Recommender System

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What is a recommender system?

Wikipedia

A recommender system or a recommendation system is a system that seeks to predict the "rating" or "preference" a user would give to an item

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Recommendation comes in multiple flavors

Collaborative filtering

Infer preferences for a user based on:

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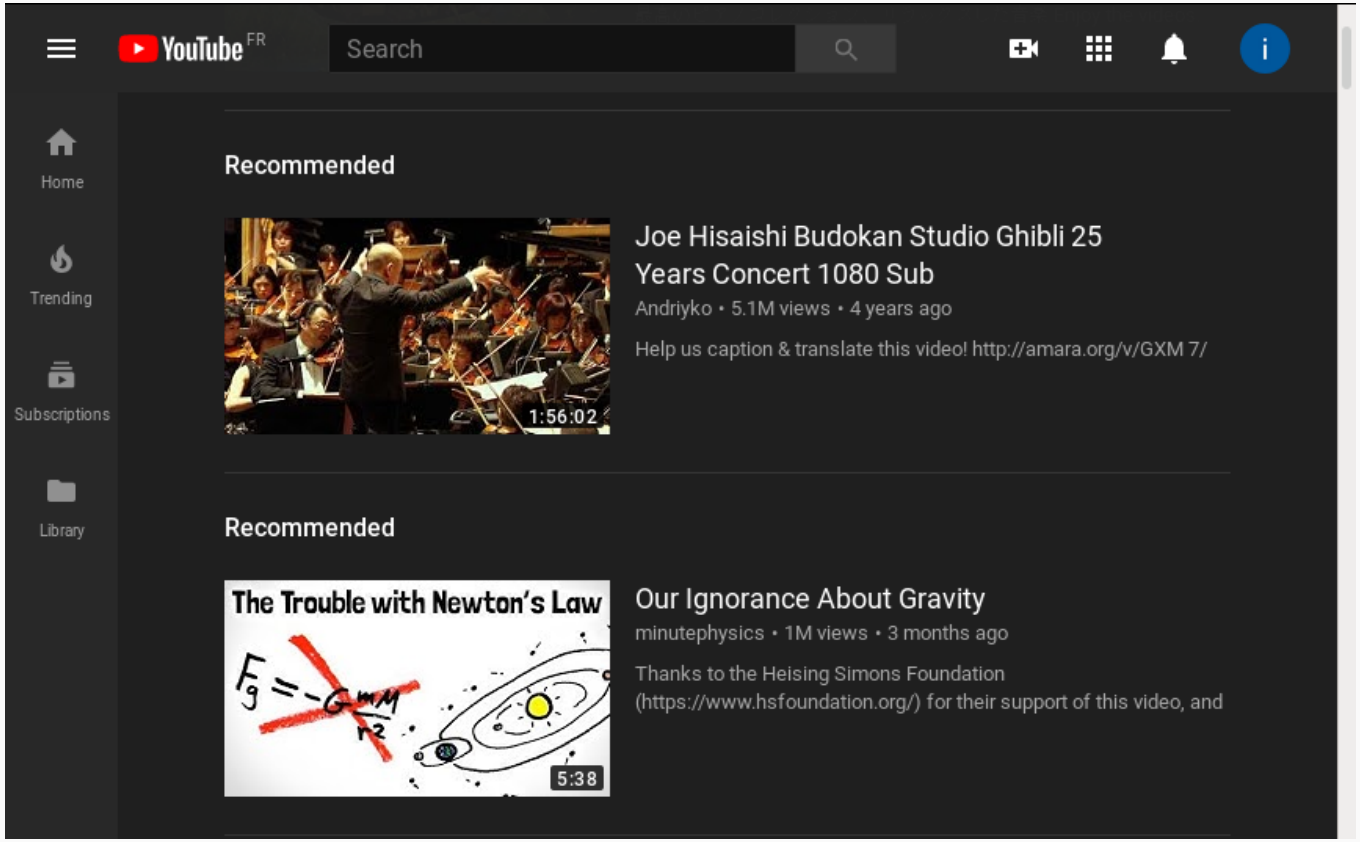

