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None

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<http://dcs.bbk.ac.uk/~eldaw>

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A Neural Network Model for Collaborative Filtering

Introduction

In recommender systems, the user is presented with information that is likely to be of interest to them according to the information given in their profile. A successful technique called collaborative filtering, has been at the heart of recommender systems research for some time where a number of algorithms have been developed for generating recommendations. In collaborative filtering, the information given by a group of users is used to predict missing information that might be of interest to individuals from the same group.

In this project we present a new model that employs a feedforward neural network architecture to generate recommendations. Our main objective is to outperform existing models in terms of prediction accuracy, performance and scalability.

Collaborative filtering Prediction

The data over which collaborative filtering is carried out normally include an $n \times m$ matrix R of ratings in the range of 1 to t , where there are n users, u_1, u_2, \dots, u_n , and m products (e.g. movies) p_1, p_2, \dots, p_m . An entry $r_{ij} = 0$ indicates that no rating is available by the i th user for the j th movie. The rating matrix R is normally sparse, since most of its entries are 0.

Given the matrix R , collaborative filtering *prediction* can be described as the problem of guessing the rating r_{ij} when $r_{ij} = 0$, i.e. when the rating information for a user movie pair is unknown.

	P ₁	P ₂	P ₃	P ₄		P ₁	P ₂	P ₃	P ₄
U ₁	5	0	0	3	U ₁	5	5	3	3
U ₂	0	0	4	0	U ₂	3	2	4	3
U ₃	0	1	0	2	U ₃	3	1	5	2
U ₄	3	0	3	0	U ₄	3	2	3	3
U ₅	0	2	5	0	U ₅	3	2	5	2
U ₆	0	5	0	3	U ₆	5	5	3	3

An arbitrary User-Product matrix R before and after prediction of unknown ratings where the ratings range between 1 to 5.

Datasets

Collaborative filtering is boring without a reasonably large dataset. Hence, a number of datasets (e.g. MovieLens and Netflix datasets) have been selected to evaluate the new model during the design and the development stages. These datasets are based on explicit data collected by applications which normally store other information along with the plain ratings.

Performance

The performance of recommender systems is measured in several aspects such as throughput, accuracy ... etc. Usually the accuracy is measured by calculating the root mean squared error (RMSE) of the system's prediction against the actual ratings which the system is trying to predict. So far our new model has achieved a RMSE of 0.98 on the MovieLens dataset.

