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A Survey of Dynamic Network Models in Discrete and Continuous Time

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Given the growing number of available tools for modeling dynamic networks, the choice of a suitable model becomes central. It is often difficult to compare the different models with respect to their applicability and interpretation. The goal of this survey is to provide an overview of popular dynamic network models. The survey is focused on introducing binary network models with their corresponding assumptions, advantages, and shortfalls. The models are divided according to generating processes, operating in discrete and continuous time, respectively. First, we introduce the Temporal Exponential Random Graph Model (TERGM) and its extension, the Separable TERGM (STERGM), both being time-discrete models. These models are then contrasted with continuous process models, focusing on the Relational Event Model (REM). We additionally show how the REM can handle time-clustered observations, i.e., continuous time data observed at discrete time points. Besides the discussion of theoretical properties and fitting procedures, we specifically focus on the application of the models using a network that represents international arms transfers. The data allow to demonstrate the applicability and interpretation of the network models.