Nov 1

Collaborative filtering (Netflix)

Each user ≡ 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 Pain Hustlers	①	② = a_3

Counting inversions

Input: A ranking $a_1, \ldots, a_n$ (permutation of $1 \ldots n$)

(Implicit assumption: $1 \ldots n$ is the "true" ranking)

Output: The number of inversions

Def: (i,j) is an inversion $i, j \in [n]$ ← $\{1, \ldots, n\}$

(1) $i < j$ (2) $a_i > a_j$

Ex 1: User 2: $(a_1, a_2, a_3) = (3, 2, 1)$ (1 2 3)

$(1,3)$ $(1,2)$ $(2,3)$ ← all pairs $i<j$ are inversions

$\#\text{inv} = 3$

User 3: $(a_1, a_2, a_3) = (1, 3, 2)$

Only inversion $(2,3)$ $\#\text{inv} = 1$.

Ex 2: $(a_1, \ldots, a_n) = (1, 2, \ldots n)$ $\#\text{inv} = 0$

[Ex (for home)] $a_1, \ldots, a_n$ are sorted $\equiv$ $\#\text{inv} = 0$

Ex 3: $(a_1, \ldots, a_n) = (n, n-1, \ldots, 1)$ $\#\text{inv} = \#\text{pairs} = \binom{n}{2} = \frac{n(n-1)}{2}$

$0 \le \#\text{inv} \le \binom{n}{2}$ Ex (for home)