香港數學學會

The Hong Kong Mathematical Society

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THE HONG KONG MATHEMATICAL SOCIETY
ANNUAL GENERAL MEETING 2018

26 May 2018 (Saturday)
9:30am- 5:45pm

City University of Hong Kong

Schedule of Events

Venue: Lecture Theatre LT-3, CityU

9:30am -- 10:30am **HKMS Distinguished Lecture by Ngaiming Mok (University of Hong Kong)**

10:30am – 10:50am **Coffee Break**

10:50am – 11:40am **Plenary Lecture 1 by Defeng Sun (Hong Kong Polytechnic University)**

11:40am – 12:00pm **Award Presentation Ceremony**

12:00am -- 12:15pm **HKMS Member's meeting**

12:15pm -- 2:00pm **Lunch (Chinese Restaurant)**

Venue: Lecture Theatre LT-3, CityU

2:00pm - 2:50pm **Plenary Lecture 2 by Huai-Liang Chang (Hong Kong University of Science & Technology)**

2:50pm – 3:15pm **Coffee Break**

Venue: B4302, G4302, G5214, City U

3:15pm – 5:45pm **Invited talks (Parallel Sessions)**

Title and Abstracts

Venue: Lecture Theatre LT-3, CityU
Distinguished lecture
Chair: Tong Yang

9:30am-10:30am: Ngaiming Mok (University of Hong Kong)
Title: Geometric structures, geometric substructures and and applications to K\"ahler geometry
Abstract: Together with Jun-Muk Hwang we introduced in the late 1990s a geometric theory of uniruled projective manifolds based on the variety of minimal rational tangents (VMRT), i.e., the collection of tangents to minimal rational curves on a uniruled projective manifold $(X,\mathcal K)$ equipped with a minimal rational component. This theory provides
differential-geometric tools for the study of uniruled projective manifolds, especially
Fano manifolds of Picard number 1. Associated to $(X, \mathcal K)$ is the fibered space $\pi: \mathscr C(X) \to X$ of VMRTs called the VMRT structure on $(X,\mathcal K)$. A motivating problem is the Recognition Problem, namely the characterization of certain classical Fano manifolds such as generalized flag manifolds G/P of Picard number 1 in terms of their VMRTs. More recently, taking $(X,\mathcal K)$ as an ambient space, with collaborators the author has been studying the geometry of germs of complex submanifolds on them in analogy to the geometry of submanifolds in Riemannian manifolds. We focus on germs of complex submanifolds $(S;x_0)$ on $(X, \mathcal K)$ inheriting geometric substructures, to be called sub-VMRT structures, obtained from intersections of VMRTs with tangent subspaces, i.e., from $\varpi: \mathscr C(S) \to S$, $\mathscr C(S) := \mathscr C(X) \cap \Bbb PT(S)$. Central to our study is a relative version of the Recognition Problem, e.g., the characterization of distinguished uniruled projective subvarieties on G/P such as Schubert cycles in terms of VMRTs and sub-VMRTs. As applications I will relate the theory to the existence and uniqueness of certain classes of holomorphic isometries into bounded symmetric domains. For uniqueness results parallel transport (holonomy), a notion of fundamental importance both in K\"ahler geometry and in the study of sub-VMRT structures, plays an important role.

Venue: Lecture Theatre LT-3, CityU
Plenary lecture 1
Chair: Jun Zou

10:50am – 11:40am: Defeng Sun (Hong Kong Polytechnic University)
Title: A block symmetric Gauss-Seidel decomposition theorem and its applications in big data nonsmooth optimization
Abstract: The Gauss-Seidel method is a classical iterative method of solving the linear system Ax =b. It has long been known to be convergent when A is symmetric positive definite. In this talk, we shall focus on introducing a symmetric version of the Gauss-Seidel method and its elegant extensions in solving big data nonsmooth optimization problems. For a symmetric positive semidefinite linear system Ax = b with x = (x_1,…,x_s) being partitioned into s blocks, we show that each cycle of the block symmetric Gauss-Seidel (block sGS) method exactly solves the associated quadratic programming (QP) problem but added with an extra proximal term. By leveraging on such a connection to optimization, one can extend the classical convergent result, named as the block sGS decomposition theorem, to solve a convex composite QP (CCQP) with an additional nonsmooth term in x_1. Consequently, one is able to use the sGS method to solve a CCQP. In addition, the extended block sGS method has the flexibility of allowing for inexact computation in each step of the block sGS cycle. At the same time, one can also accelerate the inexact block sGS method to achieve an iteration complexity of O(1/k^2) after performing k block sGS cycles. As a fundamental building block, the block sGS decomposition theorem has played a key role in various recently developed algorithms

