SCIENCE FACULTY

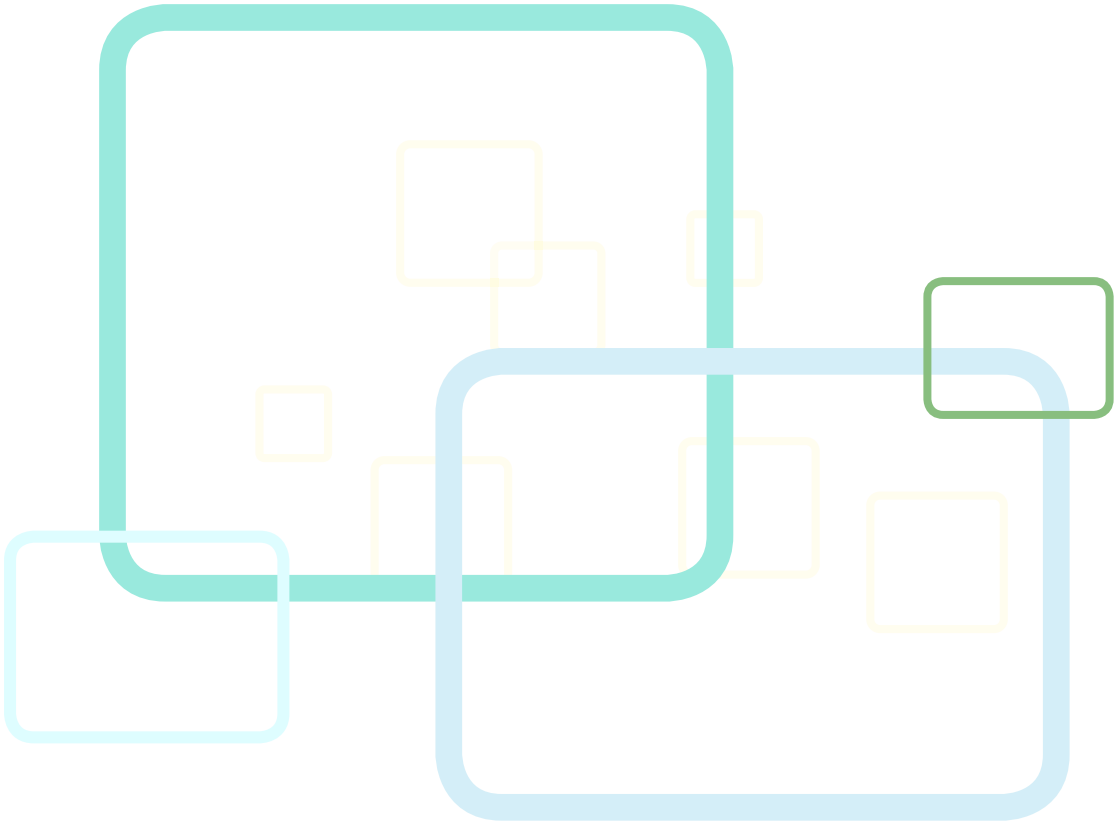
Research Day 2016

Thursday 16 June 2016

9:00a.m. - 12:35p.m.

L2, Science Centre

Faculty of Science
The Chinese University of Hong Kong



Event Programme

09:00 - 09:15 **Opening Ceremony**

09:15 - 10:15

Medical Morphometry using Quasiconformal Teichmüller Theory

Professor Ronald Lok-Ming Lui
Assistant Professor
Department of Mathematics
The Chinese University of Hong Kong

10:15 - 10:30 **Tea Break**

10:30 - 11:30

The Ancient Chinese Game of Weiqi and Statistical Learning

Professor Ming-Gao Gu
Professor
Department of Statistics
The Chinese University of Hong Kong

11:30 - 12:30

Big Data in Risk Management Science

Professor Hoi-Ying Wong
Professor
Department of Statistics
The Chinese University of Hong Kong

12:30 - 12:35 **Event Closing**

卓越研究

Excellence in Research

The Faculty of Science is proud to be home of over 100 dedicated scientists conducting cutting-edge research in various areas of science. Our staff and students remain committed to our Faculty's Mission in expanding the frontiers of human knowledge, aiming to build a better world for the future.

