MPIDS Colloquium

MAX-PLANCK-GESELLSCHAFT

12 years of network geometry: from single-layer systems to multiplexes and temporal networks

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Many real-world networks are characterized by two universal properties: (i) strong clustering and (ii) heterogeneous distributions of node degrees. Clustering implies that there is a latent geometry underlying their observed topologies, while the heterogeneity in their degree distributions implies that this geometry is hyperbolic. This observation has led to the development of powerful generative models and statistical inference methods that map real networks into hyperbolic spaces, with profound applications in community detection, link prediction, and network navigation or search, paving the way to the emergent field of "Network Geometry". In this talk, we will overview our work in this area during the past 12 years, since we first made the aforementioned observation. We will start our discussion from the development of hyperbolic geometric graphs, the mapping of the first real network (AS Internet) into its hyperbolic space, and the finding that hyperbolic geometry emerges naturally in networks where connections take place by optimizing tradeoffs between popularity and similarity. We will then describe how this framework has been extended and applied to multiplex systems, which are collections of networks (layers) that share common nodes, and conclude with recent developments on human proximity networks, which are time-varying graphs representing the closeness among humans in a physical space. We will also discuss what we believe is the most major open problem in the area of network geometry, which, if tackled, could lead to a principled theory for modeling and predicting network dynamics.

Wednesday, March 31st, 2021 at 2:15 pm

MPIDS, video conference at www.zoom.us
Meeting ID: 959 2774 3389
Passcode: 651129, direct link

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