Keynote Speech 1

Parallel and Interactive Computing of Big Data

Prof. Guoliang Chen
Shenzhen Univ./Univ. of Sci. & Tech. of China, China

Abstract:

In the computation theory, the computational complexity is mainly studied in the two classes of P and NP. In the case of big data, in order to improve the solving speed of P class problem, parallel computing can be used. One example is the NC class parallel computing. In order to improve the quality of solving NP class problem, an interactive method is adopted. One example is the IP class interaction computing. In this report, we first briefly introduce the preliminary knowledge, including computational model and computational complexity, deterministic and non-deterministic solution of problem. Then we discuss the parallel solution of the P class problem and the interactive solution of NP class problem. At last, according to the target, the research strategy and the concrete implementation plan, the overall framework of big data computing is summarized.

Biography:

Professor Guoliang Chen is academician of Chinese Academy of Sciences. He is the Dean of College of Computer Science and Software Engineering of Shenzhen University. His research interests are in the areas of parallel algorithms and high performance computing and its applications. He has undertaken more than 10 national scientific research projects. He has received a number of awards for his research and education contributions, which include the first National High School Prominent Educator Award, the 2nd Prize of the National Sci-Tech Advance Award (2001), the 2nd Prize of National Education Teaching Achievement Award (1997, 2001, 2009, 2014), Major Sci-Tech Achievements Award in Anhui Province (2009).
Keynote Speech 2

Approximation Algorithms: Methodologies, Applications and Empirical Evaluation

Prof. Teofilo Gonzalez
University of California, USA

Abstract:

We discuss the basic methodologies to design approximation algorithms. These include: Restriction (structural and algorithmic), Relaxation (structural and numerical), Rounding, Transformation, Local Ratio, Primal-Dual, Local Search, and Meta-heuristics. As an example of a hybrid technique we apply the Restriction-Relaxation technique to design a set of algorithms for the problem of finding minimum edge-length corridors. We discuss several different design choices some of which provide constant ratio approximations, while others can be shown to allow for arbitrarily bad solutions. We outline the proof techniques to establish our results. An extensive empirical evaluation of our algorithms is discussed. Several open problems and the difficulty encountered when trying to solve them will be discussed.

Biography:

Dr. Gonzalez received the B.Sc. degree in Computer Science from the Instituto Tecnologico de Monterrey (1972) and the Ph.D. degree in Computer Science from the University of Minnesota, Minneapolis, (1975). In 2009 Professor Gonzalez became IASTED Fellow for his “contributions to Multicasting Dissemination Algorithms for Parallel and Distributed Computing, as well as for his decade long commitment to PDCS and IASTED”. Professor Gonzalez research activity has concentrated on the development of efficient exact and approximation algorithms as well as computational complexity issues for problems in several disciplines. Professor Gonzalez is currently working on Multi-Message Multicasting algorithms for networks. The is a fundamental problem that arises when executing program in parallel computer systems. Some applications include iterative methods for solving systems of linear and non-linear equations, and most dynamic programming procedures, etc. His research contributions include work in message routing and parallel and distributed computing. He has also developed efficient approximation algorithms for message dissemination problems in hyper cubes and communication networks when communication links or nodes fail.

Keynote Speech 3

High Performance and Big Data Proteogenomics: Challenges and Opportunities

Prof. Ajay Gupta
Western Michigan University, USA

Abstract:

Proteogenomics is an area of systems biology research at the interface of proteomics and genomics. Thanks to the emergence of high-throughput next generation sequencing technologies such as RNA-Seq and dramatic improvements in the depths and throughput of mass spectrometry-based proteomics, the pace of proteogenomics computational research has greatly accelerated. Analyzing mass spectrometry-based proteomics data using customized protein sequence databases, for example, enables the discovery of novel peptides, provides peptide-level evidence of gene expression, and assists in refining gene models. Data generated from the next generation sequencing machines or the mass spectrometry faces the traditional big data problems, namely of storage, transfer, analysis and visualization. Integrating these big data sets for proteogenomics studies compounds all of the associated computational problems. In this talk, we will explore various challenges in addressing some of these problems. High performance computing solutions for analyzing proteogenomics data sets are almost non-existent. We will thus also identify opportunities in this problem domain area for possible high performance computing research.

