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Stochastic Multiple Gradient Decent for Inferring Action-Based Network Generators

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ABSTRACT

Networked systems, like the internet, social networks etc., have in recent years attracted the attention of researchers, specifically to develop models that can help us understand or predict the behaviour of these systems. A way of achieving this is through network generators, which are algorithms that can synthesize networks with statistically similar properties to a given target network. Action-based Network Generators (ABNG) is one of these algorithms that defines actions as strategies for nodes to form connections with other nodes, hence generating networks. ABNG is parametrized using an action matrix that assigns an empirical probability distribution to vertices for choosing specific actions. For a given target network, ABNG formulates the problem of estimating an action matrix as a multi-objective optimization problem, which in turn requires an algorithm to determine a Pareto set of action matrices that can generate networks statistically similar to the target. We propose using a population based stochastic multiple gradient descent algorithm to estimate this Pareto set. Results showing the properties of networks optimized using the gradient based algorithm are presented. A comparison is also performed with the previous approach used for optimization.

KEYWORDS

Algorithm, Network, Multi-Objective Optimization, Stochastic, Gradient Descent, Action Based Network Generator