such as the proximal ALM/ADMM for linearly constrained multi-block convex composite conic programming (CCCP) and the accelerated block coordinate descent method for multi-block CCCP.

Venue: Lecture Theatre LT-3, CityU
Plenary lecture 2
Chair: Xiaoping Wang

2:00pm – 2:50pm: Huai-Liang Chang (Hong Kong University of Science & Technology)
Title: On recent progress of Gromov Witten theory of Calabi Yau threefolds
Abstract: Ever since Givental and Lian-Liu-Yau's work on genus zero mirror symmetry, people look for algorithm of higher genus Gromov Witten invariants over the past 25 years. After viewing GW theory as a Landau Ginzburg theory, we then mixed the two LG ingredients ``spin structure" with "P fields" and form a Mixed Spin P field (MSP). The MSP moduli provides an effective algorithm for higher genus Gromov Witten theory. In this talk I will survey its history, constructions, and applications.

Parallel Session 1: Statistical machine learning and complex data analysis
Chair: Junhui Wang
Venue: B4302, CityU

3:15pm – 3:45pm: Jun Fan (HKBU)
Title: Modal regression with kernels
Abstract: : Modal regression seeks the conditional mode of a response variable given a set of covariates, providing an alternative to mean regression and quantile regression in the presence of heavy-tailed noise, asymmetric noise or outliers. In this talk, we study the modal regression estimator involving two types of kernels arising from kernel density estimation and reproducing kernel Hilbert spaces. Numerical results are presented to show the efficiency of the proposed method.

3:45pm – 4:15pm: Xiaodan Fan (CUHK)
Title: Model-based Clustering for Categorical Data with General High Missingness
Abstract: High missingness is a common problem challenging classical machine learning methods, such as in recommendation system problems where only a small part of the interested variables are observed for each person. To learn from such datasets and make predictions, we often need the full picture of the joint distribution of all interested variables, which is hidden in the partial observations. We developed an efficient Bayesian nonparametric method to simultaneously cluster the partial observations and infer the joint distribution from categorical data with high missing rate. The method is based on Dirichlet process mixture of product multinomials. Both synthetic data and real data showed the high accuracy of our method.

4:15pm – 4:45pm: Heng Lian (CityU)
Title: Divide-and-Conquer for Debiased 1-norm Support Vector Machine
Abstract: 1-norm support vector machine (SVM) generally has competitive performance compared to standard 2-norm support vector machine in classification problems, with the advantage of automatically selecting relevant features. We propose a divide-and-conquer approach in the large sample size and high-dimensional setting by splitting the data set across multiple machines, and then averaging the debiased estimators. We show that under appropriate conditions the aggregated estimator can obtain the same convergence rate as the central estimator utilizing all observations.

4:45pm –5:15pm: Yangqiu Song (HKUST)
Title: Recent Development of Heterogeneous Information Networks: From Meta-paths to Meta-graphs
Abstract: Heterogeneous information network (HIN) is a general representation of many kinds of data, such as scholar network data, social network data, patient network data, or knowledge graph data. At the beginning, HIN was used to handle entity similarity measure problems, where the query and results are assumed to be of the same type (e.g., using Person to search Person), and applied to many applications such as entity classification and clustering. Later, it was extended to handle heterogeneous entity recommendation problems (i.e., recommending Items to Users). The similarities provided by HINs can explicitly represent subtle difference of the semantic meanings of entity relatedness, which makes the similarities and recommendations explainable. In this talk, I will introduce our recent development of heterogeneous information networks, using the meta-path to capture the semantic meanings and characterize relations between entities. We use a semi-supervised text classification problem and a recommendation problem to demonstrate that meta-graph based HIN performs better than traditional meta-path based representation.

