Engineering of FEUP, 2004/2005.

## Keynote I

## How to deal with high complexity?

Prof. Bernd Steinbach

*Department of Computer Science,*
*Freiberg University of Mining and Technology*

**Abstract**

Many problems of the real life can be modeled as Boolean problem and belong to the most complex class defined by the complexity theory. The combinational explosion limits their solution. We explore convenient models and tools for their solution, and identify limits in time and space. As general method to break these limits we found the combination of a deep analysis of hidden properties of the problem to be solved by human beings with the utilization of optimized algorithms and powerful computers.

**Speaker's Bio**

Bernd Steinbach studied Information Technology at the University of Technology in Chemnitz (Germany) and graduated with an M.Sc. in 1973. He graduated with a Ph.D. and with a Dr. sc. techn. (Doctor scientiae technicarum) for his second doctoral thesis from the Faculty of Electrical Engineering of the Chemnitz University of Technology in 1981 and 1984, respectively. In 1991 he obtained the Habilitation (Dr.-Ing. habil.) from the same Faculty. He was working in industry as an Electrician, there he had tested professional controlling systems at the Niles Company. After his studies he taught as Assistant Lecturer at the Department of Information Technology of the Chemnitz University of Technology. In a following period of industrial occupation as a research engineer he developed programs for test pattern generation for computer circuits at the company Robotron. He returned to the Department of Information Technology of the Chemnitz University of Technology as Associate Professor for design automation in logic design. Since

1992 he is a Full Professor of Computer Science/Software Engineering and Programming at the Freiberg University of Mining and Technology, Department of Computer Science. He has served as Head of the Department of Computer Science and Vice-Dean of the Faculty of Mathematics and Computer Science. He published more than 240 chapters in books, complete issues of journals, and papers in journals and proceedings.

## Committees

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