Application of Recommendation System in Banking Industry

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Jan 2019

Agenda

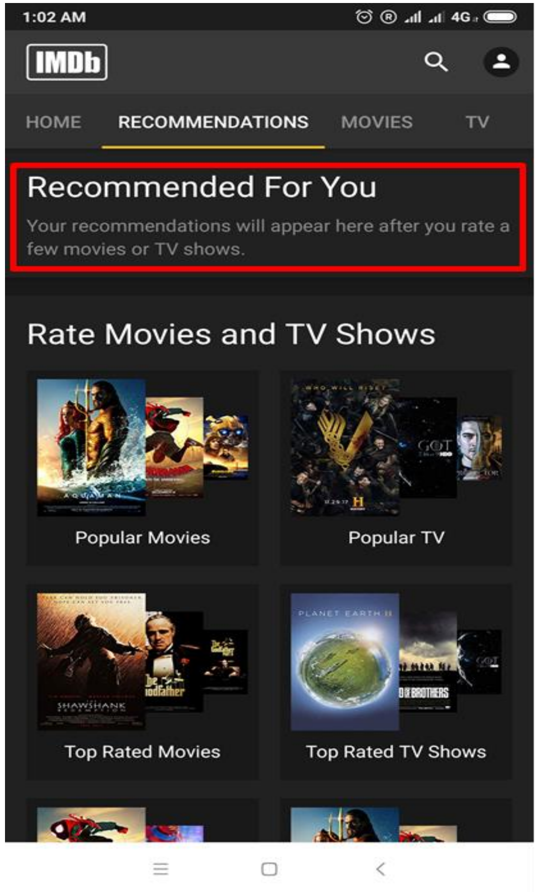
- How IMDb recommend movies ?
- Content-Based Filtering
- Collaborative Filtering
- Collaborative vs Content-based: Pros and Cons
- Use Case: Credit Card Offer Recommendation

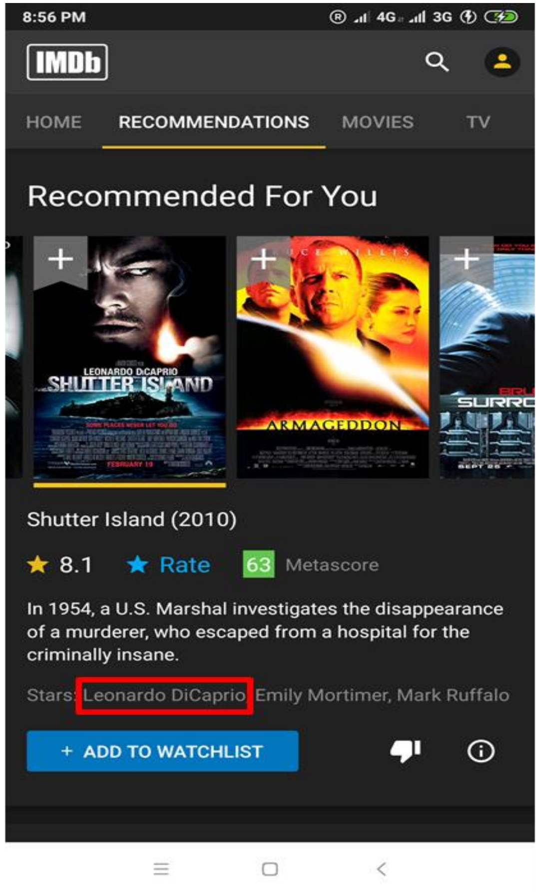
How IMDb recommend movies ?

