Recommender Systems

Content Based

- Featurize users & items
- Regression / classification

Users → [boxes] — gender, weight, age, group, language

8 - Features

Items → [boxes] — lang, genre, director, length, duration

12 Features

Collaborative

→ Similarity Based Algorithms

- User - User Similarity
- Item - Item Similarity

5 users 10 movies

← Features → | Target Rating

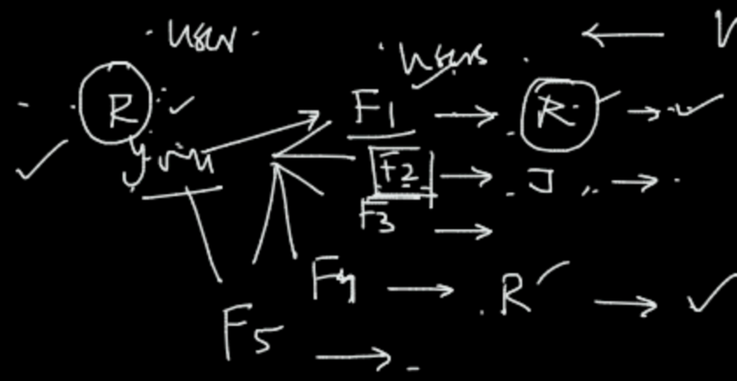
	Features	Target Rating	
U_1M_1 =	M 32 I En . . E thr – – – – –	4.5	1
U_1M_2 =	, , , , – – – – – – –	2.0	0
U_1M_3 =		.	1
U_2M_1		.	1
U_2M_2		.	.
U_5M_{10}		3.5	.

M_{11} →

		Rating	
U_1M_{11}		3.0	0
U_2M_{11}		4.5	1
U_3M_{11}		2.0	0
U_4M_{11}		4.0	1
U_5M_{11}		1.5	0

U_6 =

U_6M_1	– – .	4.0
U_6M_2		
U_6M_{10}		4.5



← User - user similarity →

Find friends who are III^y to you
F1 F4

Movies F1 & F4

you ↵

Find users who have ratings similar to you for items

5 users →

↓ →

User = 100

1. Find users who are III^y to user 100
(Based on Ratings)

u_{33}, u_{74}

2. Find movies highly rated by u_{33} & u_{74}

M_1 M_7 M_1 M_{19}

3. Recommend M_1 M_7 M_{19} to user 100

← Item-Item Similarity →.

— Find items like to each other.

Harry potter → Magic related movies

User → Iw.

1. Find items highly rated by user Iw.

M_1 M_2

2. Find movies which are similar to M_1 & M_2 based on ratings

M_5 M_7 M_{11} M_{12}

3 Recommend M_5, M_7, M_{11}, M_{12} to user Iw

User – user similarity.

$$X = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ \vdots \\ u_n \end{array} \begin{array}{c} \begin{array}{cccccc} I_1 & I_2 & I_3 & \cdots & I_m \end{array} \\ \begin{bmatrix} R_{11} & R_{12} & R_{13} & \cdots & R_{1m} \\ R_{21} & R_{22} & R_{23} & \cdots & R_{2m} \\ - & - & - & \cdots & - \\ & & & & \\ R_{n1} & R_{n2} & R_{n3} & & R_{nm} \end{bmatrix} \end{array}$$

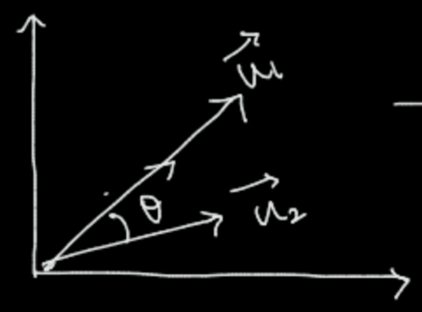
$10M \times 1M$

→ Sparse Matrix

→ Matrix Completion Problem

— Find column corresponding to the max rating given by User 3

$$\vec{u_1} = \begin{bmatrix} R_{11} \\ R_{12} \\ R_{13} \\ \vdots \\ R_{1M} \end{bmatrix} \qquad \vec{u_2} = \begin{bmatrix} R_{21} \\ R_{22} \\ R_{23} \\ \vdots \\ R_{2M} \end{bmatrix}$$



→ Cosine similarity

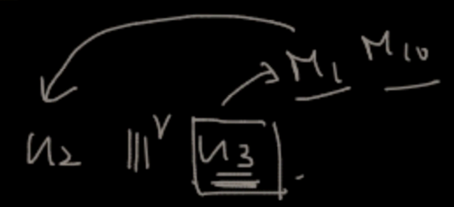
$\theta = 0$; 1 → Exactly similar

$\theta \to$ large → Very dissimilar.

User similarity matrix.

