Improving the Quality of Top-N Recommendation

Modern Approaches with a special focus on Similar Users/Items

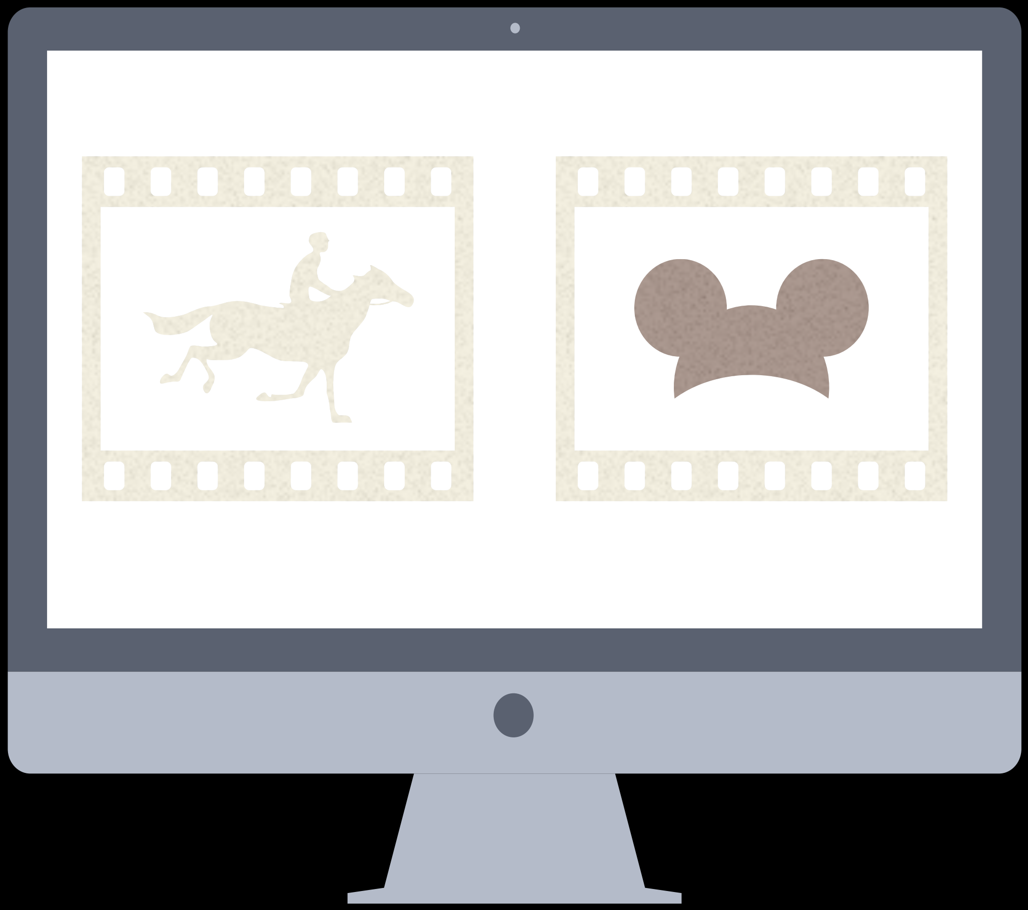
“Average users spend 18 mins browsing before selecting what program to watch. ”

