

**University of California, Irvine
Statistics Seminar**

Modeling Ensembles of Networks

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Parametric models for networks with heterogeneity and/or complex dependence have seen considerable progress over the past two decades, opening the door to further modeling opportunities. Among these is the modeling of sets of networks drawn either from a single common generating process (i.e., replication), or from mixtures of such processes (as is frequently the case in observational studies of populations of networks). The multiple-network setting poses a number of computational and statistical challenges, particularly in dependence models (for which intractable normalizing factors are the norm). Here, I discuss several examples of progress on this front, all within the context of exponential family random graph models (ERGMs). These include strategies for efficient analysis of large numbers of pooled networks, approximate continuous mixtures to account for heterogeneity in reciprocity and mean degree, and discrete mixtures of ERGMs for populations with higher levels of heterogeneity. These approaches are illustrated with applications to protein structure and dynamics, intra-organizational networks, and political interactions.