Branching Processes and Their Applications

Tuesday 17th September 2019, Pevensey 1A6

11:00-12:00 Alex Watson (UCL)

Long-term behaviour of growth-fragmentation processes

Abstract: Growth-fragmentation processes describe the evolution of systems of cells which grow continuously and fragment suddenly; they are used in models of cell division and protein polymerisation. In the long term, the concentrations of cells with given masses typically increase at some exponential rate and, after compensating for this, they arrive at an asymptotic profile. Up to now, this has mainly been studied for the average behaviour of the system, often by means of a natural partial integro-differential equation and the associated spectral theory. However, the behaviour of the system as a whole, rather than only its average, is more delicate. We obtain a criterion for the convergence of the entire collection of cells to a certain asymptotic profile, and we find some improved explicit conditions for this to occur. Joint work with Jean Bertoin.

12:00-14:00 LUNCH

14:00-15:00 Bénédicte Haas (Paris 13)

Scaling limits of multi-type Markov Branching trees

Abstract: We introduce and describe the scaling limits of multi-type Markov Branching trees, which are random population tree-models where the distribution of the subtree of descendants of each individual only depends on the size and type of the individual, independently of the other individuals of the same generation. We will observe two regimes in the scaling limits and illustrate them with two notable applications: growing models of random trees and multi-type Galton-Watson trees. An important tool in our study is to describe the scaling limit of a typical path in the tree (which turns out to be a bivariate Markov chain) as a time-changed Markov additive process. Based on joint works with Robin Stephenson.

15:00-15:30 *Afternoon coffee break*

15:30-16:30 Matt Roberts (Bath)

Exceptional times of transience for a dynamical simple symmetric random walk

Abstract: We define a dynamical simple symmetric random walk in one dimension, and show that there almost surely exist exceptional times at which the walk tends to infinity. In fact the set of such times has Hausdorff dimension 1/2 almost surely. This is in contrast to the usual dynamical simple symmetric random walk in one dimension, for which such exceptional times are known not to exist. This is joint work with Martin Prigent.

16:30-16:45 BREAK

16:45-17:45 Minmin Wang (Sussex)

Prunings, cut trees and the reconstruction problem

Abstract: The subject of pruning of continuum random trees have stimulated many works in recent years. The so-called cut trees encode the genealogies of the fragmentation processes induced by the pruning. The reconstruction problem investigates the question: how much information of the initial tree has been retained in its cut tree. This problem has been considered for the Brownian tree and for the stable trees, where the main arguments there rely heavily on the self-similarity of the underlined trees. Examples of continuum random trees which do not necessarily possess the self-similarity property include (non stable) Lévy trees and inhomogeneous continuum random trees. In this talk, I will discuss some new approach to the reconstruction problem that applies to these two families of trees. Joint work with Nicolas Broutin and Hui He.