理學院擁有一支充滿熱誠的科研隊伍，逾百名科學家在多個領域進行尖端研究。我們的教職員與學生將秉承一貫的宗旨，擴展人類知識領域，為未來建立一個更美好的世界。

Message from the Dean of Science

Welcome to the Science Faculty Research Day 2016. The highlight of this year's Research Day is interdisciplinary applications of Mathematical Sciences. Nowadays, we witness an incredible opportunity for deriving innovative solutions making use of Mathematical Sciences, in response to uprising challenges in our daily life. Today, we also hope to cultivate awareness and appreciation of the beauty, power and importance of Mathematical Sciences.

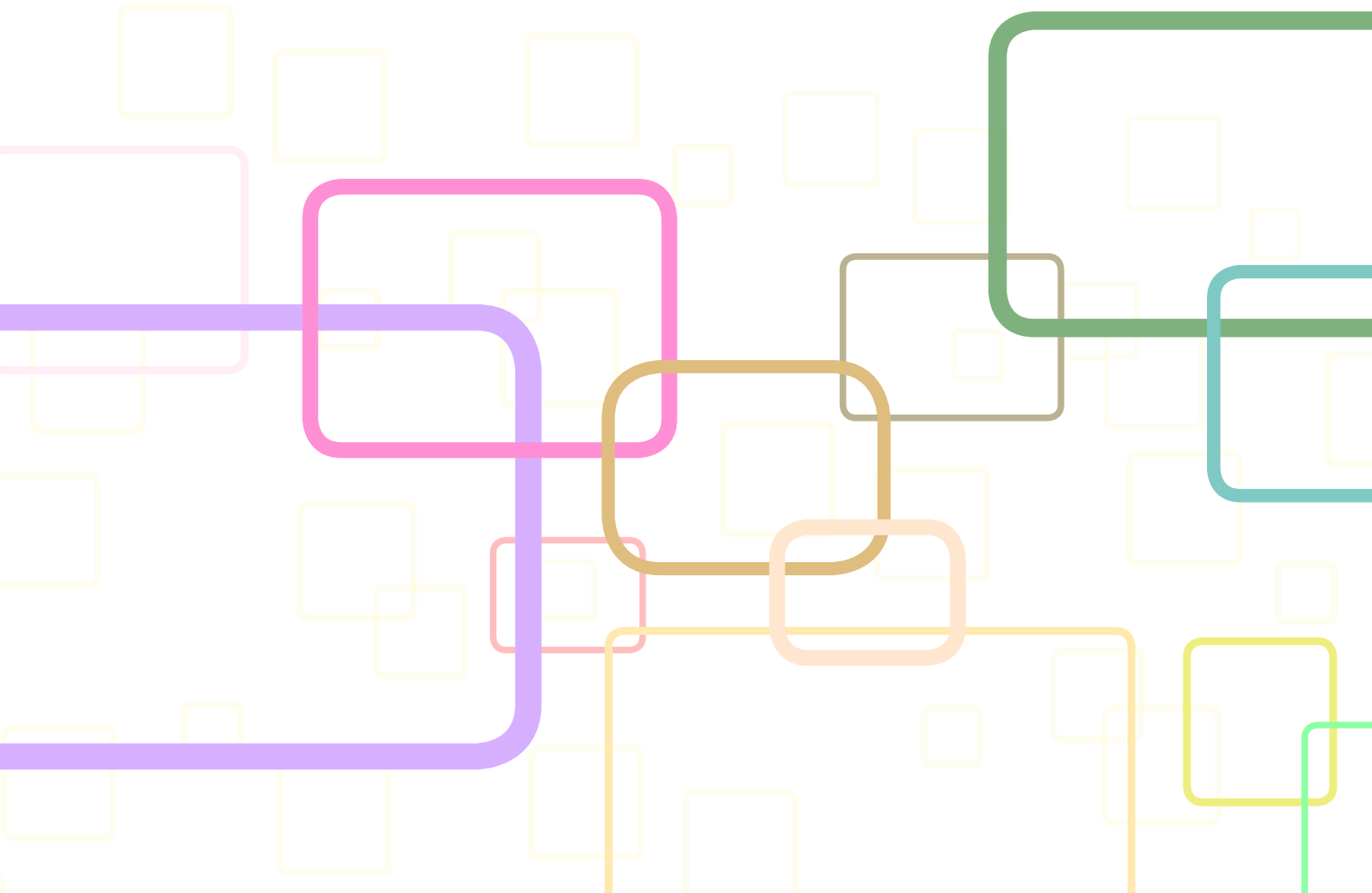
Research in Mathematical Sciences proves to be increasingly important, as driven by its related fields, such as science, engineering, business and medicine. Many exciting advances have already been achieved, building on the foundation of mathematics. For example, the development of the latest technology in medical imaging; the use of statistics to develop new kinds of artificial intelligence; or the application of statistics in enhancing dynamic risk management with real high-dimensional data.

