

Embeddings: Vector & Semantic Search

Applications | Concepts | Examples

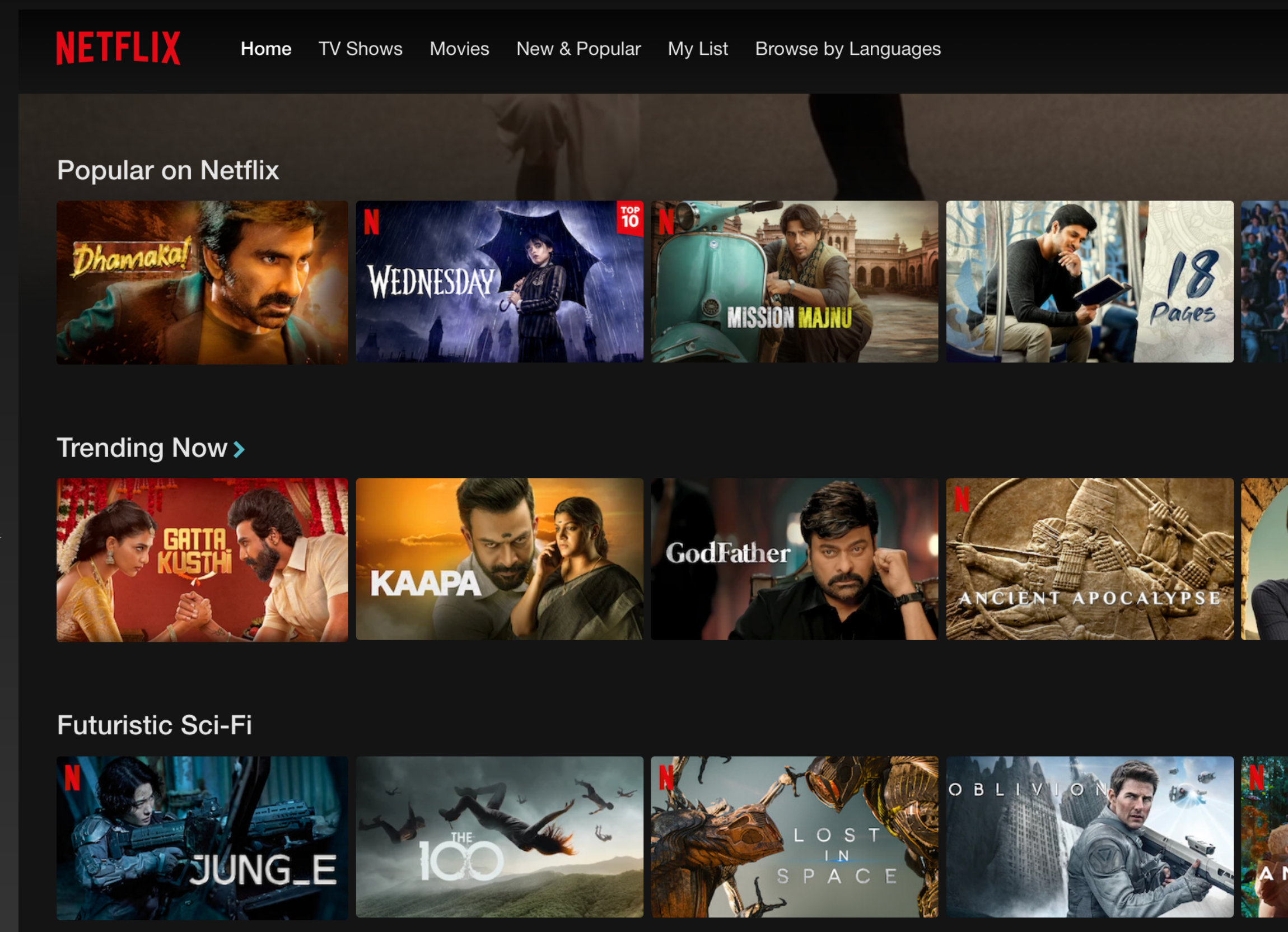
Today's Lecture

1. Introduction and Motivation

2. Semantic Search

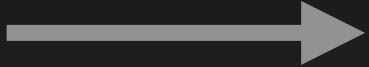
Netflix Recommendations

**MULTIPLE
CAROUSELS**

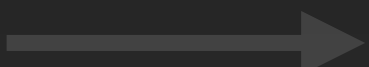


Netflix Recommendations

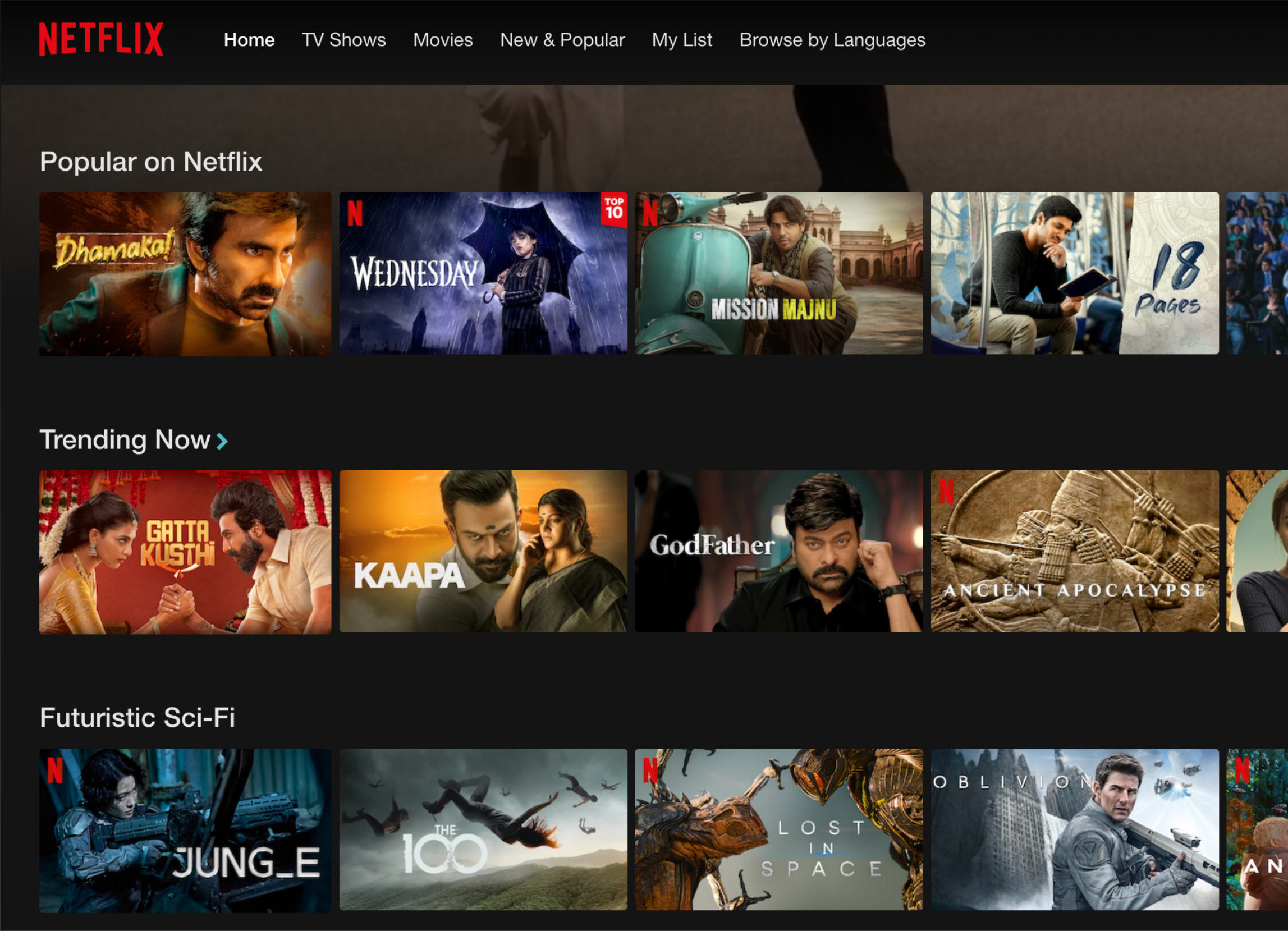
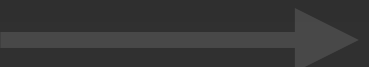
POPULAR yet
PERSONALIZED



PERSONALIZED
TRENDS



PERSONALIZED
GENRE



Netflix Million Dollar Prize!

NETFLIX				
Netflix Prize				
Home	Rules	Leaderboard	Register	Update
Submit	Download			
Leaderboard		Display top 40 leaders.		
Rank	Team Name	Best Score	% Improvement	Last Submit Time
--	No Grand Prize candidates yet	--	--	--
Grand Prize - RMSE $\leq$ 0.8563				
1	PragmaticTheory	0.8584	9.78	2009-06-16 01:04:47
2	BellKor in BigChaos	0.8590	9.71	2009-05-13 08:14:09
3	Grand Prize Team	0.8593	9.68	2009-06-12 08:20:24
4	Dace	0.8604	9.56	2009-04-22 05:57:03
5	BigChaos	0.8613	9.47	2009-06-15 18:03:55
Progress Prize 2008 - RMSE = 0.8616 - Winning Team: BellKor in BigChaos				
6	BellKor	0.8620	9.40	2009-06-17 13:41:48
7	Gravity	0.8634	9.25	2009-04-22 18:31:32
8	Opera Solutions	0.8640	9.19	2009-06-09 22:24:53
9	xlvector	0.8640	9.19	2009-06-17 12:47:27
10	BruceDengDaoCiYiYou	0.8641	9.18	2009-06-02 17:08:31
11	Ces</			

