Reconstructing 3D cube complexes from boundary distances

Jane Tan

University of Oxford, United Kingdom

jane.tan@maths.ox.ac.uk

Given a quadrangulation of a disc, suppose we know all the pairwise distances (measured by the graph metric) between vertices on the boundary of the disc. Somewhat surprisingly, a result of Haslegrave states that this is enough information to recover the whole interior structure of the quadrangulation when all internal vertex degrees are at least 4, providing a discrete analogue to boundary rigidity results from Riemannian geometry. In this talk, we look at a generalisation of this result to 3 dimensions, where we show that it is possible to reconstruct cube complexes that are homeomorphic to a ball from the pairwise distances between all points on the boundary sphere as long as a certain curvature condition holds. We'll also discuss some plausible variants that turn out to be false, and generalisations that should be true.

Joint work with John Haslegrave (University of Oxford), Alex Scott (University of Oxford) and Youri Tamitegama (University of Oxford).