Complementarity in complex networks

Talk by Maksim Kitsak

In many networks, including networks of protein-protein interactions, interdisciplinary collaboration networks, and semantic networks, connections are established between nodes with complementary rather than similar properties. While complementarity is abundant in networks, we lack mathematical intuition and quantitative methods to study complementarity mechanisms in these systems. In this work, we close this gap by providing a rigorous definition of complementarity and developing geometric complementarity frameworks for modeling and inference tasks on networks. We demonstrate the utility of complementarity frameworks by learning geometric representations of several real systems. Complementarity not only offers novel practical analysis methods but also enhances our intuition about formation mechanisms in networks on a broader scale and calls for a careful re-evaluation of existing similarity-inspired methods.