Playlist creation with GNNs

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1 Introduction

Music streaming services have become increasingly popular over the past decade, with millions of users streaming music every day. However, one challenge faced by streaming services is creating dynamic playlists that are tailored to the users' preferences. In this project, we will explore how graph neural networks (GNNs) can be used to generate playlists that are tailored to a user's preferences.

2 Dataset

For this project, we will be using Spotify's Million Song Dataset, an open-source dataset containing information about over one million playlists. The MSD contains various metadata about the songs, such as artist name, album title, and song duration. The dataset contains around 1 million playlists, 2 million songs and 300 thousand artists. Since the dataset is way too large for us to process entirely, we are going to sample a subgraph by taking only the most popular songs and playlists (according to the highest node degree).

Main features of the dataset:

- Main Song features:
  - Song name
  - Album name
- Main Artist features:
  - ID
- Main Playlist features:
  - Name
  - Date of Modification
  - Whether it is collaborative
  - Followers
  - Duration

With most features we also get coresponding IDs which can be used for further data extraction via the Spotifies API.

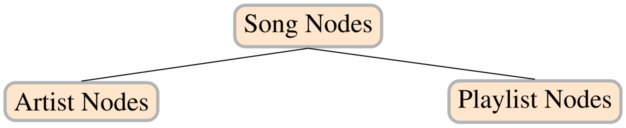
Main relationship features:

- Song to Playlist:
  - Position

3 Graph Structure

We will use this dataset to construct a heterogenous graph, with nodes representing songs, artists and playlists, and edges representing authorships/playlist inclusions. We will then use a GNN to generate playlists for each user based on their past recorded preferences - which can be viewed as a virtual playlist.

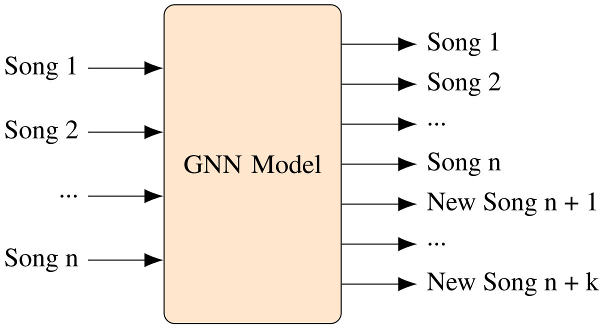
Base tripartite graph structure:



4 Graph ML Model

We will use GraphSAGE, a graph neural network architecture for semi-supervised node classification, for our GNN model. GraphSAGE is a neighbourhood-based graph neural network, where each node's representation is aggregated from its neighbours. This model is appropriate for our task because it can capture the similarities between songs and generate playlists that are tailored to a user's preferences.

Model will wrok by accepting *n* selected songs and generating additional *k* songs.


Song 1
Song 2
...
Song n
GNN Model
Song 1
Song 2
...
Song n
New Song n + 1
...
New Song n + k