M6 Topics in Random Geometry and Mathematical Physics

Organiser: Eveliina Peltola, *University of Helsinki*

1. Conformal Invariance in Critical Models of Statistical Physics

Steven Flores, *University of Helsinki*

There is a large class of models in statistical physics, including percolation, the Ising model, loop-gas models, and polymer models, that exhibit conformally invariant critical behavior. These models are complicated enough to simulate real-world critical phenomena, such as spontaneous magnetization, network connectivity, and polymer folding, yet simple enough for tractable calculations to be possible. As such, they are both practical and fascinating to study, having attracted intense interest from physicists and mathematicians for decades. In this talk, I will survey some well-known results from this field and some of the mathematical techniques that are used to study it.

2. Finding BCFT correlation functions with the help of a hidden quantum group

Eveliina Peltola, *University of Helsinki*

I describe a systematic method, making use of the representation theory of a quantum group, for solving PDEs of certain type, with boundary conditions given by specified asymptotic behaviour of the solutions. Such PDEs arise both in CFT, from singular vectors in representations of the Virasoro algebra, and in random geometry, from vanishing drift terms of SLE local martingales. Applications to random curves include multiple SLE partition functions, and chordal SLE boundary visit probability amplitudes. Explicit asymptotics enable to identify solutions associated to desired events, and allow to study monodromy properties of the solutions.

3. Coupling of GFF with UST

Benoit Laslier, *Cambridge*

On Z^2, Temperley's bijection relates uniform spanning trees with domino tilings, whose height function is a kind of discrete Gaussian free field. A natural continuum version of the bijection was first given by Dubedat and cast into the general imaginary geometry theory later. In this talk I will discuss work in progress on a new approach, somewhat more elementary, to the continuum bijection where the continuity of the field with respect to the spanning tree is more apparent. In particular we hope to use it to prove the convergence of the height function to the GFF in other discrete cases such as tilted lozenge tilings where a version of Temperley's bijection works but usual dimer techniques fail

4. Eigenvalues of large random matrices

Christian Webb, *Aalto University*

We'll discuss some models for large random matrices motivated by applications in different fields of mathematics, physics, and other sciences. We will then discuss the eigenvalues of these matrices – in particular, we'll be interested in universal macroscopic properties of the spectrum of a large random matrix.