Collaborative Filtering

Rishi

Michael

Karthik

Roshin

Amy

Collaborative Filtering



Avatar



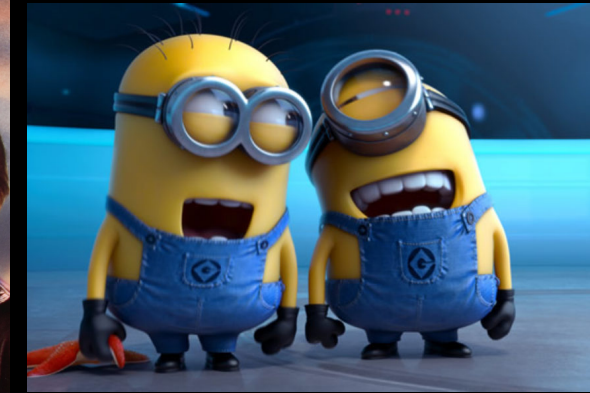
Arrival



When Harry



Before Sunrise



Minions

Rishi

Michael

Karthik

Roshin

Amy

Collaborative Filtering



Avatar



Arrival



When Harry

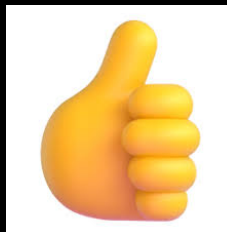
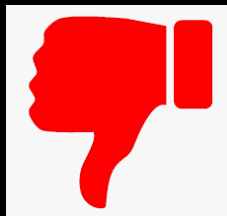
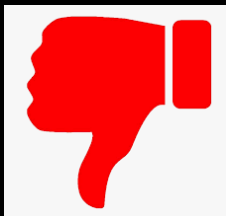
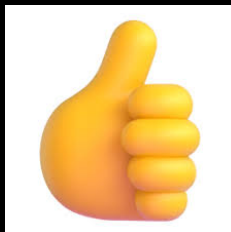
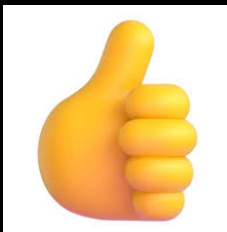


Before Sunrise

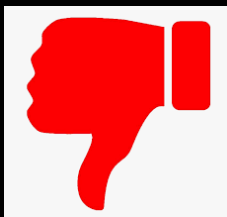


Minions

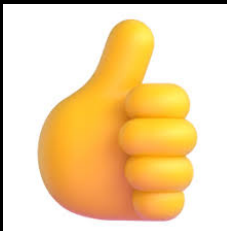
Rishi



Michael

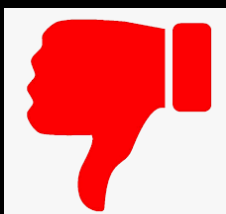
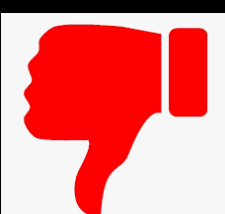
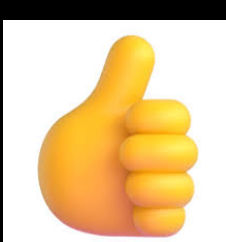
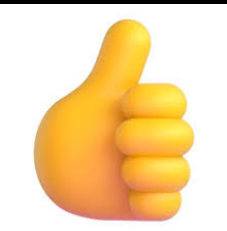
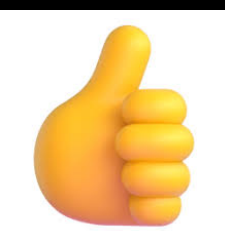
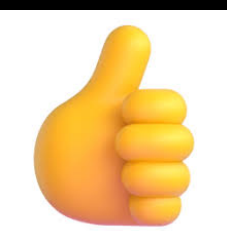
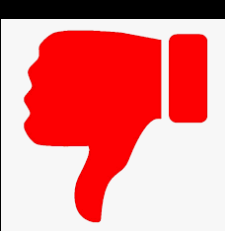


