CONNECTING THE DOTS:
LEARNING GRAPHS FROM NODAL SIGNAL OBSERVATIONS

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The talk will provide an overview of graph signal processing (GSP)-based methods designed to learn an unknown network from nodal observations. Using signals to learn a graph is a central problem in network science and statistics, with results going back more than 50 years. The main goal of the talk is threefold: i) explaining in detail fundamental GSP-based methods and comparing those with classical methods in statistics, ii) putting forth a number of GSP-based formulations and algorithms able to address scenarios with a range of different operating conditions, and iii) briefly introducing generalizations to more challenging setups, including multi-layer graphs and learning in the presence of hidden nodal variables. Our graph learning algorithms will be designed as solutions to judiciously formulated constrained-optimization sparse-recovery problems. Critical to this approach is the codification of GSP concepts such as signal smoothness and graph stationarity into tractable constraints. Last but not least, while the focus will be on the so-called network association problem (a setup where observations from all nodes are available), the problem of network tomography (where some nodes remain unobserved, and which can be related to latent-variable graphical lasso) will also be discussed.