Machine Learning for Complex Networks

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Abstract: Collection and analysis of data from deployed networks is essential for understanding modern networks. Traffic traces collected from various deployed communication networks and the Internet have been used to characterize and model network traffic, analyze Internet topologies, and classify network anomalies. Data mining and statistical analysis of network data are often employed to determine traffic loads, analyze patterns of users' behavior, and predict future network traffic. Spectral graph theory has been applied to analyze various topologies of complex networks and capture historical trends in their development. Recent machine learning techniques have proved valuable for predicting anomalous traffic behavior and for classifying anomalies in complex networks. Further applications of these tools will help improve our understanding of the underlying mechanisms that govern the behavior of complex networks such as the Internet, social networks (Facebook, LinkedIn, Twitter, Internet blogs, forums, and websites), power grids, gene regulatory networks, neuronal systems, food webs, social systems, and networks emanating from augmented and virtual reality platforms. They will also help improve performance of these networks and enhance their security.