It gives me great honor to present to you three researchers who are experts in the field of Mathematical Sciences. First of all, we have Professor Ronald Lok-Ming Lui, Assistant Professor of the Department of Mathematics, CUHK. His research interests focus on scientific computing, mathematical shape analysis and their applications to medical image analysis. The Faculty has also invited Professor Ming-Gao Gu, Professor of the Department of Statistics, CUHK, and a world-renowned statistician, who has notably made practical applications of statistical methods to real life problems. Last but not the least, we have Professor Hoi-Ying Wong, Professor of the Department of Statistics, CUHK, and Director of the M.Sc. program in Risk Management Science, who will share with us the impact of big data on risk management decisions.

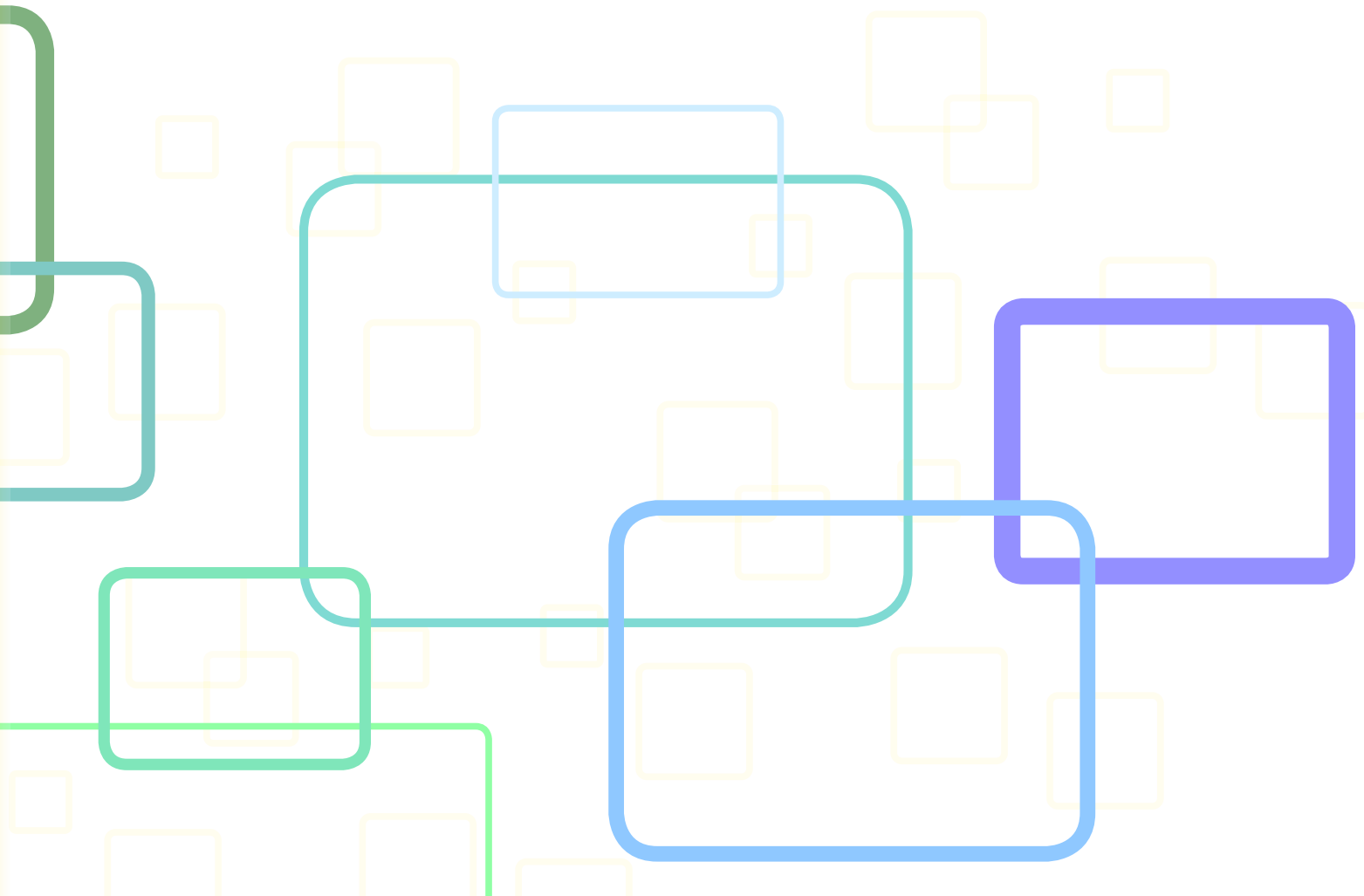
It is our pleasure to have a panel of three distinguished speakers with us today, and thank you for taking your time to experience research results obtained by our own faculty members. I am sure you will find these presentations both educational and inspirational.