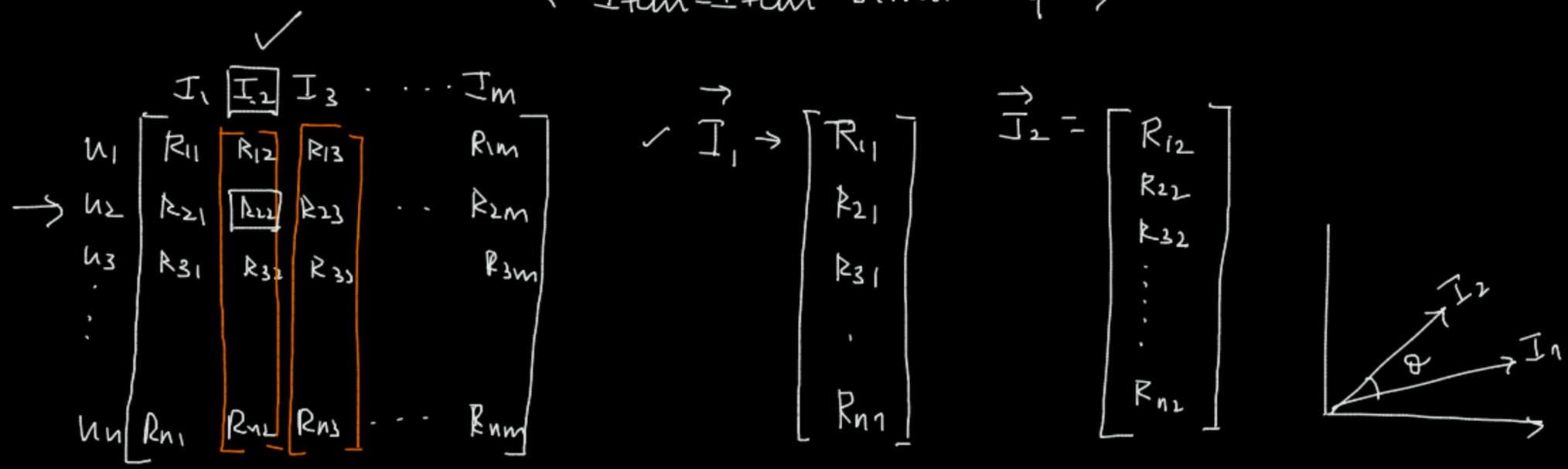
	u_1	u_2	u_3	u_4	
u_1	~~1.0~~	0.87	0.15	0.34	←
u_2	0.87	~~1.0~~	0.94	0.37	→ max,
u_3	0.15	0.94	~~1.0~~	0.73	
u_n	[			0]	

User 2.

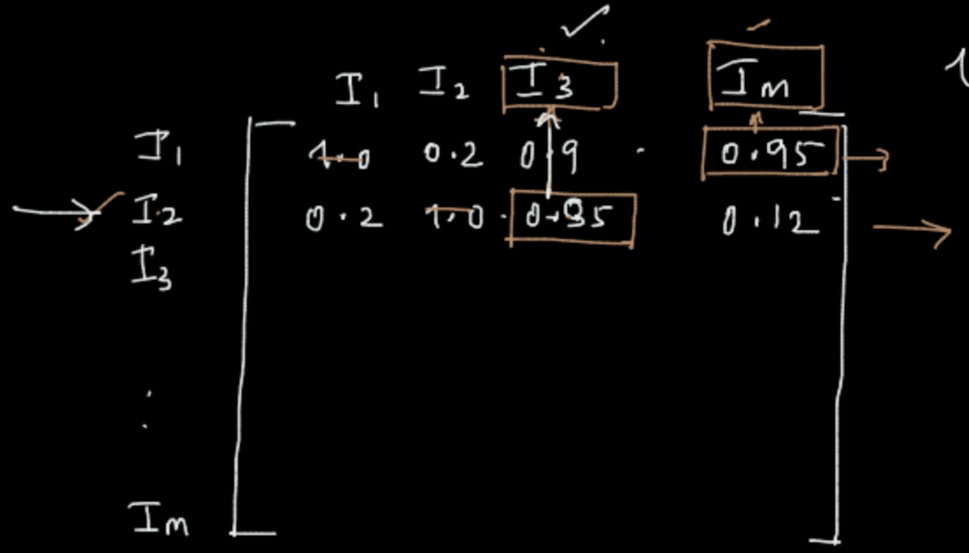


Column Value corresponding to the highest similarity in the u_2 row.

← Item-Item similarity →



1. Most popular movies
2. ...
   ↳ .



1. Find items highly rated by user 2

1. user specific products → ✓ No search reqd — 5

2. products Similar to Searched → . . . — 3

3. popular items — 2

10:45 am