DEPARTMENT OF APPLIED MATHEMATICS
應 用 數 學 系

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

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Christmas Party 2007

The Department held its annual Christmas luncheon on 24 December 2007. Apart from full-time staff of AMA, the party was also attended by quite a few colleagues who had retired from the Department, as well as other guests within PolyU, including a number of Faculty Deans and Heads of Departments in the Faculty of Applied Science and Textiles.

Participants were thrilled by the excitement of the lucky draw. Some of them went home with fabulous prizes, many of which had been donated by our guests.

Particular thanks to colleagues from the General Office for their excellent job in organizing the luncheon.

Alumni "Poon Choi" Gathering

The Poon Choi gathering at Sha Tau Kok attracted altogether 47 participants, 28 of whom were students. We gathered at the Sheung Shui station in the morning of 17 February and two specially chartered mini-buses took us across the heavily-guarded border (the Shenzhen River) to the LIN MA HANG Village (the so-called Ip's Territory). Led by Dr. Ip, we made a tour of the village school and some historical heritage, including the Ancestral Hall. We also walked up the hill to visit a derelict Hong Kong Police Kong Shan Police Post and had a very good view over its surroundings. We were then invited to attend a sumptuous Poon Choi banquet which is an annual event during the spring festival for the local villagers.

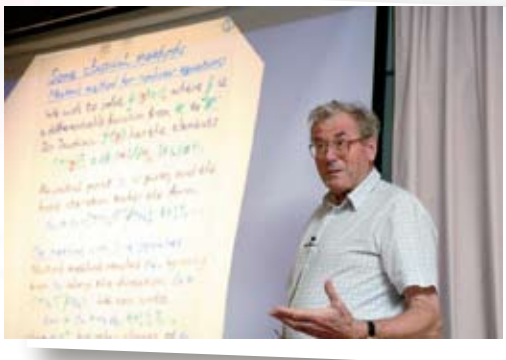
Mentor-mentees Gathering

A tea reception was held earlier this year at the Staff Club to give our students an opportunity to meet their mentors for the first time. This is an official mentorship activity organized by our Department. Some alumni were also invited to the gathering as potential mentors for future students. The tea reception also served as an orientation meeting for the mentorship programme. Altogether there were 63 participants.

Past and Forthcoming Events of the JRI (AMSS-PolyU Joint Research Institute)

In the first semester of 2007-2008, the Department was very honoured to have several leading academics delivering Distinguished Lectures:

On 14th November, ***Professor Tommaso Ruggeri*** of University of Bologna, Italy, visited our Department and presented his lecture on "An introduction to the modern theory of extended thermodynamic with applications to rarefied gases and multi-temperature mixture of fluids". Professor Ruggeri is the Director of GNFM (National Group of Mathematical Physics) and a member of the Italian National Academy. The lecture was of general interest and introduced the main idea and assumptions of the modern approach of extended thermodynamics.



On 5th December, ***Professor Michael J.D. Powell*** of University of Cambridge shared with us his deep knowledge of the history of nonlinear optimization in his lecture "On algorithms for nonlinear optimization since 1959". Particular attention was given to several ideas that provided major advances in practice.

Professor Peter G. Hall joined us on 21st December. He is a Fellow of the Australian Academy of Science and the Royal Society of London and a previous winner of the COPSS (Committee of Presidents of Statistical Societies) Award. He gave us new insights on heavy-tailed data in his talk on "Robustness of multiple hypothesis testing procedures against dependence." We are certain that his audience were much stimulated by his ideas in the areas of statistics.

The fourth equally inspiring Distinguished Lecture held on 27th December was "Finding equitable convex partitions and its applications" delivered by ***Professor Yinyu Ye*** of Stanford University. Professor Ye was the first recipient of the Farkas prize of the INFORMS Optimization Society. He was listed as a highly cited mathematical researcher on http://www.ISIhighlycited.com in 2004. His lecture presented a fast algorithm which can be applied to multi-depot vehicle routing, load-balanced network designing and client/server service load balancing, etc. The audience was much impressed by this algorithm.

A further Distinguished Lecture will be delivered by ***Professor Jong-shi Pang*** on 3rd April, 2008. Professor Pang is the Head of the Department of Industrial and Enterprise Systems Engineering, University of Illinois at Urbana-Champagne. Professor Pang was also an ISI Highly Cited Researcher in the Mathematical Category between 1980 – 1999.

