Non-commutative probability and related fields

- Dates: November 1 and 2, 2018
- Venue: Faculty of Sci. Bldg 4, Room 501, Hokkaido University

Program

November 1 (Thu)

13:00 - 14:00	**Hiroaki Yoshida** (Ochanomizu University) The free analogue of the beta prime distribution and its properties
14:10 - 15:10	**Yoshimichi Ueda** (Nagoya University) Analysis of pairs of projections in free probability
15:20 - 16:20	**Nobuhiro Asai** (Aichi University of Education) Poisson type operator on the Fock space of type B
16:30 - 17:30	**Takahiro Hasebe** (Hokkaido University) Monotone increment processes, classical Markov processes and Loewner chains
18:30 -	**Banquet**

November 2 (Fri)

9:00 - 10:00	**Akihito Hora** (Hokkaido University) Effect of microscopic pausing time distributions on evolution of macroscopic profiles in Young diagram ensembles
10:10 - 11:10	**Uwe Franz** (University of Franche-Comté) Haar traces and Haar KMS states on the Brown-Glockner-von Waldenfels algebra
11:20 - 12:20	**Satoshi Yabuoku** (Chiba University) Eigenvalue processes of Ginibre ensemble and their properties
12:20 - 14:00	**Lunch**
14:00 - 15:00	**Rei Mizuta** (University of Tokyo) Malliavin calculus over the symmetric Fock space
15:10 - 16:10	**Yuki Ueda** (Hokkaido University) Factorizable Markov operators on noncommutative probability spaces and their applications from quantum information theory

1. Nobuhiro Asai (Aichi University of Education)

   Title: Poisson type operator on the Fock space of type B

   Abstract: By Bożejko-Ejsmont-Hasebe (JFA, 2015) the Fock space of type B is construced with two deformation parameters. It is shown that the probability laws of the Gaussian operator on this type B space are identified with symmetric q-Meixner distributions for $q \in (-1, 1)$ in a sense.

   In this talk, we introduce an analogue of the Poisson operator on a slightly midified Fock space of type B and discuss the probability law of the operator. We show that non-symmetric q-Meixner ditributions can be also incoporated into their framework, but for $q \in [0, 1)$.

   This is based on a joint work with H. Yoshida (Ochanomizu Univ).

2. Uwe Franz (University of Franche-Comté)

   Title: Haar traces and Haar KMS states on the Brown-Glockner-von Waldenfels algebra

   Abstract: Denote by $C(U_n^{\mathrm{dual}})$ the universal C*-algebra generated by the coefficients of a $n \times n$ unitary $U = (u_{jk})_{1 \leq j,k \leq n}$. Voiculescu showed that this algebra can be equipped with the structure of a dual group and Cébron and Ulrich studied its properties from a quantum probabilistic viewpoint, see [**?**, **?**] and the references therein. In particular, they defined convolution products associated to the five universal notions of independence (tensor, free, monotone, boolean, and anti-monotone) for states on $C(U_n^{\mathrm{dual}})$. Cébron and Ulrich showed that there exists so-called *tensor and free Haar traces*, i.e. tracial states that are invariant under tensor or free convolution with other tracial states. In my talk I will introduce a family of automorphism groups on $C(U_n^{\mathrm{dual}})$ and I will show that for each of these automorphism groups there exists a tensor and a free Haar KMS-state, i.e. a state satisfying a KMS property that is invariant under tensor or free convolution with any other state satisfying the same KMS property. This leads to a new family of reduced versions of the Brown-Glockner-von Waldenfels algebra algebra $C(U_n^{\mathrm{dual}})$.

   My talk is based on joint work with Guillaume Cébron and Michaël Ulrich.

3. Takahiro Hasebe (Hokkaido University)

   Title: Monotone increment processes, classical Markov processes and Loewner chains.

   Abstract: We establish a bijection between the following objects: Non-commutative stochastic processes with monotonically independent increments; classical Markov process with some space-homogeneity property; Loewner chains on the upper-half plane with decreasing ranges and a normalization at infinity. This is a joint work with Uwe Franz and Sebastian Schleissinger.

4. Akihito Hora (Hokkaido University)

Title: Effect of microscopic pausing time distributions on evolution of macroscopic profiles in Young diagram ensembles

Abstract: We consider non-Markovian continuous time random walks on Young diagrams as microscopic dynamics instead of sticking to exponential distributions for pausing time between jumps. We derive evolution of macroscopic profiles under diffusive scaling limit by using free probability and harmonic analysis on symmetric groups. Furthermore we illustrate an anomalous phenomenon observed with pausing time obeying a heavy-tailed distribution without mean.

5. Rei Mizuta (University of Tokyo)

   Title: Malliavin calculus over the symmetric Fock space

   Abstract: An extension of Malliavin calculus over the symmetric Fock space was developed by U. Franz et al. in [arxiv:0004088]. In there, it is shown that exponentials of position operators are unitary equivalent to multiplication operators, and this property is inherited also to Malliavin derivations of them. We extend this relation to unbounded operators, and give an application for an analysis of intertwiner of some two CCR representations over the symmetric Fock space with infinite degree of freedom.

6. Yoshimichi Ueda (Nagoya University)

   Title: Analysis of pairs of projections in free probability

   Abstract: Free probability is a noncommutative analysis, and thus its central problem is to investigate noncommutative phenomena. A pair of projections in free probability can be viewed as the most elementary 'noncommutative' case. A radial Loewner-Kufarev equation naturally appears and plays a role in the analysis of pairs of projections. This is an observation made in my joint work with Masaki Izumi some years ago. I will explain some results around this observation, including some recent works due to Tarek Hamdi.

7. Yuki Ueda (Hokkaido University)

   Title: Factorizable Markov operators on noncommutative probability spaces and their applications from quantum information theory

   Abstract: A Markov operator on W^* probability space is defined as a unital, completely positive linear map which is state-preserving and modular-preserving. In particular, a Markov operator on finite-dimensional W^* probability space (i.e. matrix algebras with a trace) is corresponding to a unital quantum channel. Haagerup and Musat mentioned that factorizability of unital quantum channel relates to the Connes embedding problem (CEP). Strictly speaking, they studied tensoring factorizable unital quantum (FUQ) channels with the completely depolarizing (CD) channel to approach the CEP. We will talk about their works and properties of tensoring FUQ channels with the CD channel.

8. Satoshi Yabuoku (Chiba University)

   Title: Eigenvalue processes of Ginibre ensemble and their properties

   Abstract: There are many studies of eigenvalue processes for normal matrices, especially Dyson's Brownian motion models. On the other hand, there are few studies for non-normal matrices, such as Ginibre ensemble. In this talk, we introduce SDEs of the complex eigenvalue processes for Ginibre ensemble and discuss about the overlap matrix related to the eigenvector processes for this model.

9. Hiroaki Yoshida (Ochanomizu University)

   Title: The free analogue of the beta prime distribution and its properties

   Abstract: We introduce the free analogue of the classical beta prime distribution by the multiplicative free convolution of the free Poisson and the reciprocal of free Poisson distributions. We will discuss some related distributions and the rationales of our free analogue from the point of view of the potential functions.