Biography:

Ajay Gupta is a Professor of Computer Science at Western Michigan University and the TCPP-Chair of IEEE-CS. From 1998 to 2002, he was the Chairman of the Computer Science Department at Western Michigan University. Dr. Gupta received his Ph.D. in Computer Science from the Purdue University in 1989, his M.S. in Mathematics and Statistics from the University of Cincinnati in 1984, and his B.E. (Honors) in Electrical and Electronics Engineering from the Birla Institute of Technology and Sciences, Pilani, India in 1982. Dr. Gupta’s research interests include sensor networks and systems, cloud computing, evolutionary computation, scientific computing, and design and analysis of parallel and distributed algorithms. He has published numerous technical papers and book chapters in refereed conferences and journals in these areas. He is a senior member of the IEEE and member of the IEEE Computer Society, the IEEE Communications Society, the ASEE and the ACM.
Keynote Speech 4

Challenges of Big Data in Scientific Discovery

Prof. Benjamin W. Wah

The Chinese Univ. of Hong Kong, China

Abstract:

Big Data is emerging as one of the hottest multi-disciplinary research fields in recent years. Big data innovations are transforming science, engineering, medicine, healthcare, finance, business, and ultimately society itself. In this presentation, we examine the key properties of big data (volume, velocity, variety, and veracity) and their relation to some applications in science and engineering. To truly handle big data, new paradigm shifts (as advocated by the late Dr. Jim Gray) will be necessary. Successful applications in big data will require in situ methods to automatically extracting new knowledge from big data, without requiring the data to be centrally collected and maintained. Traditional theory on algorithmic complexity may no longer hold, since the scale of the data may be too large to be stored or accessed. To address the potential of big data in scientific discovery, challenges on data complexity, computational complexity, and system complexity will need to be solved. We illustrate these challenges by drawing on examples in various applications in science and engineering.

Biography:

Benjamin W. Wah is currently the Provost and Wei Lun Professor of Computer Science and Engineering of the Chinese University of Hong Kong. Before then, he served as the Director of the Advanced Digital Sciences Center in Singapore, as well as the Franklin W. Woeltge Endowed Professor of Electrical and Computer Engineering and Professor of the Coordinated Science Laboratory of the University of Illinois, Urbana-Champaign, IL. He received his Ph.D. degree in computer science from the University of California, Berkeley, CA, in 1979. He has received a number of awards for his research contributions, which include the IEEE CS Technical Achievement Award (1998), the IEEE Millennium Medal (2000), the IEEE-CS W. Wallace-McDowell Award (2006), the Pan Wen-Yuan Outstanding Research Award (2006), the IEEE-CS Richard E. Merwin Award (2007), the IEEE-CS Tsutomu Kanai Award (2009), and the Distinguished Alumni Award in Computer Science of the University of California, Berkeley (2011). Wah’s current research interests are in the areas of big data applications and multimedia signal processing.

Wah cofounded the IEEE Transactions on Knowledge and Data Engineering in 1988 and served as its Editor-in-Chief between 1993 and 1996, and is the Honorary Editor-in-Chief of Knowledge and Information Systems. He currently serves on the editorial boards of Information Sciences, International Journal on Artificial Intelligence Tools, Journal of VLSI Signal Processing, and World Wide Web. He has served the IEEE Computer Society in various capacities, including Vice President for Publications (1998 and 1999) and President (2001). He is a Fellow of the AAAS, ACM, and IEEE.
Keynote Speech 5

Information Security: Issues and Challenges

Prof. Manu Malek
Stevens Institute of Technology, U.S.A

Abstract:

While the Internet has provided many online services and facilitated finding information and doing transactions, it has created challenging security and privacy issues due to its very openness. Internet of Things (IoT) promises to connect up to 100 billion objects by the year 2020. The proliferation and use of mobile devices at home and enterprise has further exacerbated the situation. Now, the Internet poses vulnerabilities resulting in many attacks, such as ID theft, denial of service, and industrial espionage. This talk describes some typical vulnerabilities and attacks, discusses the sources of security problems, and offers some safeguards and defenses. It also touches on security forensics - the discipline to identify the attackers and document their activities.