5:15pm –5:45pm: Aijun Zhang (HKU)
Title Sequential Uniform Design-based Parameter Tuning for Machine Learning Algorithms
Abstract: Parameter tuning, or hyperparameter optimization, plays a key role in machine learning algorithms and it is often performed by grid search. In this talk we propose an alternative method of parameter tuning based on the use of sequential uniform designs. Some preliminary results will be presented for popular machine learning algorithms, including support vector machines, gradient boosting machines and deep neural networks.

Parallel Session 2: Mathematics in Biology, Imaging and Graphics
Chair: Ronald Lui
Venue: G4302, CityU

3:15pm – 3:45pm: Jianfeng Cai (HKUST)
Title: A framework of non-convex methods for low-rank matrix reconstruction: algorithms and theory
Abstract: We present a framework of non-convex methods for reconstructing a low rank matrix from its limited information, which arises from numerous practical applications in machine learning, imaging, signal processing, computer vision, etc. Our methods will be applied to several concrete example problems such as matrix completion, phase retrieval, and robust principle component analysis. We will also provide theoretical guarantee of our methods for the convergence to the correct low-rank matrix.

3:45pm – 4:15pm: Jon Luo (CityU)
Title: Hybrid numerical tool for stochastic morphogen-mediated patterning system
Abstract: The patterning of many developing tissues is organized by morphogens. Genetic and environmental perturbations of gene expression, protein synthesis and ligand binding are among the sources of unreliability that limit the accuracy and precision of morphogen-mediated patterning. In the talk, we will discuss several stochastic numerical methods for modeling morphogen-mediated patterning system. Also, we will present our new hybrid stochastic numerical method for this study. Applications to two nonlinear systems of morphogens demonstrate the effectiveness and benefits of the new hybrid method.

4:15pm – 4:45pm: Robald Lui (CUHK)
Title: Mathematical models for restoration of turbulence-degraded images
Abstract: Turbulence-degraded image frames are distorted by both turbulent deformations and space-time-varying blurs. To suppress these effects, a multi-frame reconstruction scheme is usually considered to recover a latent image from the observed distorted image sequence. Recent approaches are commonly based on registering each frame to a reference image, by which geometric turbulent deformations can be estimated and a sharp image can be restored. A major challenge is that a fine reference image is usually unavailable, as every turbulence-degraded frame is distorted. A high-quality reference image is crucial for the accurate estimation of geometric deformations and fusion of frames. Besides, it is unlikely that all frames from the image sequence are useful, and thus frame selection is necessary and highly beneficial. In this talk, we will describe several mathematical models to restore turbulence-distorted images. Extensive experimental results will also be shown to demonstrate the efficacy of different models.

4:45pm – 5:15pm: Qiu Di (CUHK)
Title: Parametrising flat-foldable surfaces with incomplete data
Abstract: We propose a novel way of computing surface folding maps via solving PDEs. This framework is a generalisation to the existing quasiconformal methods but allows manipulation of the geometry of folding. Moreover, the crucial quantity that characterises the geometry occurs as the coefficient of the equation, namely the Beltrami coefficient. This allows us to solve an inverse problem of parametrising the folded surface when only partial data and the folding geometry are given.

