

PhD projects

Supervised by Carl Dettmann

Stabilisation in switched systems Given a pair of 2×2 matrices, is it possible, from any initial point in \mathbb{R}^2 , to apply them in some order (depending on the initial point) so as to approach the origin? Surprisingly, this question is likely undecidable, that is, there is no algorithm that can answer it. But we can get useful bounds, also for more and larger matrices, involving the singular values of the matrices. This project involves using dynamical systems and numerical techniques to study this problem. See my paper “Lower bounds and dense discontinuity phenomena for the stabilizability radius of linear switched systems” at the website below.

Spatial networks What happens if you place points randomly in space, link them with a probability that depends on pairwise distance, and study the resulting network? How does this depend on the shape of the domain, the density of points, generalisations such as angular dependence, obstacles, time-dependent locations? These questions are interesting from both a theoretical and practical point of view. One of the main applications is the design of wireless ad-hoc networks. But there are many other kinds of networks with spatial structure that could be considered. See my paper “Spatial networks with wireless applications” at the website below.

For more ideas, please look at other recent papers at the website below. They are research articles, hence rather technical; please read only to get the general idea, and then contact me to discuss your interests.

<https://people.maths.bris.ac.uk/~macpd/>