Karthik



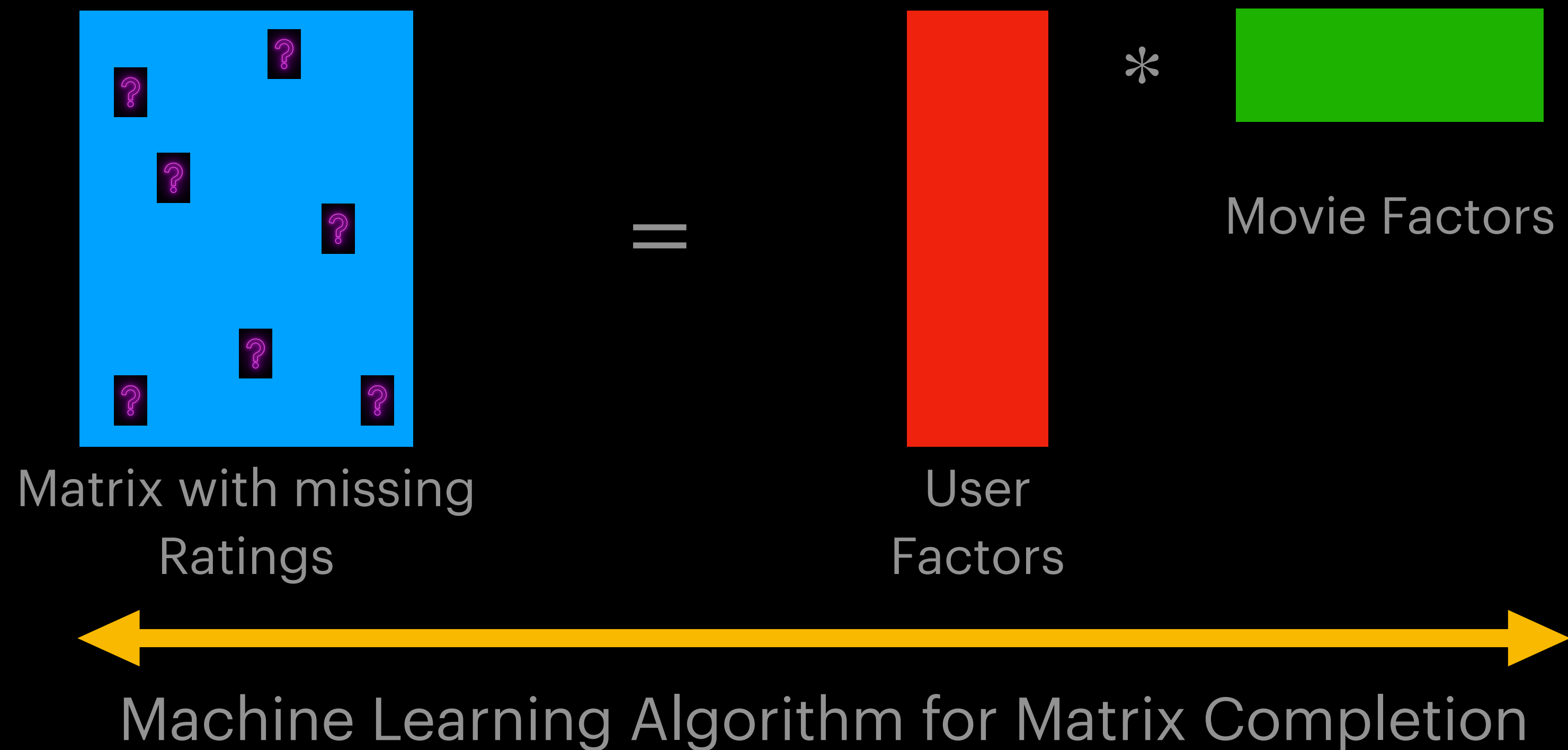
Collaborative Filtering

Through Matrix Completion!

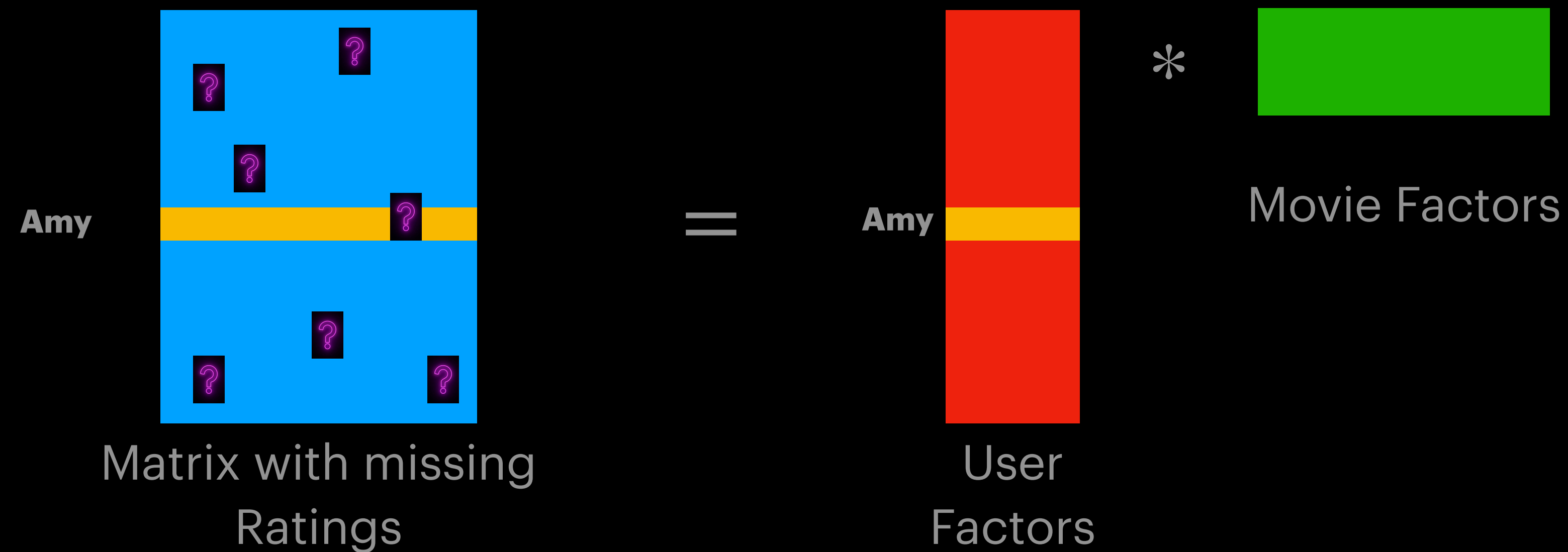
Collaborative Filtering

Through Matrix Completion!



