

Collaborative Filtering Based Recommendation of Online Social Voting

In this paper, proposed Recommender systems (RSs) for voting in online social networks (like facebook, twitter, etc.) have two main concepts.

1. Matrix factorization (MF)
2. Nearest-neighbor (NN)

Notations:

U, u	user
V	voting
G	group
V	Target User
Q_u	User Latent Feature
P_i	Voting Latent Feature
$\check{R}_{u,i}$	User-voting interaction
$G_{u,n}$	User-group interaction
$S_{u,v}$	User-user interaction

Matrix factorization (MF)

This concept will help to non-social people. The Voting system requires social relationship in *Nearest-neighbor (NN)* ($u \rightarrow v$). Here *Matrix factorization (MF)* doesn't require any social relationships. Finding hot voting is main motive of this concept without social relationship.

In MF we rank the voting's according to user-voting interaction $\check{R}_{u,i}$.

$$\check{R}_{u,i} = r_m + Q_u P_i^T \quad [\text{Ref algorithm. 1}]$$

Here: $\check{R}_{u,i} \rightarrow$ User-voting interaction. (Find the hot voting based on user and vote latent features)

$r_m \rightarrow$ User voting interaction of target vote latent feature

$Q_u P_i^T \rightarrow$ Score of the voting interaction.

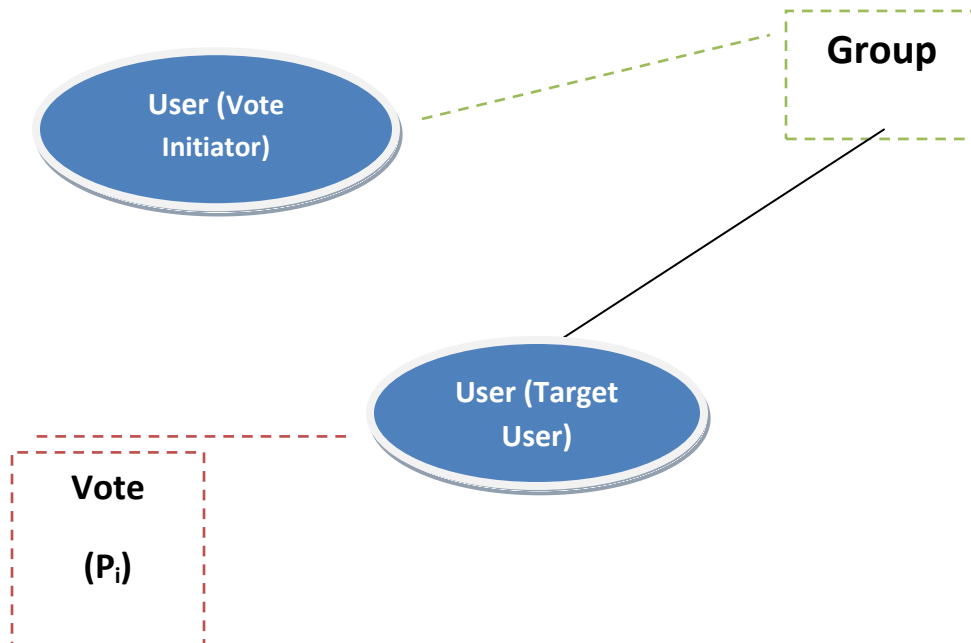
Nearest-Neighbor (NN)

In this paper, the idea of metapath to construct nearest neighborhoods for target users with four formats.

1. U-G-U-V metapath
2. U-U-V metapath
3. U-V-U-V metapath.
4. UNN

U-G-U-V metapath

Count of P_i Voting Latent Feature of v (target user) of group's of user u (vote initiator)



U-U-V metapath

Voting count of U 's followers/friends with in m -hops with same latent features. (1-hop Direct friend, 2- hop Indirect friend).

1-hop Direct friend $w=1$

2-hop Indirect friend $w=0.1$

Ex:

Sajid (Vote Initiator), Vote LF: Books \rightarrow Swamy (1-hop) P_i of books is 2

$$1*2=2;$$

Sajid (Vote Initiator), Vote LF: Books \rightarrow Ali (2-hop) P_i of books is 2

$$0.1 * 2 = 0.2;$$

U-V-U-V metapath.

Find the set of users who have participated, take count of the voting's participated vote initiator's previous voting's.

UNN

Set of NNs of user u in the user latent feature space, and the NNs of user u are weighted according to their similarity $\text{sim}(u, v)$ with user u . Simply take U 's Latent features and count the voting participated of LF.

Combined Neighborhoods:

Hybrid Approach is the combination of UGUV, UUV(m-hop), UVUV, and UNN approaches.

$$\text{Score}_{u,i} = \text{U-G-U-V Score} + \text{U-U-V score} + \text{U-V-U-V Score} + \text{UNN Score};$$

Based on score we forward the vote to users.