

Oct 29

Collaborative Filtering (Netflix)

Each user \equiv a ranking of movies/shows on Netflix

Hypothesis: User A is close to User B if their rankings are close.

Assumption: Each user ranks ALL movies/shows on Netflix.

	User 1	User 2	User 3
①	Maya & the 3	③	① = a_1
②	Great British Baking Show	②	③ = a_2
③	Squid Game	①	② = a_3

Input: A ranking a_1, a_i, a_j, a_n (permutation on $1 \dots n$ def $[n]$)
 (implicit assumption is that $1, \dots, n$ is the "true" ranking)

Output: number of inversion

Def: (i, j) is an inversion if

(1) $i < j$ AND (2) $a_i > a_j$ $\{ (1, 2), (1, 3), (2, 3) \}$

Ex 1: User 2: How many inversions: \rightarrow

$\# \rightarrow$ every pair is an inversion

$\# \text{in } \text{inversions} = \binom{3}{2} = 3$

User 3: $(2, 3)$ is an inversion $\Rightarrow \# \text{inversions} = 1$.

Ex 2: $a = (1, \dots, n)$ $\# \text{inversions} = 0$

a_1, \dots, a_n is sorted $\iff \# \text{inversions} = 0$ \leftarrow Ex.

Ex 3: $a = (n, \dots, 1)$ $\# \text{inversions} = \# \text{pairs} = \frac{n(n-1)}{2}$

$0 \leq \# \text{inversions} \leq \binom{n}{2} = \binom{n}{2}$