Collaborative Filtering

Through Matrix Completion!



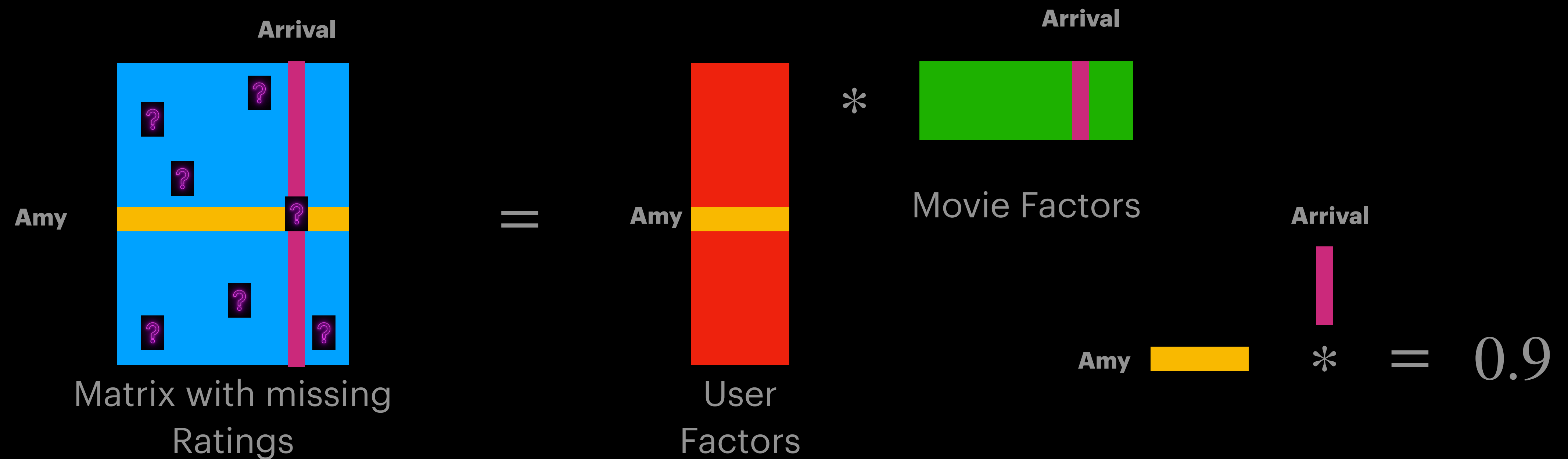
Collaborative Filtering

Through Matrix Completion!