Departmental Soccer Team

In the last issue of the Newsletter, we recapped the highlights of the main matches in the last academic year. Recently, the Department has sponsored the soccer team for their football wear. The players are shown in their new uniforms in this picture.

Department Head – Prof. Qi's Sharing of Research Experience

Here, I wish to share with you my research collaboration experience with biomedical engineering researchers.

In 2005, I published a paper [1] introducing eigenvalues for tensors. Since then, I have nine papers published or accepted for publication on this subject. My motivation in introducing eigenvalues for tensors came from a multivariate positive definiteness problem in automatic control [2]. This was later found to be of use in the best rank-one approximation problem in statistical data analysis [3].

In biomedical engineering, there is a popular magnetic resonance imaging (MRI) model called diffusion tensor imaging (DTI). The MR measurement of an effective diffusion tensor of water in tissues can provide unique biological and clinical information. A diffusion tensor is a second order, three dimensional symmetric tensor. It has six independent elements. After obtaining the values of these six independent elements by MRI techniques, the biomedical engineering researchers further calculate certain characteristic quantities of this diffusion tensor. These characteristic quantities are rotationally invariant, independent of the choice of the laboratory coordinate system. They are the three eigenvalues of the diffusion tensor. However, DTI is known to have limited capability in resolving multiple fibre orientations within one voxel. This is mainly because the probability density function for random spin displacement is non-Gaussian in the confining environment of biological tissues and, thus, the modeling of self-diffusion by a second order tensor breaks down. Recently, a new MRI model was presented by biomedical engineering researchers. They proposed using a fourth order three dimensional symmetric tensor, called the diffusion kurtosis (DK) tensor, to describe the non-Gaussian behavior. The values of the fifteen independent elements of the DK tensor can be obtained by the MRI technique. The diffusion kurtosis imaging (DKI) has important biological and clinical significance. However, what are the coordinate-independent characteristic quantities of the DK tensor? Are there special types of eigenvalues of the fourth order DK tensor, which play a role? The biomedical engineering researchers were puzzled by these questions. They searched Google and found my paper [1]. This has led to a collaboration between them and my research group. The first collaborative paper [4] has been accepted for publication. More theoretical and experimental research work lies ahead. Later, in collaboration with a mechanics researcher, I found further applications of the concepts of eigenvalues of tensors to the strong ellipticity problem in solid mechanics.
There is still a lot of hard research work ahead. But I feel confident that I am doing real applied mathematics research work. I think that, while we need to pay due attention to publications and grant applications, we should continue with our basic research pursuits. We should seek to achieve something useful and significant for our world and our community. As applied mathematicians, we should explore new applied mathematics territory.

I hope that my experience may be helpful to you.

Liqun Qi

References

[1]. L. Qi, ``Eigenvalues of a real supersymmetric tensor'', Journal of Symbolic Computation 40 (2005) 1302-1324.
[2]. Q. Ni, L. Qi and F. Wang, ``An eigenvalue method for the positive definiteness identification problem'', to appear in: IEEE Transactions on Automatic Control.
[3]. L. Qi, F. Wang and Y. Wang, ``Z-eigenvalue methods for a global polynomial optimization problem'', to appear in: Mathematical Programming.
[4]. L. Qi, Y. Wang and E.X. Wu, ``D-eigenvalues of diffusion kurtosis tensors'', to appear in: Journal of Computational and Applied Mathematics.

Forthcoming Events

Conference

The Second International Conference on "Nonlinear Programming with Applications" will be held on 7-9 April, 2008 in Beijing. The Conference is co-organized by our Department, the Academy of Mathematics and Systems Science, Chongqing Normal University and Fudan University. It aims to continue to provide a forum for eminent researchers and practitioners working in nonlinear programming and its applications to report and exchange their latest works. There will be more than 20 keynote and invited speakers from all over the world.

China Experience – Shanghai visit

The Department has organized learning experience tours to the Mainland since 2002 to provide students with the opportunity to gain a better understanding of recent development in Mainland China and to strengthen their sense of social and national responsibility. This summer, a group of our Investment Science students, led by Dr. Cedric Yiu, will visit Shanghai from 7 – 11 June. Apart from academic visits to Shanghai University of Finance & Economics and Fudan University's School of Management, the group will also tour the Shanghai Stock Exchange and Shanghai Baosteel Group, the largest iron and steel conglomerate in China. The students will also take part in some friendly basketball matches with students from other institutions.

