Workshop on interactions between commutative and noncommutative probability

August 5, 2015

Room 110, Building No. 3, Fac. of Sci. (Dept. of Math.), Kyoto Univ.

Program

9:00 – 9:50	Kouji Yano	On invariant functions for stable processes stopped upon hitting zero
10:00 – 10:50	Thomas Simon	Some analytical questions related to classical stable densities
11:00 – 11:50	Noriyoshi Sakuma	On infinitely divisible distributions on non-negative integers
11:50 – 13:30	Lunch	
13:30 – 14:30	Yuzuru Inahama	A brief introduction of rough path theory
14:40 – 15:30	Benoit Collins	Strong convergence for norm of unitary Brownian motions
15:40 –16:20	Takahiro Hasebe	Analogy between cumulants and Baker-Campbell-Hausdorff formula
16:30 – 17:20	Uwe Franz	Free and monotone Meixner laws, monotone increment processes

Abstracts

On invariant functions for stable processes stopped upon hitting zero

Kouji Yano (Kyoto University)

It is well-known that for the reflecting Brownian motion stopped upon hitting zero the scale function is invariant. In this talk we study its analogue for one-dimensional strict stable processes. We introduce renormalized zero resolvents and show their invariance. We also discuss some other aspects of them.

Some analytical questions related to classical stable densities

Thomas Simon (University of Lille 1)

Taking advantage of a certain discrete factorization with Beta random variables, we discuss the resolution of two open problems concerning classical positive stable densities, by Karlin (1968) on their TP character and by Bondesson (1977) on their HCM character. The solution on the first problem has applications on the drifted Cauchy kernel, which appears in connection with free stable random variables. We also discuss some open problems.

On infinitely divisible distributions on non-negative integers

Noriyoshi Sakuma (Aichi University of Education)

In this talk, first I will give survey on infinitely divisible distributions on non-negative integers. After then, I will give recent progress on infinite divisibility of products of independent random variables and explain open problems.

A brief introduction of rough path theory

Yuzuru Inahama (Nagoya University)

In this talk I will explain what rough path theory is all about. This is basically a survey talk for non-experts.

Simply put, rough path theory is something like "de-randomization of Itô's stochastic differential equations." Loosely speaking, we first extend the line integral for generalized paths, i.e., rough paths, by using K. T. Chen's theory on iterated integrals of paths as a guide, then we use it to make Itô's SDEs deterministic.

With this theory by T. Lyons, which is in a sense an antithesis to Itô's theory, we can look at SDEs from a very different angle. It was born approximately 15 years ago, but only a few people studied it at first. In my view it was around 2010 when rough path theory became very active.

(Moreover, two years ago this theory bore two children, which solves very singular stochastic PDEs like KPZ equation or 3-dim dynamic Phi4 model with ideas from rough path theory. One of the two got a Fields medal, which makes the future of rough path look more promising.)

Strong convergence for norm of unitary Brownian motions
Benoit Collins (Kyoto University)

We consider families of multiplicative Brownian motion on the unitary group of $N \times N$ matrices, appropriately scaled. It is known that the eigenvalue counting measure converges to a smooth probability measure on the unit circle, whose support is strictly included in the unit disc while $t < 4$. We show that with probability one, there are no outliers eigenvalues as $N \to \infty$. We also show a similar result in much greater generality, for matrices involving arbitrary sums and products of instances of the unitary Brownian motion.

Analogy between cumulants and Baker-Campbell-Hausdorff formula
Takahiro Hasebe (Hokkaido University)

I will explain analogy between multivariate cumulants in probability theory and Baker-Campbell-Hausdorff formula (in free Lie algebra) that expresses $\log(e^{X_1} \cdots e^{X_n})$ as a formal power series of $X_1, \ldots, X_n$. This work appears from research on cumulants in noncommutative probability. This talk is based on a joint work with Franz Lehner (Graz Univ. Tech.).

Free and monotone Meixner laws, monotone increment processes
Uwe Franz (University of Franche-Comté)

I will present the free and monotone analog of Laha-Lukacs regression for freely or monotonically independent random variables. This leads to free and monotone analogs of the Meixner processes, which are special cases of Lévy processes. I will also talk more generally about quantum stochastic processes with monotonically independent increments and their connection with Löwner chains.

Based on the preprint `arXiv:1504.04736` with Wiktor Ejsmont and Kamil Szpojankowski, and on unpublished joint work with Takahiro Hasebe.