Project 4: Influence of future predictions over active learning of users' tastes for recommender systems

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1. Introduction

The goal of this project app was to design and build a small recommender system that can work even for new users. This is the classic cold-start problem, because the system does not know anything about the user in the beginning.

We focused on three main things:

1. Implement an active learning(uncertainty sampling) method to ask for review.
2. Add an influence preview, so users can see how their answers change recommendations.
3. Create a user interface for a small study with participants.

We used the MovieLens small dataset (~100k ratings, ~9k movies) for training and testing.

2. Method (Task 1)

2.1 Base recommender

We used Matrix Factorization (MF).

- Each movie is represented by a vector of latent factors.
- A new user is represented by a vector, computed using ridge regression from the few ratings they provide.
- Predictions are made using the dot product

$$\hat{r}_{ui} = u^\top V_i$$

This is the standard MF idea, adapted for cold-start users.

2.2 Active learning strategy

We used uncertainty sampling:

- After each rating, we predict scores for all unseen movies.
- We then ask about the movies where the predicted score is close to the middle (~3 stars).
- These are most informative because a low vs. high answer changes the user vector strongly.
  If MF factors are not available yet (at the very beginning), we fall back to asking about the most popular unseen movies.

2.3 Influence preview

To improve transparency, we added influence previews:

- First compute the current Top-5 recommendations (“Before”).
- Pretend the user rates the current movie 1 and recompute Top-5 (“After low”).
- Pretend they rate it 5 and recompute Top-5 (“After high”).
- Show the changes:
  - ↑ if a movie goes up in rank
  - ↓ if it goes down
  - NEW if it enters the list
  - DROPPED if it disappears

3. User Study Plan (Task 2)

We designed a small between-subjects study.

- Participants: students, 18+, who watch movies.
- Conditions:
  - Baseline = recommender without previews
  - Experimental = recommender with previews

Procedure:

1. Intro + consent
   Each participant rates 10 movies
2. System shows Top-10 recommendations
3. Short survey (ease of use, trust, understanding)

Hypotheses:

- H1: Previews help participants understand how their answers affect the system.
- H2: Previews increase trust and satisfaction.
- H3: Previews may reduce the number of questions needed for good recommendations.