Music Recommendation using Content-based features

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Hypothesis: *Is it possible to recommend music to people using content-based features and improve on traditional models ?*

Content-based features

- Loudness, Timbre, Tempo, Energy, …
- Audio analysis provided by **Spotify**
- Exploring **MFCC features** lately

Aims

- Build content based model to eliminate cold start problem
- Use hybrid recommendation (CF + Content) to improve pure CF models

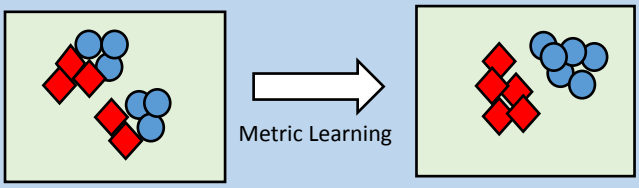
Metric Learning

- Notion of good metric is problem dependent
- Learn a customized similarity metric from data

$$\min_{A \succcurlyeq 0} \sum_{(x_i, x_j) \in S} d_A(x_i, x_j)$$

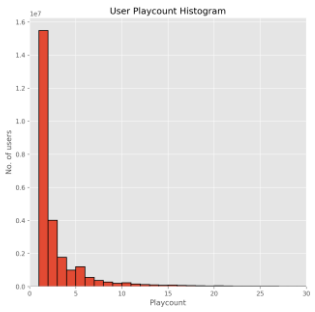
$$such\ that \sum_{(x_i, x_j) \in D} \sqrt{d_A(x_i, x_j)} \geq 1$$

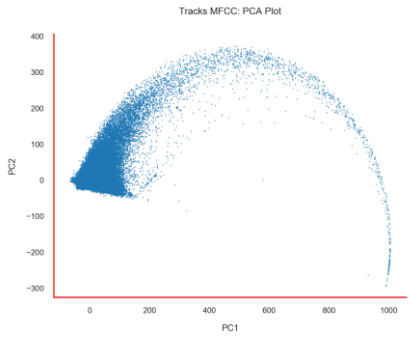
$$where\ d_A(x_i, x_j) = \sqrt{(x - y)^T A (x - y)}$$

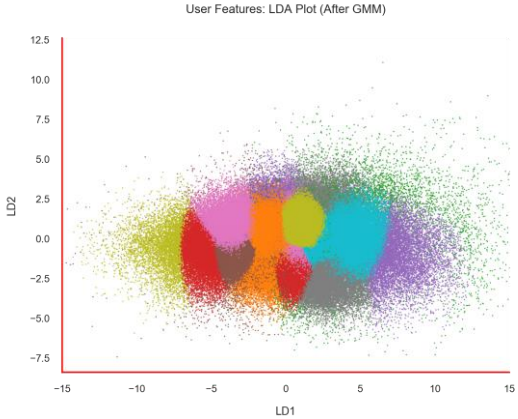


Progress and Preliminary results

- Used **Mahalanobis Metric for Clustering (MMC)** to learn a metric for music similarity based on single user's taste
- Learning a separate metric for individual users is difficult due to **sparse** and **implicit feedback** nature of dataset
- Built a Hybrid recommendation system based on MFCC features using **Gaussian Mixture Model**







Problems and challenges

- Sparsity of usage data
- Implicit feedback nature
- Semantic gap between user's taste & content similarity
- Hard to define good discriminative features

Future Work

- Rebuild metric learning model using MFCC features
- Improve performance by using MLR and better tags/labels for features