The visit is part of the Students' Development Programme of the Department, and is partially funded by the Dean's Reserve.

Academic Visit to UK

A Faculty delegation led by the Dean will visit several reputed universities in the UK at the beginning of April. The representatives of the Department are Prof. C.K. Chan and Dr. H. Wong. The main purpose will be to learn from Departments in the UK about programme development in the areas of financial mathematics, actuarial science and statistics related programmes.

Marathon

Our technicians Alex Au-Yeung and Benny Fu took part in the Standard Chartered Marathon held on Sunday 17 February 2008. Alex successfully completed the 10 km race in 1 hour and 9 mins while Benny completed the Half Marathon in 2 hours and 30mins. Well done Alex and Benny !

We hope other colleagues will follow their footsteps and get in shape during the Year of the Rat.

Election of Council Member

Associate Professor Joseph Lee Heung Wing was elected a member of the University Council by eligible staff in November/December 2007. His tenure in Council started from January 1 2008 and will last for two years. He also served as a member of the Estates Committee and a trustee of the PolyU Superannuation Fund.

Joseph won by a comfortable margin in the election due to his work as Vice-chairman of the Polytechnic University Staff Association. His tenacity in safeguarding staff rights has earned him a lot of support from the grassroots. We wish him all the best in his endeavours in Council.

Well done, Joseph, and keep up the good work!

Summer Camp

The Department will once again organize a summer camp for high school students in July this year. The theme will be "The Science of Investment". Up to 80 students at F.4 or above will attend the summer camp from 16 to 18 July 2008. Apart from talks on finance modeling and investment science, some front-line professionals in the industries will be invited to share their working experience with students. There will also be games and competitions, team building activities and other recreational activities during the 3-day event.

Posters together with other relevant information will be sent to schools in early April by the Office of the Faculty of Applied Science and Textiles. The Camp is sponsored by funding from the Dean of FAST.

Staff Movement

1. Chen Xiao-jun was appointed Professor in December 2007. Before joining the Department, she was a Professor in the Department of Mathematical Sciences, Hirosaki University, Japan. Her research interest includes numerical analysis, optimization and applications in engineering and economics.
2. James Huang was appointed Instructor of the Department in December 2007, and was later promoted to Lecturer upon the conferment of a degree of Doctor of Philosophy from the University of Alberta in February 2008. James' research areas cover Stochastic Analysis, Bayesian Statistics and Financial Mathematics.
3. Julia Yeung and Agnes Fung joined the Department in November 2007 as an Executive Assistant and in January 2008 as a Work Integrated Education Officer respectively.
4. Chan Cheong-Ki and Chan Chi-kin have been promoted to Professor and Associate Professor respectively from 1 March 2008. Both CKs have been with AMA for more than 20 years, and both have played very important roles in the teaching, research and administration of the Department. Our heartfelt congratulations to them for their very worthy promotion.
5. Zhou Xian has resigned after serving the Department as an Assistant /Associate Professor for more than 10 years. A party will be held in April to bid him farewell.
6. Professor Ian Sloan has been appointed Chair Professor under the Distinguished Scholar Scheme. Professor Sloan is a world renounced applied mathematician, specializing in Numerical Analysis. He would spend two months every year in the Department for the next two years.
7. Professors Chang Kung-ching of Peking University and Ye Yin-yu of Stanford University were appointed Honorary Professors of the Department. Professor Chang is a leading expert in non-linear analysis. He is an Academician of the Chinese Academy of Sciences, and was honoured as a Distinguished Chinese Visiting Scholar by the PolyU in 2007. Professor Ye is a Professor of Management Science and Engineering at Stanford University. He is a highly cited mathematical researcher, with research area covering Operations Research, Stochastic Combinatorial Optimization, Mathematical Programming, Algorithm Design and Analysis and Decision Making. Professor Ye is the Chief Editor of Pacific Journal of Optimization, and is the first recipient of the Farkas Prize of the INFORMS Optimization Society of 2006.

From left to right, Agnes Fung, James Huang, Chen Xiaojun and Julia Yeung.

New Member of the Editorial Board

Dr. Zhou Xian, a member of the Newsletter's Editorial Board, will leave PolyU in April 2008. His vacancy in the Board has been filled by Professor Hou Shui Hung, Associate Head of the Department.

We take this opportunity to thank Xian for his immense contribution to the Newsletter and wish him all the best in his future endeavours.

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