Data-Driven Network Dynamics Reconstruction and Prediction

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Predicting critical transitions in complex systems, such as those observed in the climate or the brain, constitutes a central challenge due to the inherent difficulty in anticipating these abrupt shifts within intricate systems. These transitions can potentially cause significant disruptions to the system's normal functioning. The comprehension of these complex systems fundamentally relies on our capacity to construct appropriate models based on empirical observations. This presentation will delve into the intricacies of reconstructing network dynamics, mimicking brain dynamics, from empirical data. We also discuss the unexpected outcomes, such as revealing phenomena like hypernetwork dynamics, even when the constituent agents of the original system engage in pairwise interactions within the network structure. Ultimately, this recovery process will equip us with the means to forecast critical transitions based on the insights derived from the reconstructed model.