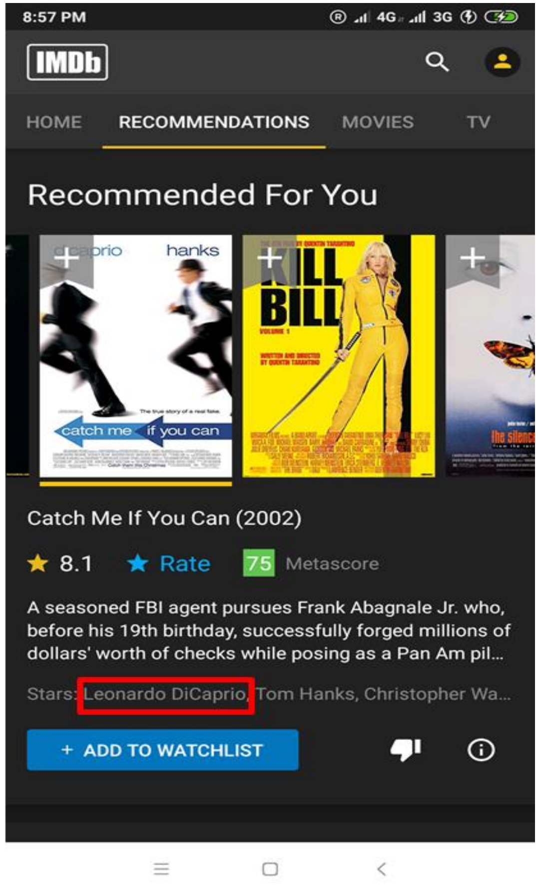
"Your recommendations will appear here after you rate a few movie or TV shows"

I rate 4 movies of Thriller/Adventure/Si-Fi/Mystery, stars by Nicolas Cage/Scarlett Johansson/Bruce Willis

- A list of 50 movies are recommended **REAL TIME**! Most are of similar genre as the movies I rate, and I watched more than half of the list.
- IMDb knows **Leonardo DiCaprio** is my favorite star !





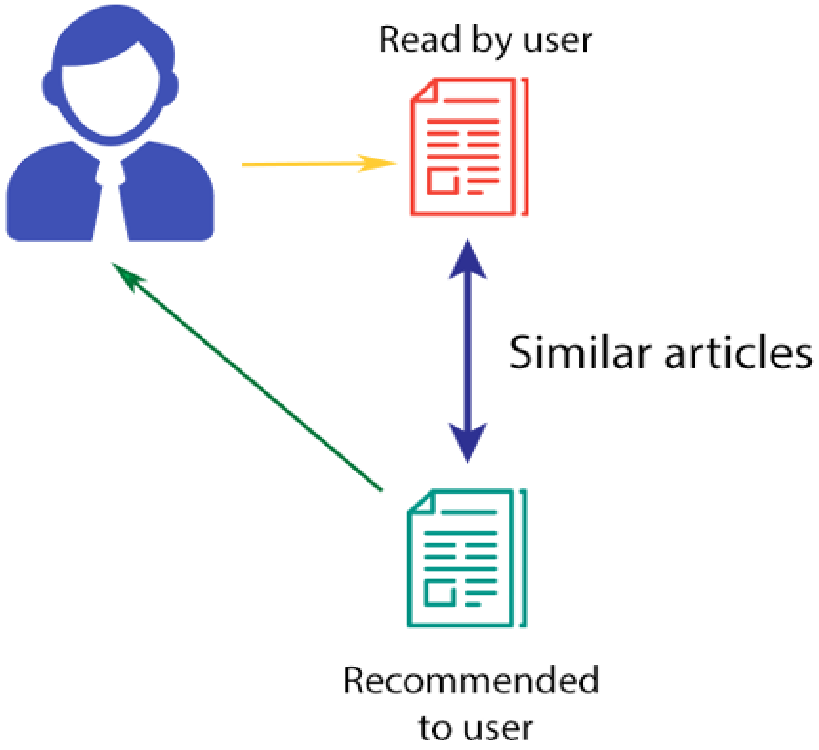


Content-Based Filtering

Customers who buy a specific item in the past, will buy similar items in the future !