Parallel Session 3: Geometric Analysis
Chair: Frederick Fong
Venue: G5214, CityU

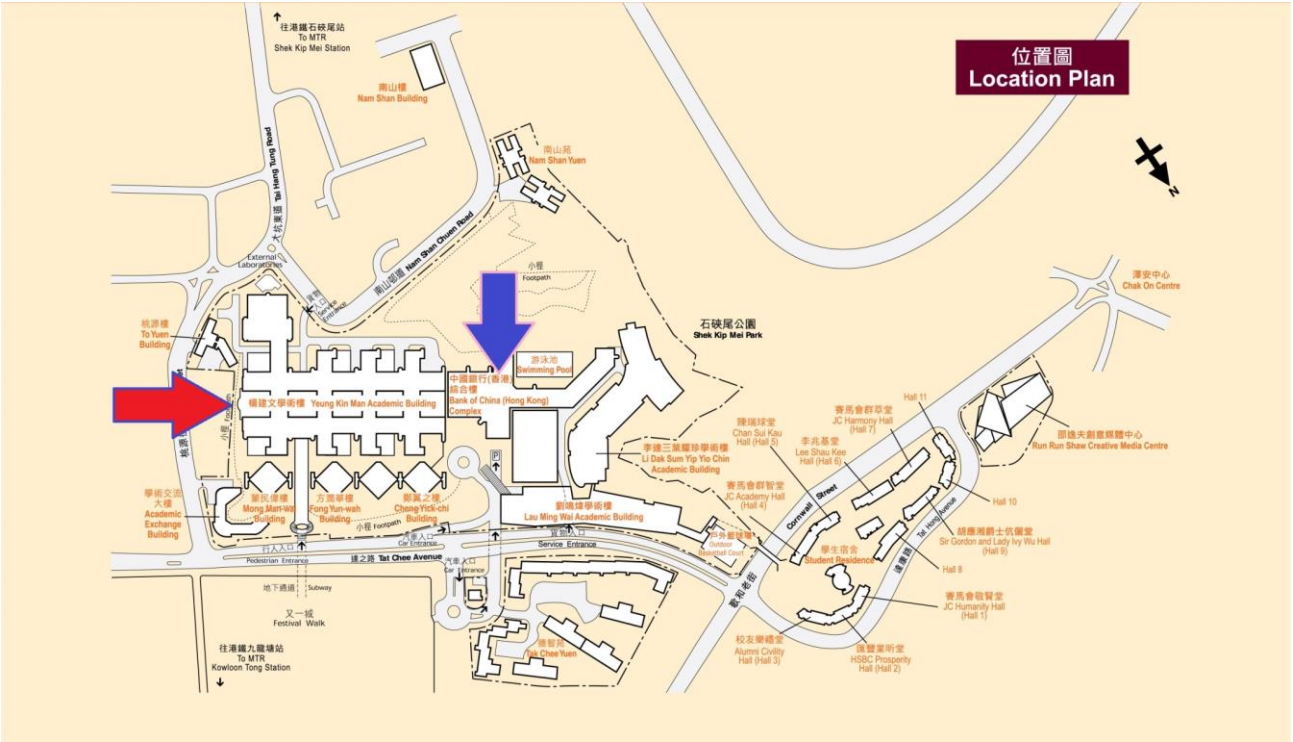
3:15pm – 4pm: Kwok-Kun Kwong (National Cheng Kung University)
Title: Comparison theorems under weak assumptions
Abstract: The classical volume comparison states that under a lower bound on the Ricci curvature, the volume of the geodesic ball is bounded from above by that of the geodesic ball with the same radius in the model space. On the other hand, counterexamples show the assumption on the Ricci curvature cannot be weakened to a lower bound on the scalar curvature, which is the average of the Ricci curvature. In this talk, I will show that a lower bound on a weighted average of the Ricci curvature is sufficient to ensure volume comparison. In the course I will also prove a sharp volume estimate and an integral version of the Laplacian comparison theorem. If time allows, I will also present the Kahler version of the theorem.

3:45pm – 4:45pm: John Man-Shun Ma (Rutgers University - New Brunswick)
Title: Uniqueness theorems for non-compact mean curvature flow with possibly unbounded curvatures
Abstract: In this talk, we discuss uniqueness for mean curvature flow of non-compact manifolds. We use an energy argument to prove two uniqueness theorems for mean curvature flow with possibly unbounded curvatures. These generalize the results in Chen and Yin. This is a joint work with Alen Lee (CUHK).

4:45pm – 5:15pm: Aaron Tsz-Kiu Chow (HKUST)
Title: Self-expanders to inverse curvature flows by homogeneous functions

Abstract: In this talk, we discuss a class of parabolic inverse curvature flow by homogeneous symmetric functions of principal curvatures in Euclidean space. We then extend some earlier results concerning the rigidity of self-similar solutions of the inverse mean curvature flow to this wider class of flows. We will first show that the only compact self-expander to the concerned flows are spheres, and secondly that complete non-compact self-expanders with asymptotically cylindrical ends to the concerned flows are rotationally symmetric. Thirdly, we will show that under the extra assumption of uniform parabolicity, there exist complete non-compact rotationally symmetric self-expanders to the concerned flows which are asymptotic to two round cylinders with different radii.

