April 1

Collaborative Filtering

Each user ≡ a ranking on movies/shows on Netflix

Hypothesis: user 1 is 'close to' user 2 if user 1's ranking is close to user 2's ranking.

Assumption: Each user ranks all movies/shows.

Mike	Ron
1. The Office	1. Parks&Rec
2. Parks & Rec	2. The Office
3. Arrested Dev.	3. Portlandia

Input: A ranking $a_1, \ldots, a_n$ (permutation on $\{1, \ldots n\}$)

Output: Number of inversions

ex. 1 3 2

(3, 2) is an inversion

Recall: (i, j) is an inversion

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

Ex 1. $a = (1, \ldots, n)$; # inversions = 0

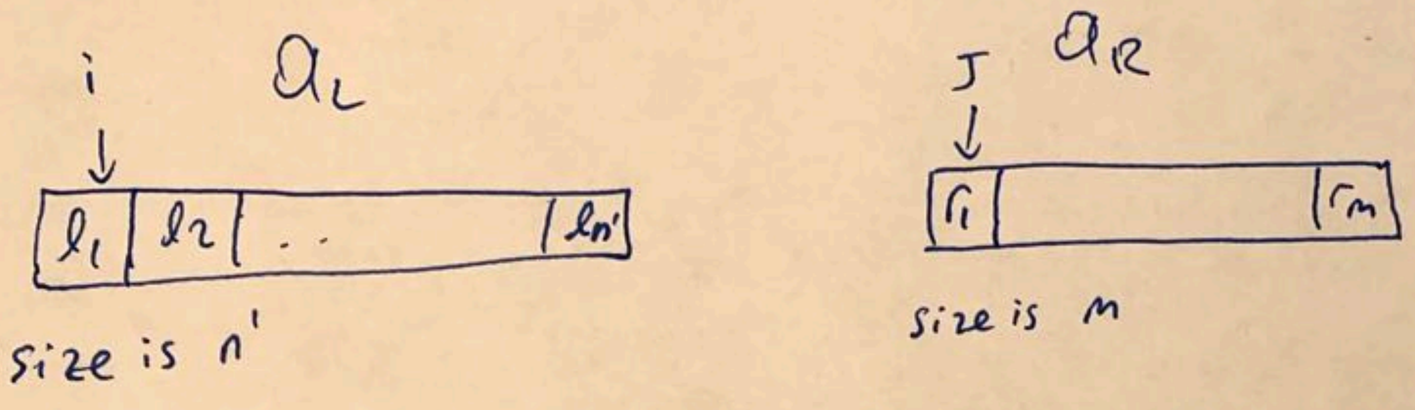
all pairs are NOT inversions

(if $i < j$; $a_i = i$, $a_j = j$)

Ex. 2 $a = (n, n-1, \ldots, 1)$; # inversions $= \binom{n}{2} = \frac{n \cdot (n-1)}{2}$

all pairs are inversions.

General 'bad case'



Assume a_L is sorted and a_R is sorted.

Goal:

Count # pairs (i,j)

$1 \le i \le n'$

$1 \le J \le m$

s.t. $l_i > r_J$

Merge Count (a_L, a_R)

```
0. c = 0
1. i = 1, J = 1
2. while i ≤ n' AND J ≤ m
       if l_i < r_J
           i++
       else
           c += (n' - i + 1)
           J++
3. return c
```