

Yogeshwaran D

Random d -Complexes : Persistence diagram and spanning acyles.

With Primoz Skraba and Gagan Thoppe.

It is well-known that extremal edge-weights on a minimal spanning tree, nearest-neighbour distances and connectivity are inter-related for randomly weighted graphs. In this talk, we shall look at generalization of this result to random simplicial complexes. The first part of the talk shall be concerned with establishing some basic properties of spanning acycles and thereby justifying it as a natural topological generalisation of spanning trees. Further, we shall extend the Kruskal's algorithm and Prim's algorithm to simplicial complexes and thereby, providing algorithms for generating minimal spanning acycles. As a consequence of the simplicial Kruskal's algorithm, we shall obtain a connection between minimal spanning acycles and persistent diagrams. In the second part, we shall explore applications of these results in the context of random d -complexes and in particular, paying attention to extremal face-weights of the minimal spanning acycles on a complete d -complex with i.i.d. face weights. We shall relate them to extremal weights on a natural nearest-neighbour hypergraph as well as higher-dimensional connectivity of the random d -complex. We shall finally discuss stability results in this context and thereby extending our results to certain class of dependent perturbations of i.i.d. face-weights.