Biography:

Dr. Malek is the Editor-in-Chief of the Elsevier international journal of Computers and Electrical Engineering. Dr. Malek has extensive experience in teaching, practicing, and research in communications and computer networking; and has held various academic positions in USA and overseas, as well as technical management positions at Telcordia Technologies and AT&T/Lucent Bell Labs. He was a Distinguished Member of Technical Staff at Lucent Bell Labs until 2001; then joined Stevens Institute of Technology as an Industry Professor of Computer Science and Telecom Management. He retired from Stevens in 2008. Dr. Malek is the author, co-author, or editor of seven books, and the author or co-author of more than fifty published technical papers in the areas of control systems, communication networks, computer communications, and network management. He is a Life Fellow of the IEEE and an IEEE Millennium medalist for his contributions. He was Editor for Network Management for IEEE Transactions on Communications (1989-92), and an IEEE ComSoc Distinguished Lecturer (1999-2007). He founded and was the Editor-in-Chief of Springer’s Journal of Network and Systems Management (1993-2010). He has been Editor-in-Chief of Computers and Electrical Engineering since 2010. Dr. Malek earned his Ph.D. in EE/CS from the University of California at Berkeley.
Keynote Speech 6

New Period of Big Data: “Art” Flourishes and Supercomputing Returns

Prof. Lionel M. Ni
The University of Macau, Macau

Abstract:

In the recent years, with the maturity of Big Data technologies regarding data acquisition, data management and data processing, academia and industry have begun to turn their attention to Big Data technologies regarding in-depth analytics such as deep neural networks, recommender systems and large-scale graph mining. In this new stage, the development of Big Data technologies has shown two notable characteristics. First, the success of practical data analytics relies more on the experience and inspiration of data scientists rather than the adoption of profound theories. For example, the top-ranked teams in the ImageNet competition would make most of the efforts on finding ‘golden’ features and trying various ‘tricks’ to train their models better. In other words, data analytics is more like an art rather than a science. Second, supercomputing, which was once believed not suitable for big data processing, has regained researchers’ attention as in-depth data analytics require much more computing power than simple data management. In this talk, we will uncover the reasons behind ‘the Rise of Art’ and why supercomputing could be a great help to data scientists. We will also discuss the challenges of applying the latest supercomputing technologies in Big Data analytics.

Biography:

Professor Lionel M. Ni is chair professor in the Science and technology department at University of Macau. He also serves as the Vice Rector (Academic Affairs) at University of Macau. Before that, he was Chair Professor in the Computer Science and Engineering Department at the Hong Kong University of Science and Technology (HKUST). He served as the Department Head from 2002 to 2008. He also served as the Special Assistant to the President, Dean of HKUST Fok Ying Tung Graduate School. He was the Chief Scientist of the National Basic Research Program of China (973 Program) on Wireless Sensor Networks, He is a visiting chair professor at Shanghai Jiaotong University, a visiting chair professor at Tsing Hua University (Beijing), and an honorary chair professor at National Tsinghua University (Hsinchu). Prior to coming to HKUST, Professor Ni was a full Professor in Computer Science and Engineering at Michigan State University. He was co-founder and CEO of CC&T Technologies, Inc, and the program director of the U.S. National Science Foundation Microelectronic Systems Architecture Program. Lionel M. Ni earned the Ph.D. degree in electrical and computer engineering from Purdue University, West Lafayette, IN, in 1980. He was elevated to the rank of fellow of IEEE in 1994. His papers are published most in top conference and journals, the number of citations is over 22,000 times, H-index is 64. He has 15 patents in U.S. and China, and another 30 are under review. In recognition of his great contribution, he got the Overseas Outstanding Contribution Award from China Computer Federation in 2009, the First Class Award in Natural Sciences for Research Excellence by the Ministry of Education, China in 2010 and the Second Class Award in Natural Sciences for Research Excellence by the State Council, China in 2011.