Reelgood and Learndipity Data Insights. Wire 2016

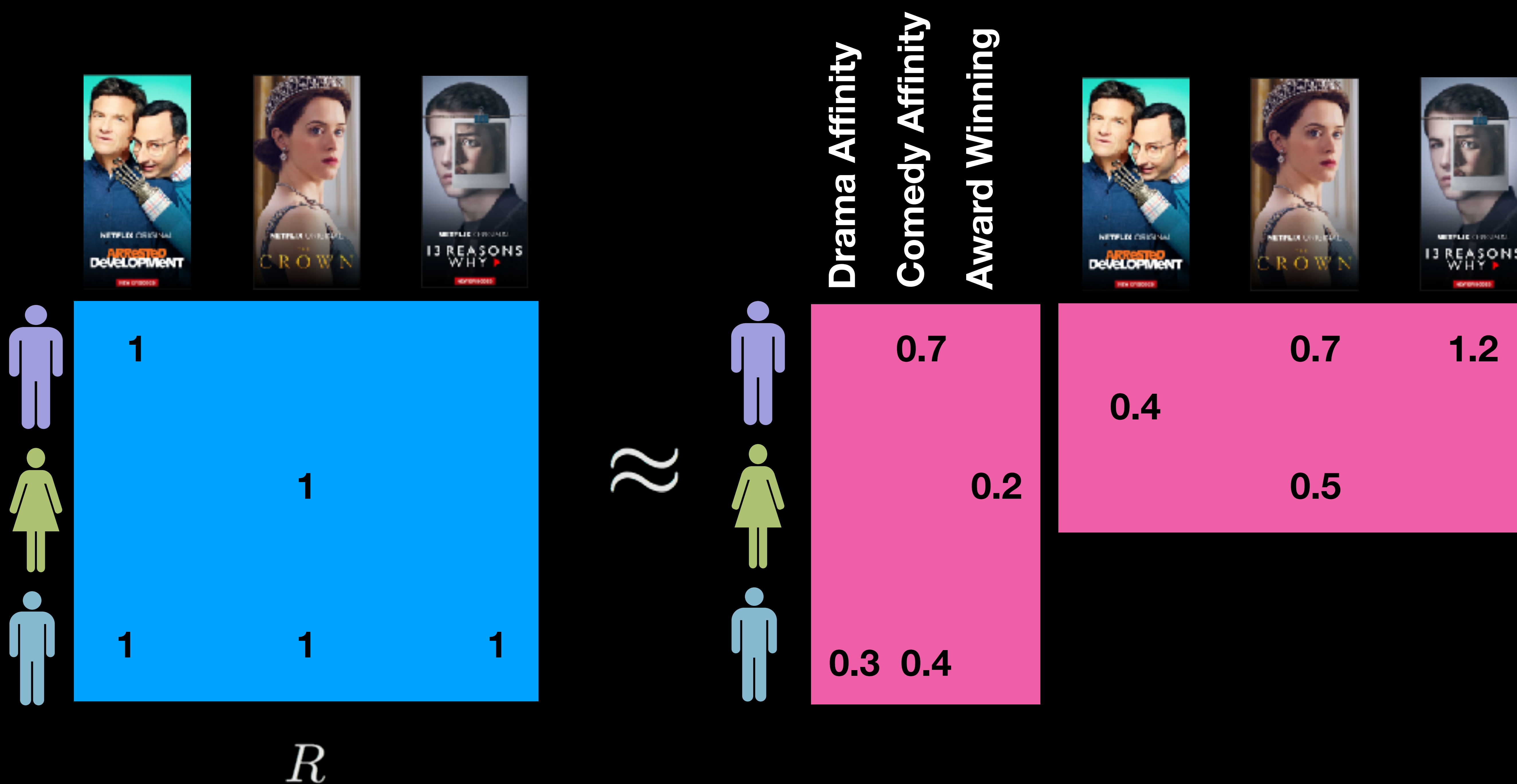
“Users spend 51 mins a day looking for something to entertain them. ”

