

Discrete Curvature and Applications in Representation Learning

Melanie Weber
Harvard University, U.S.

The problem of identifying geometric structure in heterogeneous, high-dimensional data is a cornerstone of Representation Learning. In this talk, we study the problem of data geometry from the perspective of Discrete Geometry. We focus specifically on the analysis of relational data, i.e., data that is given as a network or can be represented as such. We start by reviewing discrete notions of curvature, where we focus especially on discrete Ricci curvature. Then we discuss how curvature is linked to meso-scale structure in graphs, which gives rise to applications of discrete curvature in network analysis. Finally, we discuss the problem of embeddability: For downstream machine learning and data science applications, it is often beneficial to represent relational data in a continuous space, which may be Euclidean or Non-Euclidean. How can discrete curvature aid us in learning good representations?