Probability Day

4 December 2014

10am – 5pm

IMS Auditorium, NUS

NUS National University of Singapore

Department of Mathematics
Faculty of Science

Programme

10.00am – 10.45am	**Singular linear statistics of the Laguerre Unitary Ensemble and P_{III}: A Double scaling analysis** *CHEN Yang* *University of Macau, Macau SAR*
10.45am – 11.00am	Break @ IMS Lounge
11.00am – 11.45am	**New results in 2-matrix model and non-intersecting Brownian motions** *WANG Dong* *National University of Singapore, Singapore*
11.45am – 2.00pm	Lunch
2.00pm – 2.45pm	**Limits in Polya urn models with immigration** *Adrian ROELLIN* *National University of Singapore, Singapore*
2.45pm – 3.00pm	Break @ IMS Lounge
3.00pm – 3.45pm	**Exponential ergodicity of 3D stochastic Navier-Stokes equations driven by mildly degenerate noises** *XU Lihu* *University of Macau, Macau SAR*
3.45pm – 4.00pm	Break @ IMS Lounge
4.00pm – 4.45pm	**Macro- and microscopic structures of the family tree for an island model of branching processes** *Vladimir VATUTIN* *Steklov Mathematical Institute, Moscow*

Abstract

Singular linear statistics of the Laguerre Unitary Ensemble and P_{III}: A Double scaling analysis

CHEN Yang, University of Macau, Macau SAR

In this talk we continue with the analysis of the Hankel determinant generated by a "singularly" perturbed Laguerre weight,

$$w(x; t, a) := x^a e^{-x}\, e^{-t/x}, \quad 0 \le x < \infty, \quad a > 0, \quad t > 0,$$

where an "infinitely" strong zero is introduced at $x = 0$ on the Laguerre weight,

$$w(x; 0, a) = x^a e^{-x}, \quad 0 \le x < \infty, \quad a > 0.$$

The finite n Hankel determinant reads

$$D_n(t, \alpha) := \det\left(\int_0^\infty x^{i+j} w(x; t, \alpha) dx\right)_{0 \le i, j \le n-1}.$$

The finite n aspect of the problem first appeared in Chen and Its [1]. In this paper we show that, under a double scaling where n the order the Hankel matrix tends to ∞, and t tends to 0, the scaled—and therefore infinite dimensional—Hankel determinant, has an integral representation in terms of a "lesser" Painleve III, and its derivative. Expansions of scaled, and therefore in some sense infinite, determinant for small and large parameter s are obtained. Here,

$$s = (2n + 1 + a)t.$$

References

[1] Y. Chen, A. R. Its, *Painlevé III and a singular linear statistics in Hermitian random matrix ensembles, I* Journal of Approximation theory, **162** (2010) 270–297.

New results in 2-matrix model and non-intersecting Brownian motions

WANG Dong, National University of Singapore, Singapore

In this talk we discuss a double contour integral formula that is applicable in a special kind of 2-matrix models and non-intersecting Brownian motions with special initial/boundary conditions. With the help of the formula, we derive new expressions of previously known universal distributions and processes, and are able to give explicit formulas to new universal distributions and processes.

The talk is based on joint work with Tom Cleays and Karl Liechty.

Limits in Polya urn models with immigration

Adrian ROELLIN, National University of Singapore, Singapore

We consider the standard Polya urn with the twist that additional balls immigrate after fixed and random number of steps. That urn model is then used to analyse the degree distribution in variations of the preferential attachment random graph model.

Exponential ergodicity of 3D stochastic Navier-Stokes equations driven by mildly degenerate noises

XU Lihu, University of Macau, Macau SAR

We shall prove exponential ergodicity of 3D stochastic Navier-Stokes equations driven by mildly degenerate noises (i.e. finite Fourier modes of Z^3 are not driven by noises), the main tools are Malliavin calculus and Markov selection.

Macro- and microscopic structures of the family tree for an island model of branching processes

Vladimir VATUTIN, Steklov Mathematical Institute, Moscow

A decomposable critical Galton-Watson branching process with N types of particles labelled 1, 2, …, N is considered in which a type i parent may produce individuals of types $j \geq i$ only. This model may be viewed as a stochastic model for the sizes of a geographically structured population occupying *N* islands, the location of a particle being considered as its type. The newborn particles of island $i \leq N - 1$ either stay at the same island or migrate, just after their birth to the islands $i + 1, i + 2, \ldots, N$. Particles of island N do not migrate. We investigate the macroscopic and microscopic structures of the family tree of this process as well as the distributions of the birth moment and the type of the most recent common ancestor of the individuals existing in the population at a distant moment n.