Content-based filtering

Infer preferences based on items description and user profile:

- recommend similar items
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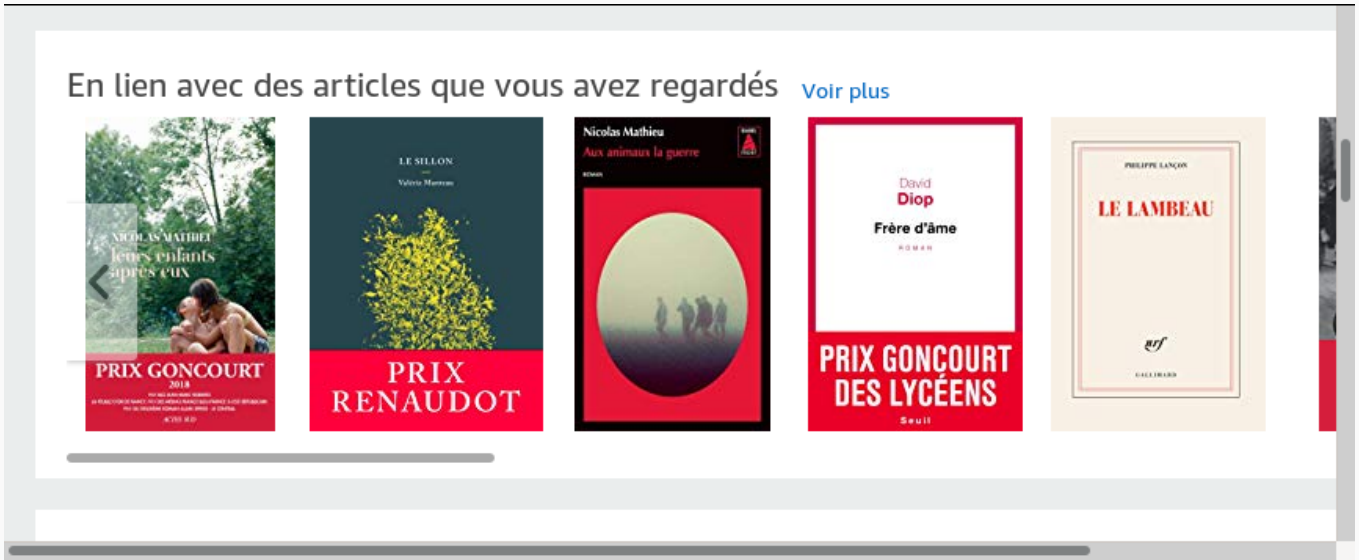

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$\Rightarrow$ Can also be seen as a classifier for each user!

Recommendation is not only about accuracy!

- Diversity

showing diverse items

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  How "original" are the recommendation

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- Serendipity

  How "original" are the recommendation

- Explainable

  Can you provide information on why item A is recommended

Collaborative filtering using Pearson correlation

Demo

Matrix factorization for recommendation

Matrix factorization problem

Input

- A matrix M of dimension $U \times I$.
- $M_{u,i}$ contains the rating by the user u on the item i.
- A special value $\perp$ can denote the absence of rating.

Output

Find H of dimension $U \times F$ and W of dimension $F \times I$ such that

$$M \equiv H \times W$$

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Beware of over fitting!

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Output

Find H of dimension $U \times F$ and W of dimension $F \times I$ minimizing:

$$||M - H \times W||^2 + \lambda(||H||^2 + ||W||^2)$$

Matrix factorization problem

How to minimize the error?

$$||M - H \times W||^2 + \lambda(||H||^2 + ||W||^2)$$

Solution

- Gradient descent

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- Alternating Least Square

  Good for full matrices