

Counting realisations of Laman graphs via tropical geometry

Speaker: Ben Smith

Abstract: Given a Laman graph, its number of complex realisations is a finite number that is invariant for generic edge lengths. However, computing this realisation number is difficult in general, as the best known algorithm has exponential runtime. Moreover from a theoretical viewpoint, the realisation number is an invariant of the graph and yet no combinatorial formula for it is known.

Tropical geometry is a branch of algebraic geometry that studies ‘polyhedral shadows’ of algebraic varieties. These polyhedral shadows, or tropical varieties, recall a lot of data about the original algebraic variety, while introducing a combinatorial toolkit with which to study these varieties. In this talk, we will describe a novel method of computing realisations numbers of Laman graphs as an intersection of tropical varieties. Moreover, we show how this description can lead to a combinatorial formula for the realisation number purely depending on the underlying graph.

This is work in progress joint with Oliver Clarke, Sean Dewar, Daniel Green-Tripp, James Maxwell, Tony Nixon and Yue Ren.