

Abstract

Almost all natural and social phenomena can be viewed as complex systems composed of many interconnected and interdependent entities. Understanding the hidden patterns of complex systems helps to discover, predict and even utilize natural laws. In this talk, I will be presenting a generalized statistical mechanics model for coalescing all underlying entities into mathematical hypernetworks in which interactions at various orders are all captured. We implement GLMY homology theory to dissect the topological structure and function of hypernetworks. We show how hypernetwork topology can be used as a powerful tool to reveal fundamental principles of natural and social complexities.