# Scalable Generative Models for Dynamic Network Data

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Modelling dynamic networks via latent factor models [Foulds et al., 2011, Heaukulani et al., 2013, Kim et al., 2013] is significant for our understanding of complicated time-varying relational data. Using latent factor models, we can generate latent coordinates that project high-dimensional network data into low-dimensional latent feature vectors. These latent coordinates encode observed network structures, such as edges between entities. For dynamic networks, the smooth evolution of these latent coordinates over time can be captured via the construction of Markov processes. Latent factor models achieve high accuracy in terms of performing missing link prediction and future network forecasting, although their high computational costs prevent a practical use in real-world applications.

The goal of the master thesis project is to develop a probabilistic dynamic network model via the bilinear latent factor models [Caron et al., 2017, Zhou, 2015] to achieve competitive performance in terms of missing link prediction and future network prediction but with less computational cost. The tasks include: (1) developing a reasonable dynamic network model that characterizes network dynamics; (2) deriving closed-form update equations to perform model inference; (3) scaling up model inference via stochastic gradient variational Bayes [Kingma and Welling, 2014, Knowles, 2015]; (4) quantifying the proposed model's capabilities and performance on real-world dynamic network data.

Working knowledge of Matlab or Python is required and experience with C++ is a plus.

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