

MovieRecommender.net

dn-ds

What is MovieRecommender?

A web app that makes movie recommendations based on ratings supplied by the user.

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Please rate the following movies (1-5 [best], or 0 if not seen):

	0	1	2	3	4	5
Shawshank Redemption, The (1994)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forrest Gump (1994)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pulp Fiction (1994)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Silence of the Lambs, The (1991)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Matrix, The (1999)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Star Wars: Episode IV - A New Hope (1977)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jurassic Park (1993)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Schindler's List (1993)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Braveheart (1995)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Toy Story (1995)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Star Wars: Episode VI - Return of the Jedi (1983)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Star Wars: Episode V - The Empire Strikes Back (1980)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fight Club (1999)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Terminator 2: Judgment Day (1991)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Indiana Jones and the Raiders of the Lost Ark (1981)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Recommend Movies

The Dataset

- MovieLens
`http://grouplens.org/datasets/movielens/latest`
- 27 million ratings
- 280 thousand users
- Ratings created January 09, 1995 – September 26, 2018

Goal: Given user ratings, make movie recommendations.

Project Outline

Exploring the Data



Choosing a Recommender System



Selecting and Evaluating a Model

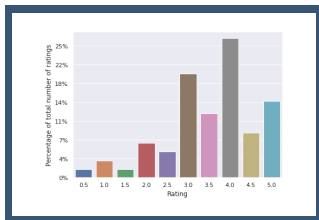


Making Recommendations



Web App

Exploring the Data



- Ratings range from 0.5 to 5.0, with increments of 0.5.
- Median rating: 3.5; Most common rating: 4.0 (27%).
- # of ratings per user: median = 30, min = 1, max \sim 24K.
- # of ratings per movies: median = 7, min = 1, max \sim 98K.
- Training and test sets are prepared.

Choosing a Recommender System

- Used the technique of **collaborative filtering**.
- Main idea: use similarities between users and similarities between items (movies, in our case) simultaneously to provide recommendations.
- Items are recommended (filtering) to a given user based on the interests of similar users (collaborating).
- Used **matrix factorization**, a collaborative filtering algorithm.
- Main idea: decompose the user-movie ratings (sparse) matrix R into a product UV , where U and V are low-rank matrices.

Choosing a Recommender System (continued)

- Optimal U and V are found by minimizing the error arising from the approximation $R \approx UV$.
- Difficult optimization problem, since the objective function is non-convex.
- Instead, solve a convex optimization problem by alternately treating U and V as constants during gradient descent, an approach known as **Alternating Least Squares (ALS)**.

Selecting and Evaluating a Model

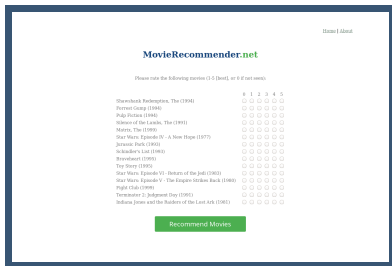
- Used a cross-validator to determine optimal hyperparameters.
- Optimal hyperparameters:
 - rank = 10
 - regularization parameter = 0.1.
- Root Mean Square Error (RMSE) on the test set: 0.8156.
- Best model improves the baseline model by 15%.

Making Recommendations

- y : ratings supplied by a new user.
- How to make recommendations?
- One approach:
 - Append y to the training set.
 - Retrain the model.
 - Make recommendations.
- Recommendations will not be available immediately.
- Instead, we used the following approach:
 - Find an approximation θ of the user factor vector for the new user.
 - Compute the product θV to obtain predicted ratings for the new user.
 - Make recommendations.

Web App

- When ratings are submitted, the information is preprocessed using jQuery and PHP, and then passed onto the machine learning model.
- The model processes the data and returns recommendations.
- The machine learning model is deployed on an AWS EC2 t2.micro instance using the Flask framework.



Main Tools and Packages Used