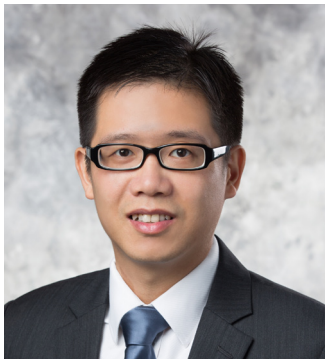
Yours sincerely,

Henry N.C. Wong



Presentation Abstracts and Speaker Introductions





Professor Ronald Lok-Ming Lui

Assistant Professor, Department of Mathematics
The Chinese University of Hong Kong

Professor Ronald Lok-Ming Lui (雷樂銘) received his Ph.D. in Applied Mathematics from UCLA in 2008, supervised by Professor Tony F. Chan. Upon graduation, Professor Lui worked as a postdoctoral scholar at Harvard University under the supervision of Professor Yau Shing Tung. His research focuses on computational conformal/quasi-conformal geometry, scientific computing, mathematical shape analysis and their applications to computer graphics, vision, and medical image analysis. In particular, one of his works applies conformal and quasi-conformal geometry to human brain mapping research for brain disease analysis.

Medical Morphometry using Quasiconformal Teichmüller Theory

Medical morphometry plays an important part in medical imaging. Its goal is to systematically analyze anatomical structures of different subjects, and to generate diagnostic images to help doctors to visualize abnormalities during the analysis of various diseases, to arrive at a diagnosis.

Quasiconformal (QC) Teichmüller theory, which studies the deformation patterns between shapes, is a useful tool for this purpose. In practice, anatomical structures are usually represented discretely by meshes.

In this talk, I will first describe how QC theories can be implemented on discrete meshes, which gives a discrete analogue of QC geometry on surfaces. Then, I will talk about how computational QC geometry can be practically applied to medical imaging for disease analysis.

Professor Ming-Gao Gu

Professor, Department of Statistics
The Chinese University of Hong Kong

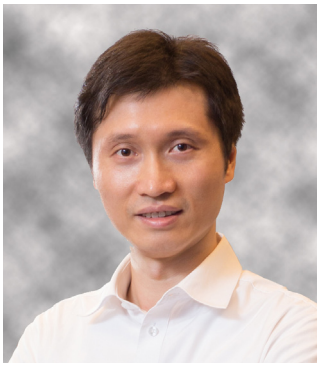
Professor Ming-Gao Gu (顧鳴高) obtained his B.Sc. in Mathematics from Fudan University. After obtaining his Ph.D. degree in Statistics from Columbia University, Professor Gu continued to teach at Columbia University, before moving on to teach at McGill University. He joined the Department of Statistics of CUHK in 1998. Professor Gu's research interests are non-parametric and semi-parametric methods; simulation methodologies and practical applications of statistical methods to solve real life problems.

The Ancient Chinese Game of Weiqi and Statistical Learning

In an article published January 2016 in Nature, the team from the DeepMind (a google affiliated company) led by Demis Hassabis, announce to the world that they have created a portable computer program, AlphaGo, which can beat human professional player in a game of Go, also called Weiqi, a feat previously thought to be at least a decade away. This feat is consequently fortified by the 5 games played between Lee Sedol, the best go player for the past decade and AlphaGo in March 2016, with millions watching the games on live broadcast. The result of 4:1 has officially declared that we have arrived in a new era of Artificial Intelligence.

Weiqi was invented more than 2500 years ago and was considered one of the four essential arts of a cultured Chinese scholar in antiquity. It was simply considered the best game man has ever created. Nowadays, being able to play Go has become one of the standard skills of a military strategist.