items you may like …

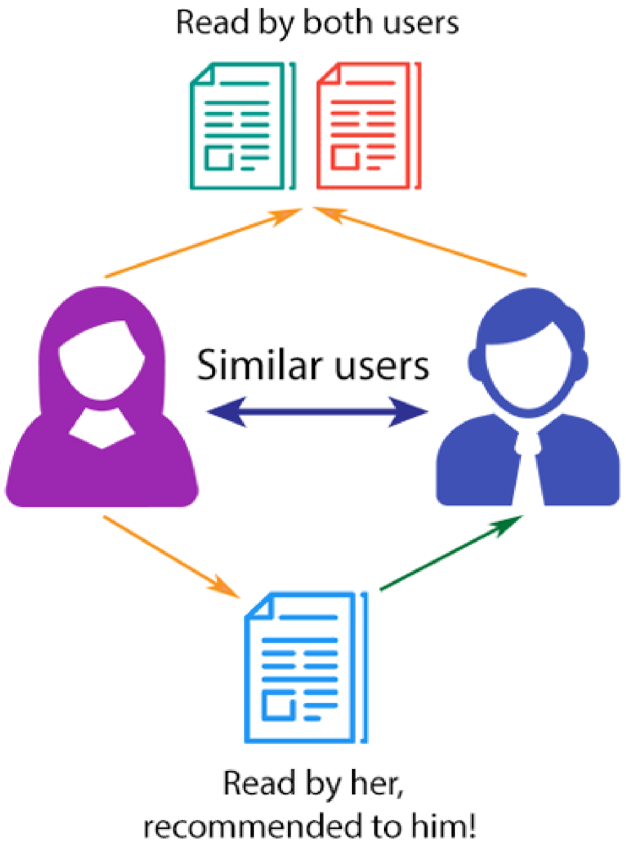
How content-base filtering works?



Collaborative Filtering

Customers who had similar tastes in the past, will have similar tastes in the future !

How collaborative filtering works?



Collaborative vs Content-based: Pros and Cons

Challenge	Collaborative Filtering	Content-based Filtering
First rater problem	Yes	No
Cold-start problem	Yes	No
Sparsity problem	Yes (may not be serious in banking)	No
Popularity bias problem	Yes	No
Complex feature selection	No	Yes

Some Handy Python Package for Recommendation System

surpriselib.com/

surprise

A Python scikit for recommender systems.

Home

Documentation

GitHub page

Star Fork Follow @Surpriselib

Maintained by Nicolas Hug

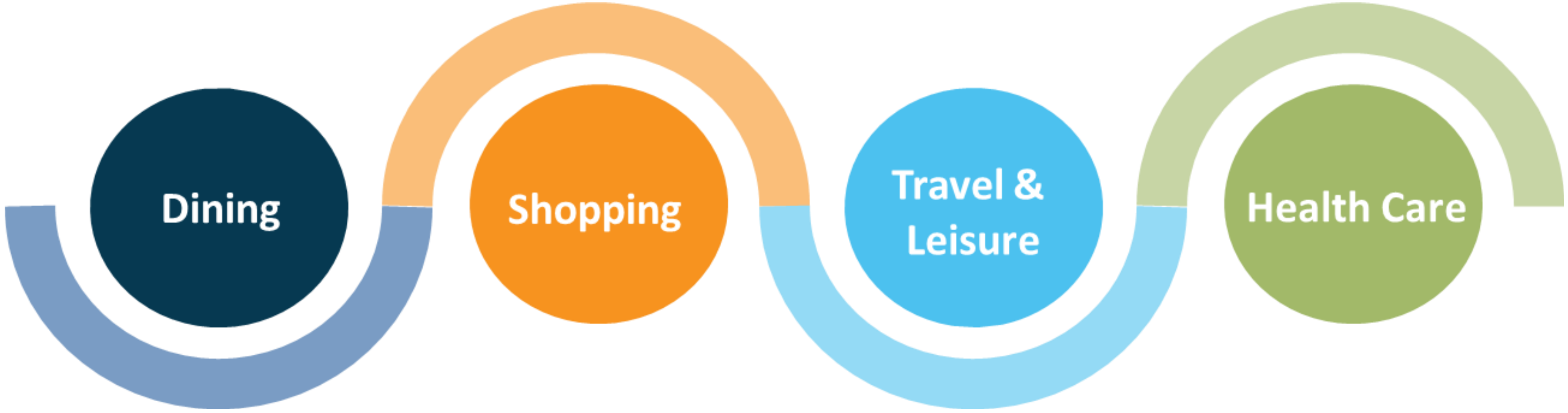
Page built with Jekyll and Hyde

Movielens 100k	RMSE	MAE	Time
SVD	0.934	0.737	0:00:11
SVD++	0.92	0.722	0:09:03
NMF	0.963	0.758	0:00:15
Slope One	0.946	0.743	0:00:08
k-NN	0.98	0.774	0:00:10
Centered k-NN	0.951	0.749	0:00:10
k-NN Baseline	0.931	0.733	0:00:12
Co-Clustering	0.963	0.753	0:00:03
Baseline	0.944	0.748	0:00:01
Random	1.514	1.215	0:00:01