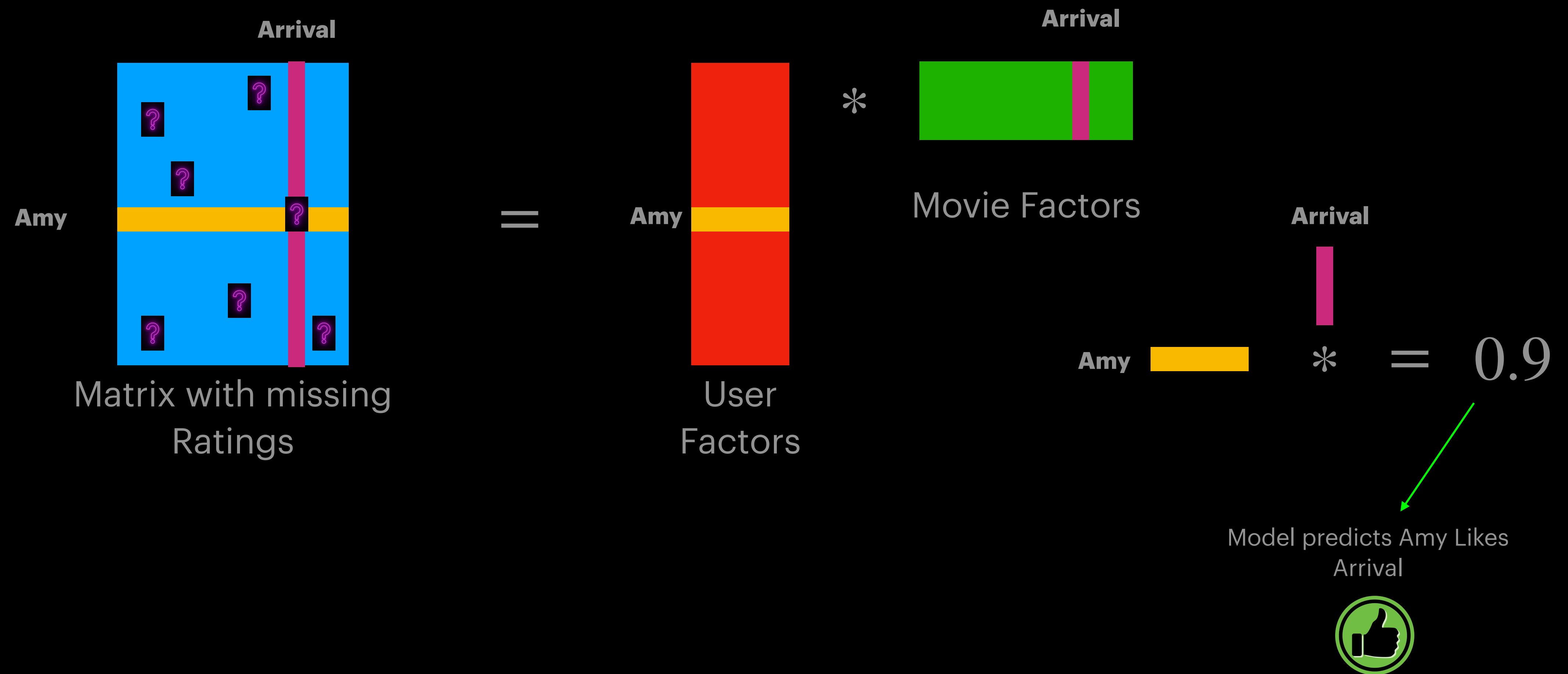
Collaborative Filtering

Through Matrix Completion!



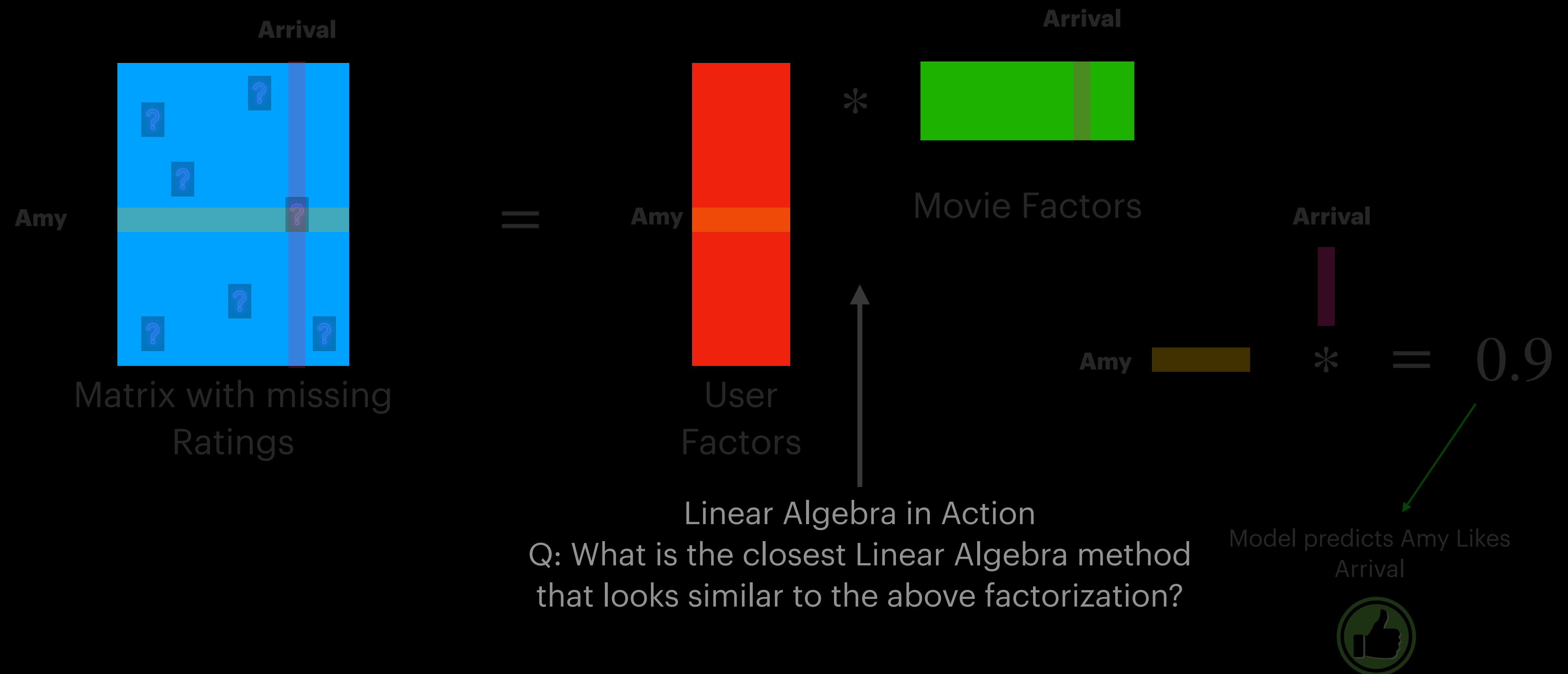
Collaborative Filtering

Through Matrix Completion!