In this talk I shall reveal the central ideas behind the achievements of AlphaGo: Statistical learning (also called Machine Learning) with deep neural networks. We try to contemplate what other applications we may venture with similar ideas and tools.



Professor Hoi-Ying Wong

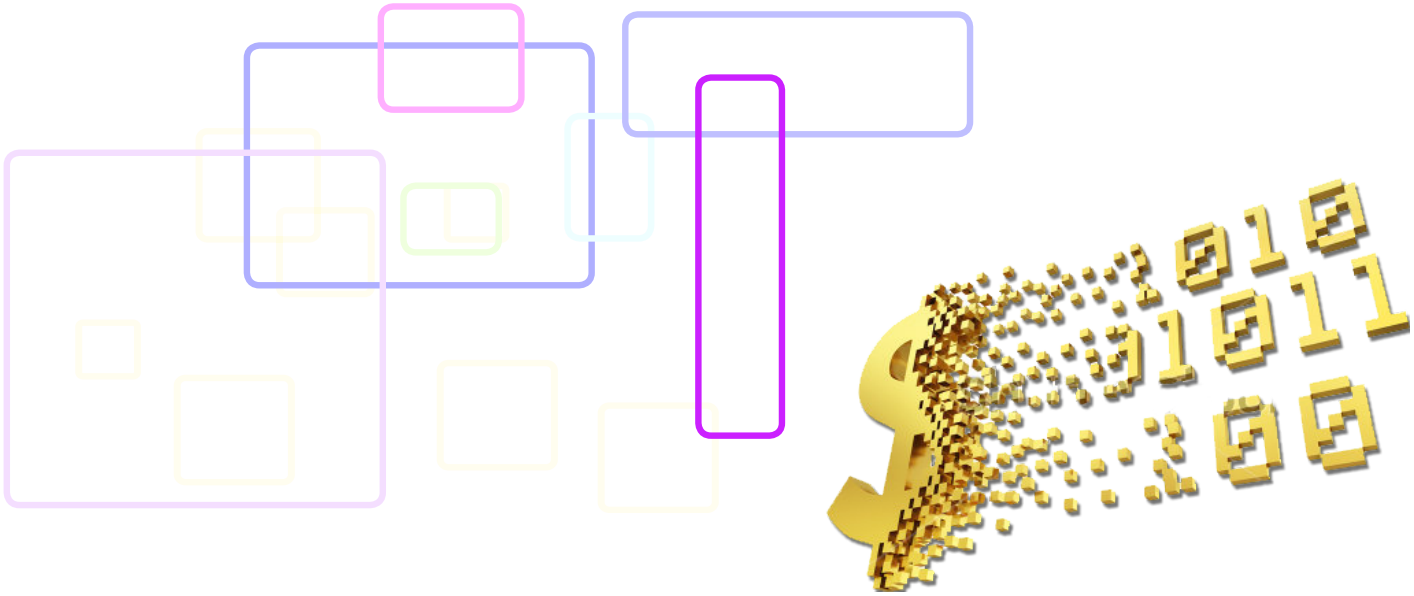
Professor, Department of Statistics
The Chinese University of Hong Kong

Professor Hoi-Ying Wong (王海嬰) received his B.Sc. in Mathematics from Hong Kong Baptist University before pursuing his Ph.D. at the Hong Kong University of Science and Technology. He later joined the CUHK Department of Statistics as a lecturer in 2001 and was promoted to professor in 2013. Professor Wong's research interest focuses on mathematical finance and risk management. He has consulting experience with Hong Kong Monetary Authority and banks, and is a founding co-director of the B.Sc. in Quantitative Finance and Risk Management Science program and currently the Director of M.Sc. in Risk Management Science, CUHK.

Big Data in Risk Management Science

Risk management science refers to the scientific decision-making procedure that strikes the best balance between risk and benefit. In the financial industry, risk management functions cover: market risk; credit risk; anti-money laundering; operational risk; compliance risk; asset-liability management; and the integration of them. Big data technology provides possible signals which play an important part to improve the processes before reaching a decision. However, it also introduces unanticipated huge noises during the data analysis.

In this talk, I will briefly review the impact of big data on risk management decisions, discuss the challenges met and explain how statistics comes into play. Typical examples will be used to illustrate the application of statistics in enhancing dynamic risk management with real high-dimensional data.



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