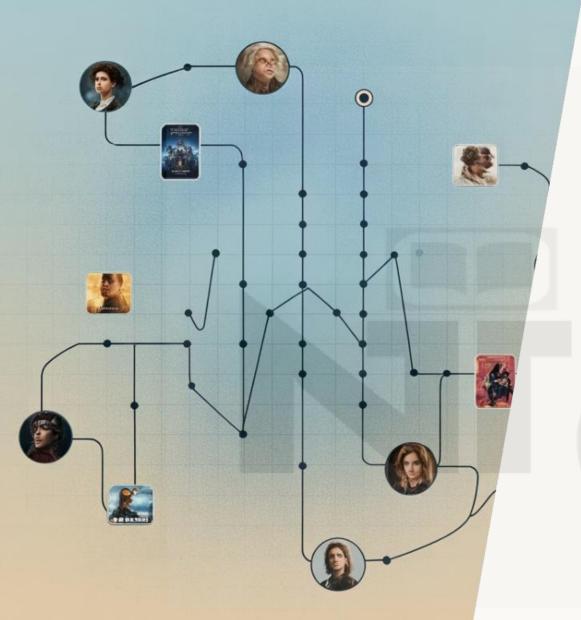


Log Out

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User-Based Collaborative Filtering

Step-by-step approach to predict user preferences based on similar users' ratings

MUKESH KUMAR

What is User-Based Collaborative Filtering?

Definition

Recommends items based on similar users' preferences

Benefits

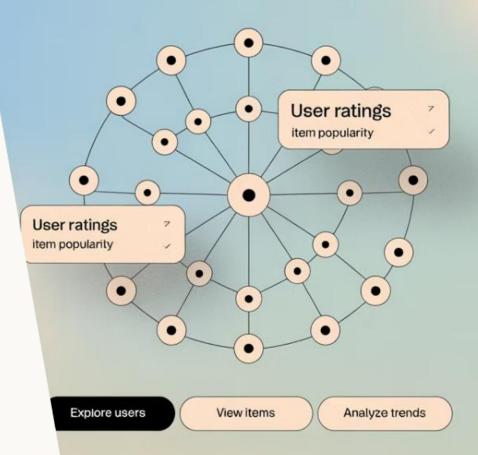
Discovers unexpected items users might enjoy

Applications

Movies, products, music, and content recommendations

Dadbder liting

uisesor retiewvertings



Our Example Setup



4 Movies

Movies A, B, C, and D



2 Users

User 1 and User 2 with ratings



Goal

Predict next movie for User 1



	8.77	-	8.37	Aoo	-	7.00	-	832	_	5.12	Λοο	8.1.0	Roo	3.57	Assin
Pont	6.59	-	8.32	Ana	-	3.10	-	834	-	4.38	Bos	3.38	Pan	4.85	Arras
Paint	8.30	-	8.16	App		(SE				0.10	Pop	6.56	Ans	6.80	Ami
Dod	4.38	-	8.50	Aan	Plinto				-	7.38	Aco	6.50	Ann	8.53	Actro
Daw	4.88	-	8.38	Rom	The same		range S		-	4.18	Pas	6.38	Ann	5.58	Paxo
Pem	8.28	-	0.18	Para			-	6.10	-	0.38	Hos	0.58	Acc	8.55	7 etast
										7.00	Dox	600	Van	730	kons

