Percolation and Related Topics (M16)

Geoffrey Grimmett

This introductory course in discrete random geometry is centred around a number of processes of topical significance.

The percolation process is the simplest probabilistic model for a random medium in finite-dimensional space. It has a central role in the theory of mathematical disordered systems, with strong links to combinatorics and statistical mechanics. Amongst its connections of current importance are those to Schramm–Loewner evolutions (SLE), to the combinatorics of self-avoiding walks, and to the theory of phase transitions in physics.

The related topics may include self-avoiding walks, and further models from interacting particle systems including the contact model for the spread of infection, and (if time permits) certain physical models for the ferromagnet such as the Ising model.

Pre-requisites

There are no essential pre-requisites beyond probability and analysis at undergraduate levels, but a familiarity with the measure-theoretic basis of probability will be helpful.

Literature

The following text will cover the majority of the course, and is available online.

1. Grimmett, G. R., *Probability on Graphs*, Cambridge University Press, 2nd edn, 2018; see `http://www.statslab.cam.ac.uk/~grg/books/pgs.html`

Additional support

Three examples sheets will be provided with three associated examples classes.