Ericsson Consumer Lab Media Report 2017

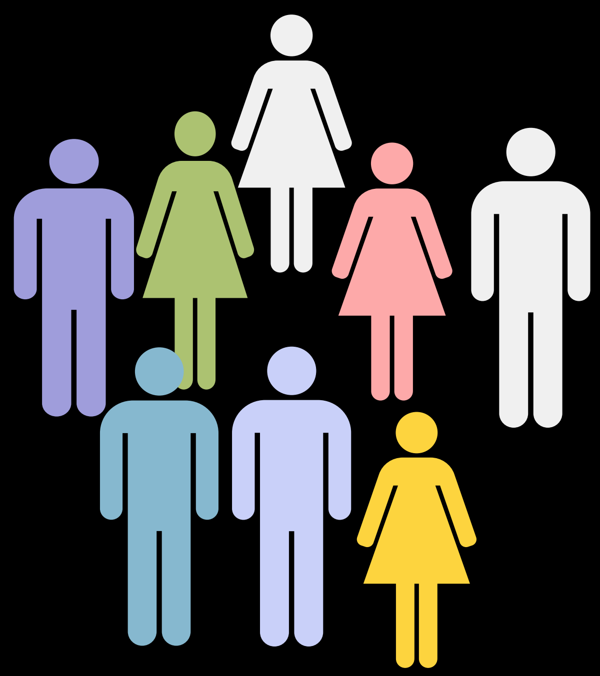
The art of recommendation



