Recommendation Systems

Giri Iyengar

Cornell University

gi43@cornell.edu

March 5 and 7, 2018

Overview

1. Recommendation Systems
   - Content-based Recommendation Systems
   - Collaborative Filtering
   - Latent Factor Models

Overview

1. Recommendation Systems
   - Content-based Recommendation Systems
   - Collaborative Filtering
   - Latent Factor Models

Recommendation Systems

- MMDS Detour 1

Latent Factor Models

- SVD/PCA based model
- NMF based models

Latent Factor Models

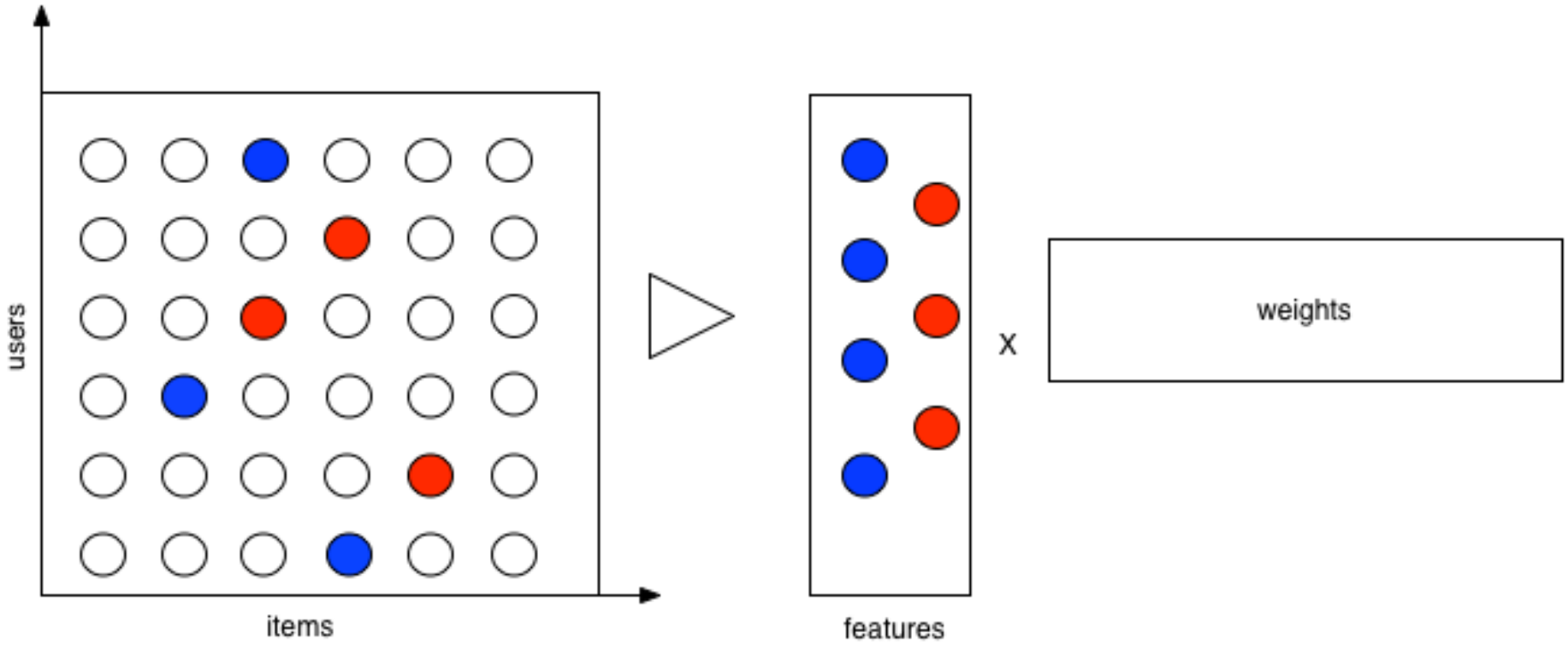

Figure: Factor Models

SVD based Latent Factor Model

- $A \approx UV$
- Use SVD to compute U and V matrices
- U: Select the top few eigenvectors of AA^T resulting in a $u \times k$ matrix

NMF

- SVD doesn't guarantee positive entries in U or V
- Enforcing positive entries have a couple of practical advantages
  - Induces sparsity. U and V continue to remain sparse unlike SVD
  - Leads to part-based representations
- Easier to interpret the weights compared with SVD

Learning NMF models

- Gradient Descent with projection (Force negative weights to zero at each iteration)
- Multiplicative Updates (variation of Gradient Descent)
- Alternating Least Squares
  - Fix U. Solve for V
  - Fix V. Solve for U
  - Repeat

Netflix Prize Model and other Latent Factor Models

- MMDS Detour 2

Other approaches for building recommendation systems

- **GloVe**: It factorizes the co-occurrence matrix. You could start with an Item-Item Co-occurrence matrix
- **Skip-gram**: It can be shown that skip-gram model factorizes the Pointwise Mutual Information matrix


thank you
danke
gracias
merci
obrigado
謝謝
ngiyabonga
teşekkür ederim
спасибо
dziękuję
bedankt
sukriya
kop khun krap
go raibh maith agat
mochchakkeram
tapadh leat
arigatô
dakujem
мерси
grazie
terima kasih
감사합니다
ありがとう
dank je
takk
рахмат
Баярлалаа
хвала
mauruuru
hvala
sagolun
taiku
ευχαριστώ
tack
mersi
barka
welalin
spas
misaotra
matondo
paldies
grazzi
mahalo
vinaka
blagodaram
faafetai lava
kiitos
dankie
dhanyavad
enkosi
asante
manana
obrigada
murakoze
tenki
djiere dieuf
mamnun
chnorakaloutioun
gratias ago
gràcies
sulpáy
dêkuji
sobodi
mèsi
najis tuke
kam sah hamnida
tanemirt
rahmet
diolch
dhanyavadagalu
shukriya
trugarez
xiexie
köszönöm
dankon
akun