4th Singapore Mathematics Symposium

Date: 27 September, 2013 (Friday)
Venue: Nanyang Technological University (LT1, SPMS)
Time: 1pm – 5:15pm

Schedule:
1:00 – 1:10: Welcome by Ling San, SMS president
1:10 – 2:00: On the Gross-Prasad Conjecture, by Gan Wee Teck, NUS
2:00 – 2:50: Negative gradient flow and non-linear boundary value problem, by Xu Xingwang, NUS
2:50 – 3:20: Tea break
3:20 – 4:10: Distributed Algorithmic Foundations of Dynamic Networks, by Gopal Pandurangan, NTU
4:10 – 5:00: Ground states and dynamics of the nonlinear Schrodinger/Gross-Pitaevskii equations and applications, by Bao Weizhu, NUS
5:00 – 5:15: Poster Prize Presentation and Closing Remarks

Titles/abstract/biography of speakers at 4th Singapore Mathematical Symposium

Speaker: Professor Gan Wee Teck (Department of Mathematics, NUS)

Title: On the Gross-Prasad Conjecture

Abstract: I will discuss a restriction problem in the representation theory of classical groups, first formulated by Gross and Prasad in the early 90's and subsequently extended to all classical groups more recently. A conjectural answer to this problem, over both local and global fields, is formulated in the framework of the Langlands program. There has been much recent progress on these conjectures and we shall survey some of these.

Biography: Wee Teck Gan works in the areas of number theory and representation theory. He obtained his PhD degree at Harvard University in 1998. After postdoctoral and faculty positions at Princeton University and University of California, San Diego, he joined NUS in 2011, where he currently holds a Provost chair.

Speaker: Professor Xu Xingwang (Department of Mathematics, NUS)

Title: Negative gradient flow and non-linear boundary value problem

Abstract: In this talk, I will report the recent progress on a well -known nonlinear boundary value problem. This problem is closely related to sharp trace inequality and geometric description of the mean curvature on the boundary

among its conformal deformations. The method used is the negative gradient flow.

Biography: Xu Xingwang graduated from Nanjing University with master degree and University of Connecticut with Ph.D. degree. He joined NUS in 1991 as a lecturer, and was promoted to full professor in 2008. He has written 40 research papers.

Speaker: Professor Gopal Pandurangan (School of Mathematical and Physical Sciences, NTU)

Title: Distributed Algorithmic Foundations of Dynamic Networks

Abstract: Many of today's real-world communication networks are highly dynamic, i.e., their network topology changes continuously over time. Examples include Peer-to-Peer (P2P) networks and ad hoc wireless and sensor networks. Such networks are now widely used in various applications, including sharing data and resources, search and storage, Internet telephony, environment monitoring and management. In P2P networks (e.g., Skype, BitTorrent), the topology changes at a rapid rate due to continuous joining and leaving of nodes; in ad hoc sensor and vehicular networks, the topology changes dynamically due to failure or mobility of the nodes. Performing robust and efficient non-trivial distributed computation in such highly dynamic networks is challenging. In this talk, I will give an overview of our recent results that make progress towards developing an algorithmic theory of dynamic networks. First, I will present a rigorous theoretical framework for studying dynamic networks. Then I will present efficient techniques and algorithms for solving the fundamental agreement problem in dynamic networks. I will also present efficient algorithms for key problems such as information spreading, search, and storage. To complement our algorithms, I will also present almost tight lower bounds for agreement and information spreading.

Biography: Prof. Gopal Pandurangan (http://www.ntu.edu.sg/home/gopal) is affiliated with the Theoretical Computer Science research group in the Mathematical Sciences Division at Nanyang Technological University. He is also a visiting faculty in the Computer Science Department at Brown University. He received his Ph.D. from Brown University (2002), Masters from SUNY Albany (1997), and B.Tech. from IIT Madras (1994), all in Computer Science. He is a senior member of the ACM and the IEEE. His research interests are in the design and analysis of algorithms, distributed computing and network algorithms, large-scale data processing, communication networks, real-world networks, and computational biology. He has published over 75 refereed research papers in prestigious international journals and conferences in the above areas. He serves on the editorial boards of Journal of Discrete Algorithms and Journal on Self Computing and has served on the program committees of various international conferences.

Speaker: Professor Bao Weizhu (Department of Mathematics, NUS)

Title: Ground states and dynamics of the nonlinear Schrodinger/Gross-Pitaevskii equations and applications

Abstract: In this talk, I begin with a brief derivation of the nonlinear Schrodinger/Gross-Pitaevskii equations (NLSE/GPE) from Bose-Einstein condensates (BEC) and/or nonlinear optics. Then I will present some mathematical results on the existence and uniqueness as well as non-existence of the ground states of NLSE/GPE under different external potentials and parameter regimes. Dynamical properties of NLSE/GPE are then discussed, which include conservation laws, soliton solutions, well-posedness and/or finite time blowup. Efficient and accurate numerical methods will be presented for computing numerically the ground states and dynamics. Extension to NLSE/GPE with an angular momentum rotation term and/or non-local dipole-dipole interaction will be presented. Finally, applications to collapse and explosion of BEC, quantum transport and quantized vortex interaction will be investigated.

Biography: Professor Weizhu BAO is currently the Provost's Chair Professor at Department of Mathematics, National University of Singapore (NUS). He got his PhD from Tsinghua University in 1995 and afterwards he had postdoc and faculty positions at Tsinghua University, Imperial College in UK, Georgia Institute of Technology and University of Wisconsin at Madison in USA. He joined NUS as an Assistant Professor in 2000 and was promoted to Professor in 2009. His research interests include numerical methods for partial differential equations, scientific computing/numerical analysis, analysis and computation for problems from physics, chemistry, biology and engineering sciences. He is currently on the Editorial Board of SIAM Journal on Scientific Computing. He is a 45-minutes Invited Speaker at the International Congress of Mathematicians in 2014 (ICM2014) to be held in Seoul, Korea.