User-Item Rating Matrix

User / Movie	Movie A	Movie B	Movie C	Movie D
User 1	5	3	0	0
User 2	4	0	4	2

Step 1: Compute User Vectors Vectors



Identify vectors

Extract ratings as numerical arrays



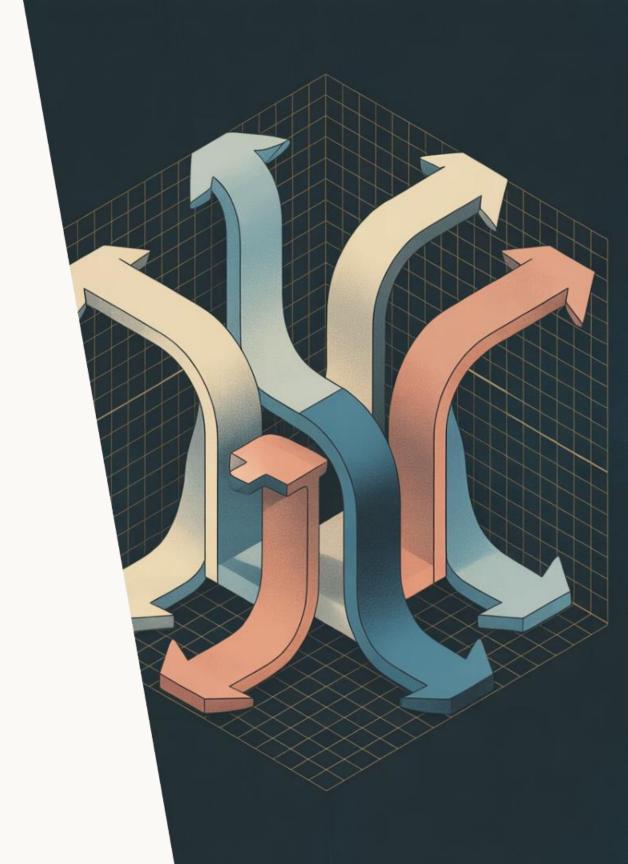
User 1 vector

[5, 3, 0, 0]



User 2 vector

[4, 0, 4, 2]



USER VECTOR A "006" **USER VECTOR B**

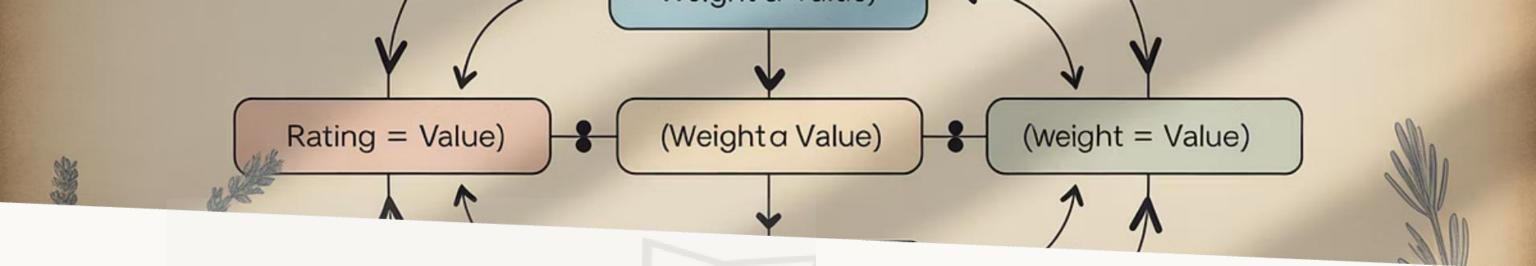
Step 2: Calculate Similarity

Formula:

$$\operatorname{cosine}(U_1,U_2) = rac{U_1 \cdot U_2}{||U_1|| imes ||U_2||}$$

Calculation:

$$egin{aligned} U_1 \cdot U_2 &= (5 imes 4) + (3 imes 0) + (0 imes 4) + (0 imes 2) = 20 \ &||U_1|| &= \sqrt{5^2 + 3^2 + 0 + 0} = \sqrt{34} pprox 5.83 \ &||U_2|| &= \sqrt{4^2 + 0 + 4^2 + 2^2} = \sqrt{16 + 0 + 16 + 4} = \sqrt{36} = 6 \ & \cos (U_1, U_2) = rac{20}{5.83 imes 6} pprox rac{20}{34.98} pprox 0.572 \end{aligned}$$



Step 3: Predict Ratings

Use similarity-weighted sum of ratings from similar users (only User 2 here):

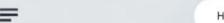
$$ext{PredictedRating}_{U1,MovieX} = rac{\sum_{ ext{neighbors}} ext{Similarity}(U1,U_i) imes ext{Rating}(U_i,MovieX)}{\sum_{ ext{neighbors}} ext{Similarity}(U1,U_i)}$$

• For Movie C:

$$\frac{0.572 \times 4}{0.572} = 4$$

• For Movie D:

$$rac{0.572 imes 2}{0.572} = 2$$



ne MyList S

Settin





Movie C

Reloted wichtenalog Cathy tecomedicatheline Merchoda. BOIBC Petalitt of liostrict Mistration Ster alotiers E Cigaratisc Chara Mifosia and LIFP MISOlee S.123. BA Sevineeric gentrecT, C Chosentice Inferior sociotesent countries countriciscom Ree ITA Odirov. Food bandoo of chi Mally, Douvried V Referendineed Intalia foe onyclasticoccupa five fightenare didination to Rotiesine VI Bumulti ofacistoracifol Meo boiliny Haing and VIMEAGlect. CE Beelman DD Midt Blace etic

Final Recommendation

4.0

2.0

Movie C Rating

Highest predicted score

Movie D Rating

Lower predicted interest

1

Final Pick

Recommend Movie C to User 1