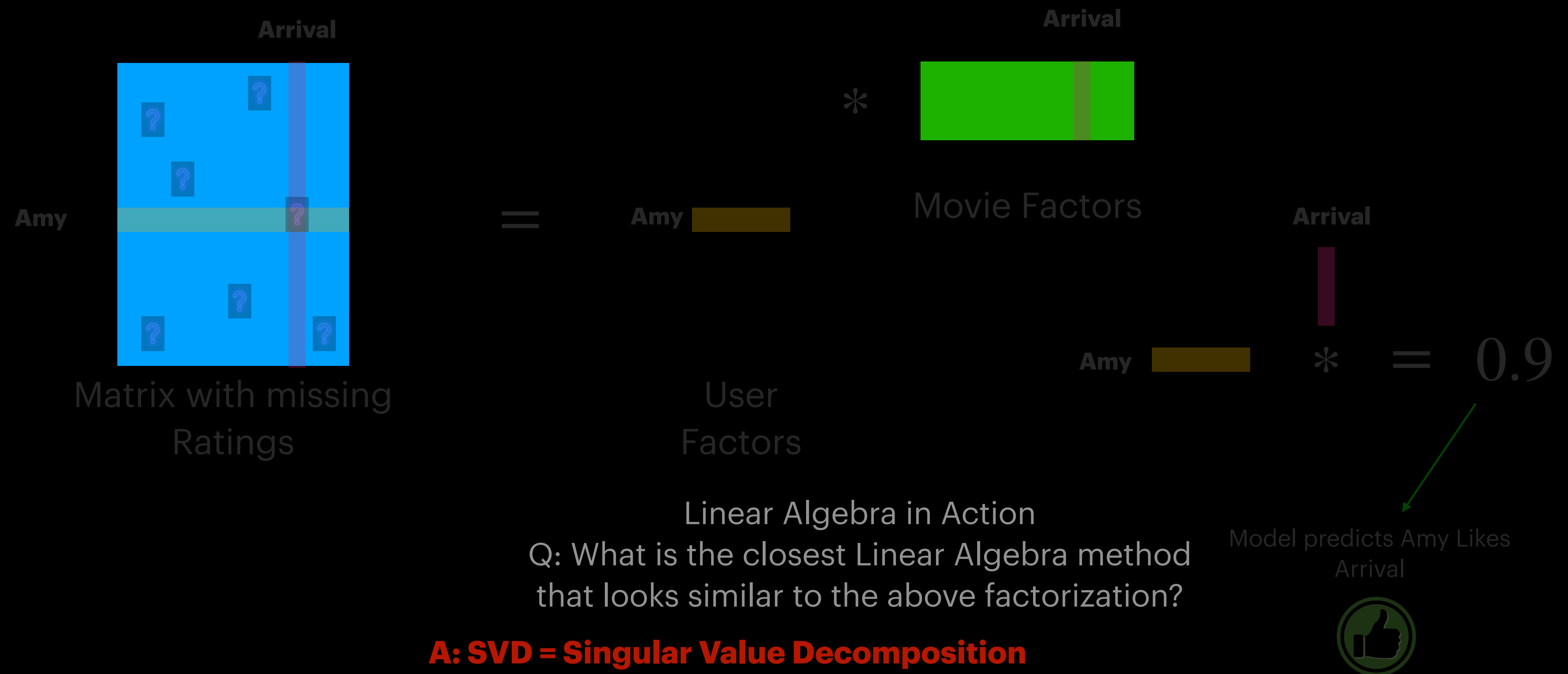
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Through Matrix Completion!

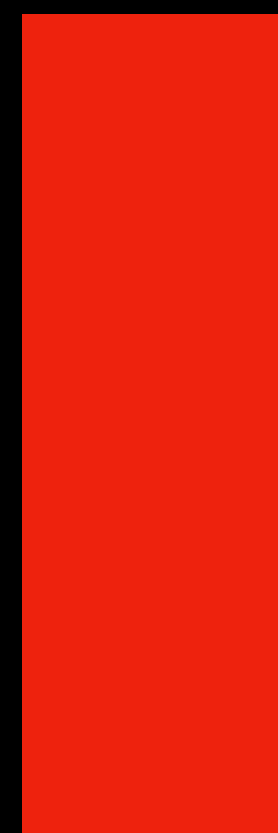


Collaborative Filtering

Through Matrix Completion!



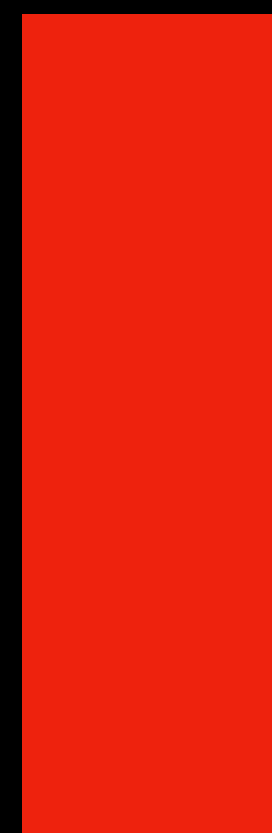
SVD of a matrix



SVD of a matrix



X



U



Sigma



V^T

SVD of a matrix



X



U



Sigma



V^T

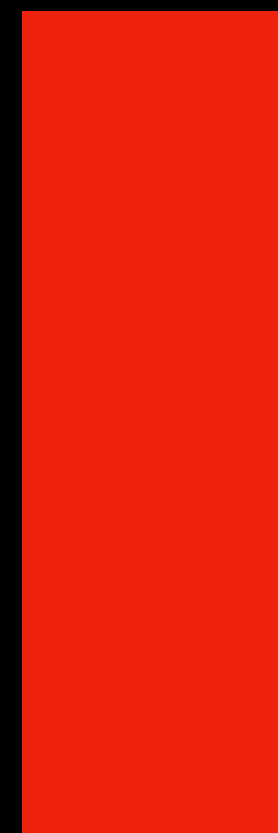
$$X = U\Sigma V^T$$

SVD of a matrix

Every matrix has an SVD!