City U Campus Map and Directions



	Location of Yeung Kin Man Academic Building
	Location of City Chinese Restaurant

The Hong Kong Mathematical Society
Annual General Meeting 2018

Date: 26 May 2018 (Saturday)
City University of Hong Kong 香港城市大學

LT-3	C Y Sun Lecture Theatre, Level 4, Yellow Zone, Yeung Kin Man Academic Building 孫建業演講廳, 楊建文學術樓四樓黃區
B4302	Level 4, Blue Zone, Yeung Kin Man Academic Building 楊建文學術樓四樓藍區
G4302	Level 4, Green Zone, Yeung Kin Man Academic Building 楊建文學術樓四樓綠區
G5214	Level 5, Green Zone, Yeung Kin Man Academic Building 楊建文學術樓五樓綠區
City Chinese Restaurant	8/F Bank of China (Hong Kong) Complex 中國銀行（香港）綜合樓八樓

How to get to Yeung Kin Man Academic Building (怎樣前往楊建文學術樓) **[see enclosed map]:**

Arrived at Pedestrian Subway 經行人隧道前往	Arrived at University Circle 經城大廣場前往
When you get off the MTR, look for Festival Walk exit. In Festival Walk, on Level LG1, there is a Pedestrian Subway which will lead you to CityU campus. After walking through the Pedestrian Subway, go straight and you will see the Yeung Kin Man Academic Building in front of you. 當你到達港鐵九龍塘站後，請往又一城商場出口走。於又一城商場內 LG1 有行人隧道連接城大校園。經過行人隧道後向前走，楊建文學術樓就在閣下的前方。	When you drop off at the University Circle, go along the covered walkway which will lead you to the Academic 1. Walk through the red doors, you will be on the 4th floor of Yeung Kin Man Academic Building. 到達城大廣場後，沿有蓋行人通道，往大樓方向走，很快便到達楊建文學術樓。通過紅色大門你便進入楊建文學術樓四樓。

How to get to City Chinese Restaurant (怎樣前往城大中菜廳) **[see enclosed map]**:

Arrived at Pedestrian Subway 經行人隧道前往	Arrived at University Circle 經城大廣場前往
1. When you get off the MTR, look for Festival Walk exit. 2. In Festival Walk, on Level LG1, there is a Pedestrian Subway which will lead you to CityU campus. 3. After walking through the Pedestrian Subway, go down the staircase on your right and follow the directional signs, you will find yourself walking under a covered corridor alongside the garden which will lead you to the University Circle. 4. From the University Circle, go along the Covered Walk Way which will lead you to the Bank of China (Hong Kong) Complex. 5. Go past the Swimming Pool, you will get to the lift 19 and lift 20. 6. Take lift 19 or lift 20 to 8/F City Chinese Restaurant. 當你到達港鐵九龍塘站後，請往又一城商場出口走。於又一城商場內 LG1 有行人隧道連接城大校園。經過行人隧道後，往右手方花園，沿小石級而下並遵指示牌方向，穿過花園旁的走廊，閣下便到達城大廣場。從城大廣場，沿有蓋行人通道到中國銀行（香港）綜合樓。往泳池方向走，走到盡頭處的十九及二十號升降機。乘搭十九或二十號升降機往八樓城大中菜廳。	1. When you drop off at the University Circle, go along the Covered Walk Way which will lead you to the Bank of China (Hong Kong) Complex. 2. Go past the Swimming Pool, you will get to the lift 19 and lift 20. 3. Take lift 19 or lift 20 to 8/F City Chinese Restaurant. 到達城大廣場後，沿有蓋行人通道，往大樓方向走，依指示牌便到達中國銀行（香港）綜合樓。往泳池方向走，走到盡頭處的十九及二十號升降機。乘搭十九或二十號升降機往八樓城大中菜廳。