



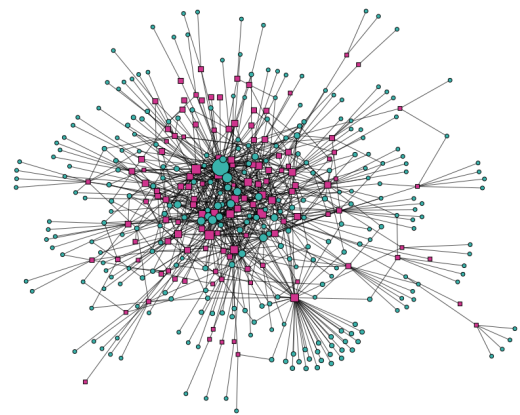
## Graph Neural Networks for Recommendation

Recommendation systems aim to predict what users will engage with next by learning relationships between users and items. Platforms like TikTok, Pinterest, and Spotify generate extremely rich data, where user behavior includes sequences of interactions, participation in communities, and viral trends that spread through the network.

Graph Neural Networks (GNNs) have become an important tool for recommendation tasks because they can learn flexible representations from user-item graphs. This makes them well suited to capturing the richness and diversity of data on modern platforms. However, GNNs also have limitations: many cannot detect certain structural patterns, like triangle counts or specific subgraph motifs, which can be crucial for modeling social influence, community structures, or shared interests.

Such structural reasoning becomes especially important in variants of the recommendation problem that naturally involve graph-based thinking, e.g.:

- **Sequential recommendation:** predicting the next item a user will interact with, based on their past behavior
- **Subgraph recommendation:** identifying communities, groups, or channels that might interest a user
- **Group recommendation:** given a set of users, recommend an item that is relevant to the group as a whole



In this thesis, we explore both theoretical and practical aspects of GNNs for recommendation tasks.

The goal is to investigate how GNNs can be adapted to better capture structural patterns and complex relationships between users and items, leading to more effective and interpretable recommendations.

**Requirements:** Strong motivation, ability to work independently, and an interest in conducting innovative theoretical and/or empirical research. Some machine learning knowledge and Python programming skills are important. Prior experience with PyTorch or GNNs is a plus.

**Interested? Please contact us for more details!**

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