

# Ensemble Learning for Hybrid Music Recommendation

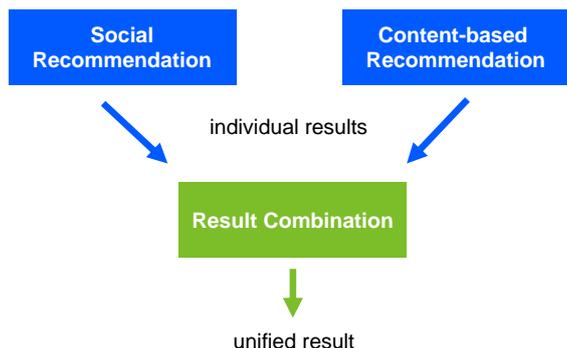
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## 1 Hybrid Music Recommendation

Current music recommendation systems use one of two recommendation paradigms: *Social Recommendation* or *Content-based Recommendation*. Hybrid recommenders can combine these two.

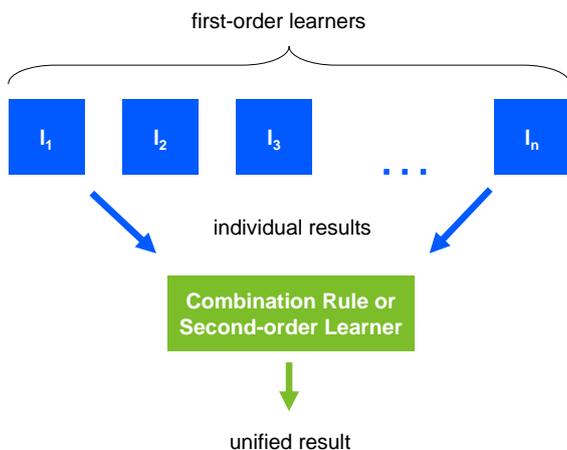


### Potential benefits

- Reduced recommendation error rate,
- Alleviated paradigm-specific problems (*cold start*, *similarity bias*),
- Flexible integration of different types of recommendation algorithms in a recommendation framework.

## 2 Ensemble Learning Methods

In *Ensemble Learning*, several weak learners are created and used in regression or classification tasks. Their individual output is combined into a unified output by applying a combination rule.

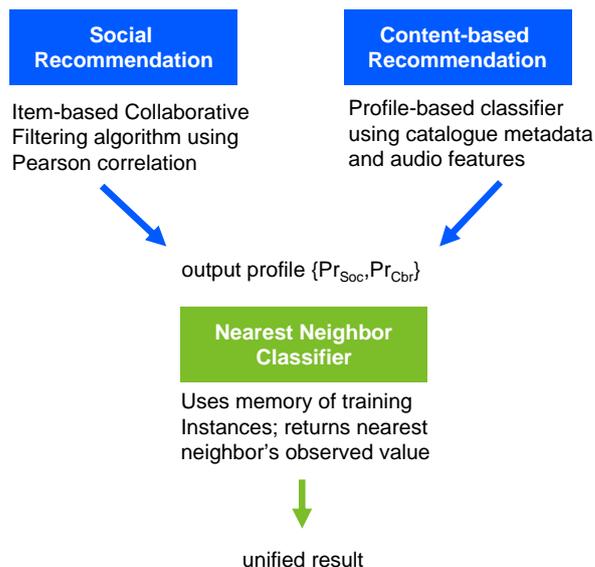


Ensemble Learning methods rely on a sufficient degree of *diversity* between the individual first-order learners. First-order learners must be able to correct errors made by other first-order learners in order to successfully decrease the ensemble's overall error rate.

Are recommendations computed using the different currently used recommendation approaches already diverse enough to significantly reduce the recommendation error?

## 3 Implementation

A frequently used social recommendation algorithm and a baseline content-based recommendation algorithm were implemented. Their results were combined using a nearest-neighbor classifier.



## 4 Evaluation

### Music Dataset

- Music collection with 63,949 popular music pieces,
- 6,939 registered participants,
- 1,139,979 logged song playback events.

The evaluation task was to predict play counts for songs. The *Mean Absolute Error*, averaged over all users, was used for as error measure.

Recommender	Mean Absolute Error (MAE)
Social	2.608
Content-based	2.884
Hybrid	2.349

## 5 Conclusions

In this preliminary experiment, unmodified frequently used music recommendation algorithms already provided output that was diverse enough to reduce the MAE by about 10% when using a simple second-order learner.

### Future Work

- Integrating more heterogeneous data sources,
- Applying diversification techniques on them,
- Developing combination rules specifically for hybrid music recommenders,
- Collecting explicit user ratings for a comparative evaluation.