PhD research topic proposal

BME, Doctoral School of Mathematics and Computer Science

Name of supervisor :

Balázs Ráth

Degree:

PhD, Associate Professor

Title of the topic:

Large-scale behaviour of stochastic epidemic models on graphs

Short description:

Interacting particle systems on a large graph can serve as a stochastic model of the spread of epidemics as well as the spread of information. One of the most famous such models is the contact process [Harris, 1974, AoP].

One possible research topic for the PhD candidate is the approximation of the time evolution of such stochastic epidemic models on large networks by systems of differential equations. The foundations of such mean field approximations have already been established for well-mixed populations in [Kurtz, 1978, SPA], but the case of sparse graphs still has many interesting open questions.

The large-scale behaviour of the upper invariant measure of the contact process on the d-dimensional lattice is also not yet completely understood. E.g., Question 2 of Section 6 of [Liggett, Steif, 2006, AIHP] asks whether upper invariant configuration undergoes non-trivial percolation phase transition as the infection parameter varies. This problem could also serve as a possible research topic for the PhD candidate.

Requirements:

Working knowledge of probability theory and stochastic processes

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Place of work:

Budapest University of Technology and Economics

Statement: *The conditions of the research above are satisfied, the theme is confirmed by the Head of the Department/Institute*