Movielens 1M	RMSE	MAE	Time
SVD	0.873	0.686	0:02:13
SVD++	0.862	0.673	2:54:19
NMF	0.916	0.724	0:02:31
Slope One	0.907	0.715	0:02:31

http://surpriselib.com/

Use Case: Credit Card Offer Recommendation



What's the best recommendation for individual customer?

deliveroo
淘宝网 香港 hk.taobao.com
Wash & Wax 威信專業汽車護理
Gleneagles™ HONG KONG 港怡醫院
美心中菜 MAXIM'S CHINESE CUISINE
惠康 wellcome
WING ON 永安百貨 Founded 1907
Lane Crawford
CATHAY PACIFIC 國泰航空公司
北京同仁堂
OpenRice 開飯喇
百佳 PARKnSHOP
amazon
Emirates
The Hong Kong Jockey Club RIDING HIGH TOGETHER

Hybrid Recommendation System

G1: Non-existing customers

Recommend the Most Popular Items (Cold-start)

- Know nothing about these customers, the most popular merchant offers will be recommended

G2: New customers without transaction

People like you also like… (customer-to-customer similarity)

- Identify the ones who are similar to you based on demographics, e.g., income level, occupation, marital status, nationality, deposit balance, etc.
- Recommend based on these similar customers’ preference

G3: Existing customer w/ <X transactions

Those who like what you like also like… (customer-to-item similarity)

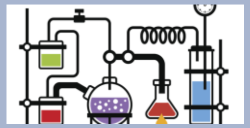
- Not enough information to conclude customers’ preference
- Identify customers who have similar preference as you, to recommend what they commonly prefer

G4: Existing customer w/ >=X transactions

You may also like… (item-to-item similarity + recency weighting)

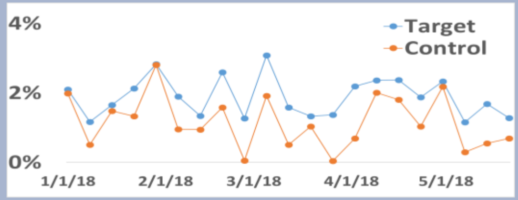
- Identify customer preference based on transaction history, e.g., cuisine type / price range / dinning location / merchant type / airline tier / hotel tier / travel seasonality, etc.
- More recent transactions would be assigned with higher weighting

Experimental Design for Measure of Success in terms of Click-through Rate, Incremental Sales & Revenue

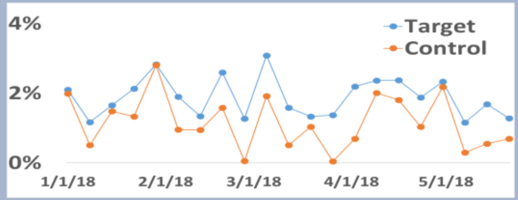


Need test & learn on different groups of customers to improve the hybrid recommendation system design

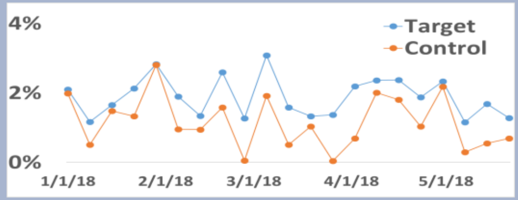
G1: Non-existing customers → Target / Control



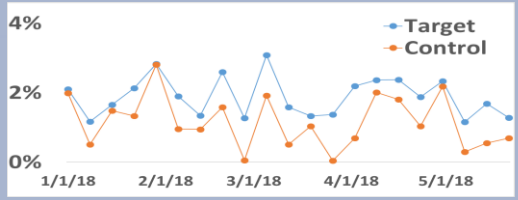
G2: New customers without transaction → Target / Control



G3: Existing customer w/ <X transactions → Target / Control



G4: Existing customer w/ >=X transactions → Target / Control



Q & A