February 20

Speaker: Dr. Yat-Hin Suen, Center for Geometry and Physics, Institute for Basic Science, South Korea

Title: Homological mirror symmetry via the Gross-Siebert program

Abstract: The Gross-Siebert program is usually referred as the algebraic version of the famous SYZ mirror symmetry. The fundamental tool in their program is tropical geometry. A natural question that we want to address is how can one understand homological mirror symmetry under the framework of the Gross-Siebert program. In this talk, I am going to introduce the notion of tropical Lagrangian multi-sections, which is a combinatorial replacement of Lagrangian multi-sections in the SYZ proposal. Such tropical object can be used to construct locally free shaves on log Calabi-Yau varieties. I will discuss the existence and smoothabililty of these locally free sheaves and their relation to mirror symmetry.

March 06

Speaker：Prof. Jean-Pierre Fouque (Department of Statistics and Applied

Probability, University of California)

Title：Linear-Quadratic Stochastic Differential Games on Directed Chain

Network

Abstract: We present linear-quadratic stochastic differential games on directed chains inspired by the directed chain stochastic differential equations introduced by Detering, Fouque, and Ichiba in a previous work. We solve explicitly for Nash equilibria with a finite number of players and we study more general finite-player games with a mixture of both directed chain interaction and mean field interaction. We investigate and compare the corresponding games in the limit when the number of players tends to infinity. The limit is characterized by Catalan functions and the dynamics under equilibrium is an infinite-dimensional Gaussian process described by a Catalan Markov chain, with or without the presence of mean field interaction.
Joint work with Yichen Feng and Tomoyuki Ichiba.

Speaker: Hao-Chung Cheng (鄭皓中), Department of Electrical Engineering, National Taiwan University

Title: A Novel Matrix Concentration Inequality and Error Exponent for Quantum Soft Covering

Abstract: How well can we approximate a quantum channel output state using a codebook with a certain size? In this work, we study the so-called quantum

soft covering problem, which is to use a random codebook to approximate the target output state of a quantum channel. We establish a one-shot exponential bound on the expected trace-norm distance between the codebook-induced state and the true state. When using an independently and identically distributed random codebook with a rate above the quantum mutual information, we prove that the trace distances decay exponentially with error exponents determined by the Legendre transform of the quantum sandwiched Rényi information. As a result, it implies a tight bound on the information leakage to Eavesdroppers in private communication over wiretap quantum channels. Our proof technique is to establish a novel matrix concentration inequality by using interpolation of noncommutative L_p space. This may have applications elsewhere.

This work is jointly collaborated with Li Gao at the University of Houston and can be found at https://arxiv.org/abs/2202.10995.

March 13

Speaker: Prof. Kuei-Nuan Lin (Penn State Greater Allegheny)

Title: Applications of blow-up algebras

Abstract: In this talk, we will define what is a blow-up algebra. We will see all kind of applications of blow-up algebras including chemical reaction network, geometry modeling, and permutation statistics. We will see that this topic has many wide open questions.