X



U



Sigma



V^T

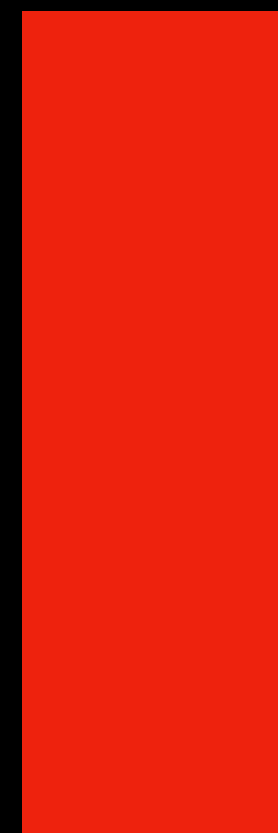
$$X = U\Sigma V^T$$

SVD of a matrix

Hence: Data Matrix also has an SVD!



X



U



Sigma

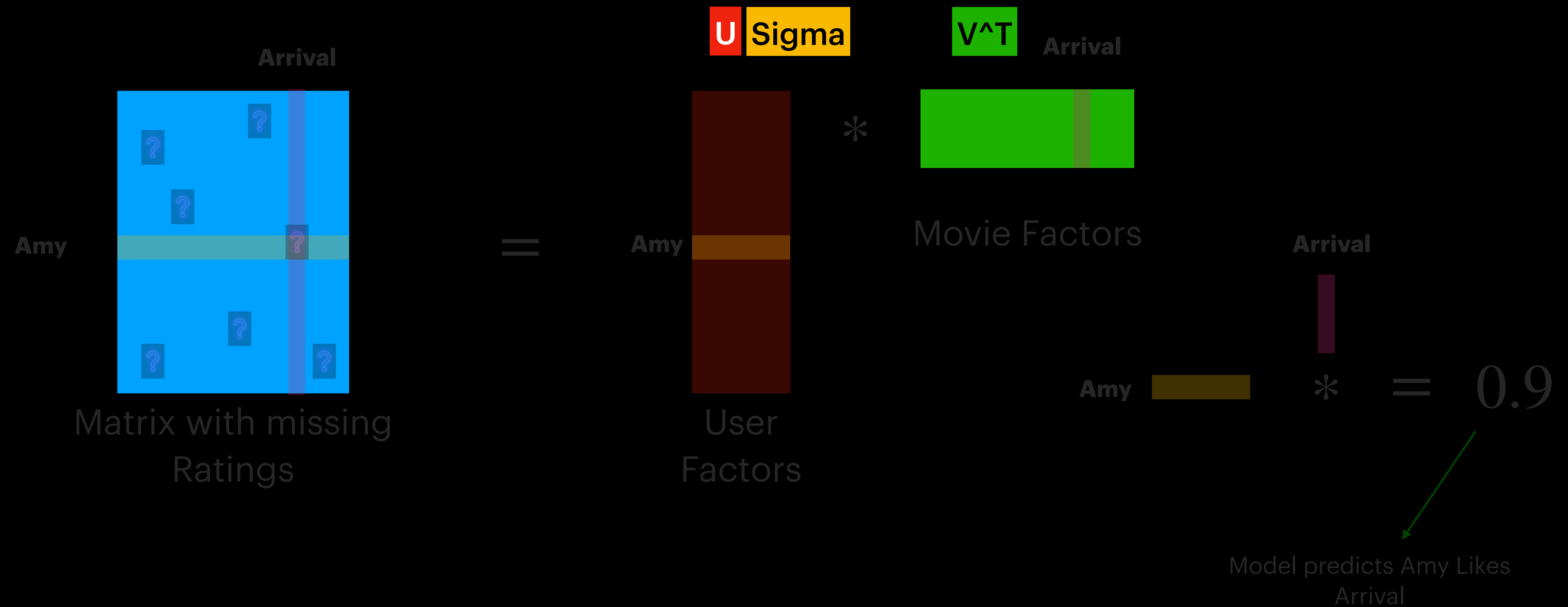


V^T

$$X = U\Sigma V^T$$

Collaborative Filtering

Through Matrix Completion!



Collaborative Filtering: Advanced SVD method or Iterative SVD method



Cauchy-Schwarz Inequality!

$$-1 \leq \text{CosineSimilarity}(x, y) = \frac{x^T y}{||x|| ||y||} \leq 1$$

Cauchy-Schwarz Inequality!

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$$|x^T y| \leq ||x|| ||y||$$

