

Plenary Talk

PV III Mon 16:30 Audimax 1

Complex networks with complex nodes — ●RAISSA D'SOUZA —
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Real world networks – from brain networks to social networks to critical infrastructure networks – are composed of nodes with nonlinear behaviors coupled together via non-trivial network structures. Approaches from statistical physics study how behaviors arise in collections of simple elements connected together in complex structures such as modular or scale-free networks. They provide understanding about massive networks, revealing implications that network structure can have on network function and resilience. In contrast, approaches from dynamical systems and control theory typically study small systems of nonlinear nodes connected together in simple networks. This talk presents recent

work bridging the gap of complex networks with complex nodes. First is considering nonlinear phase-amplitude oscillators coupled together by simple ring networks and how the interplay of nodal dynamics and coupling structure gives rise to emergent long-range order. Next is increasing the structural complexity from dyadic networks to hypergraphs to capture higher-order interactions and study cluster synchronization. The focus will then turn to social networks, starting from modeling humans as nodes with underlying attributes coupled in complete graphs, and moving on to real-world multiplex social networks in macaque monkey societies. We reveal the tensions between the forces of homophily and social balance, and show how the competition between rewarding talent and rewarding social reputation can cause cascading rank rearrangements in established social hierarchies.