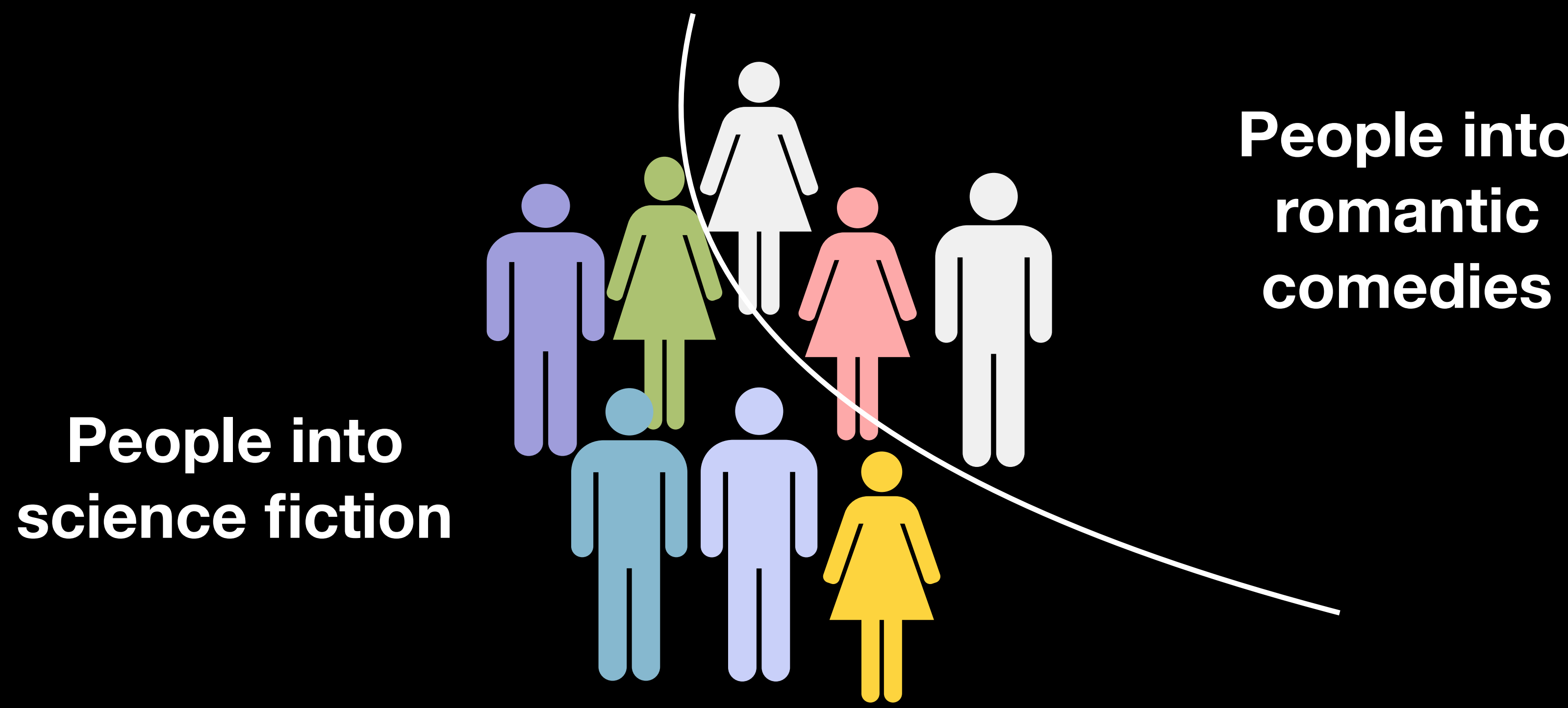
Latent Space Approaches



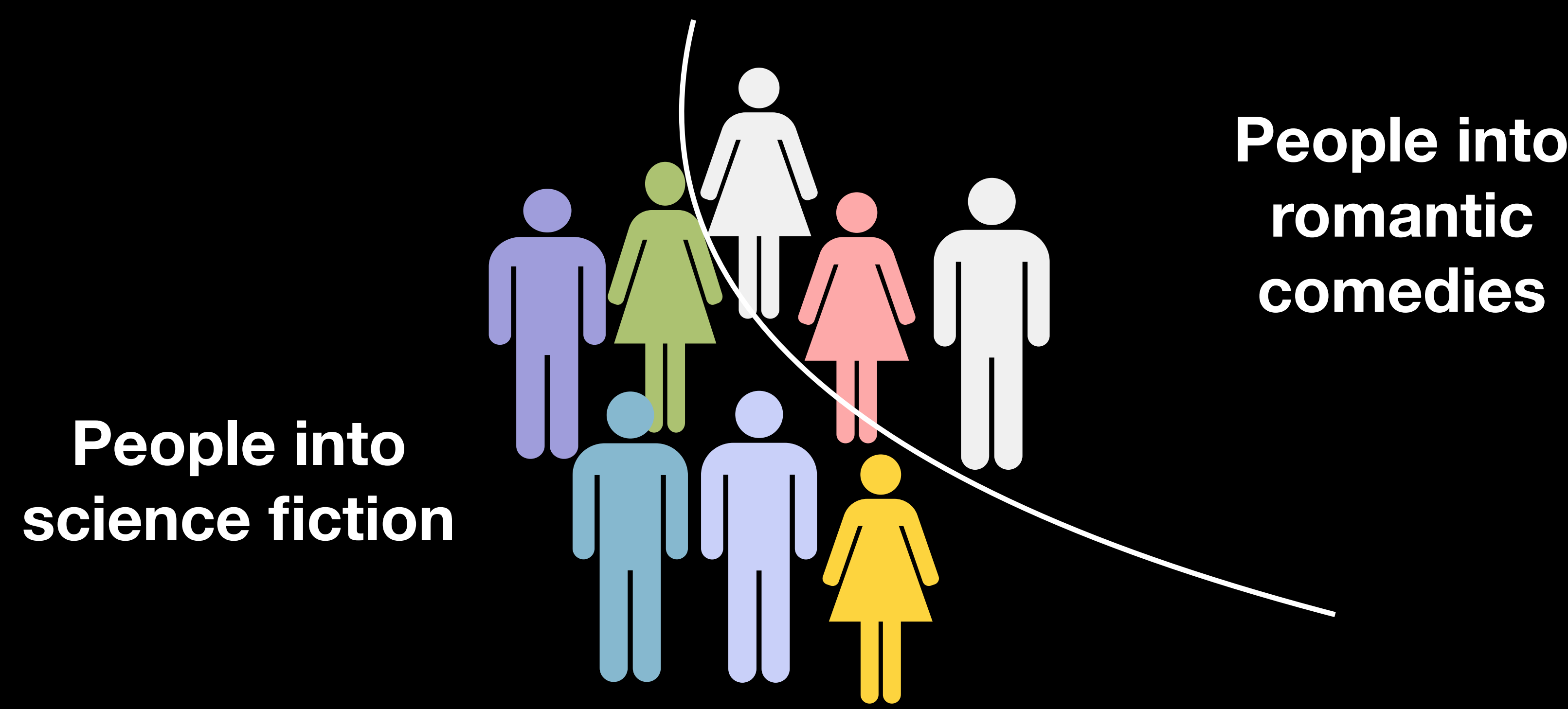
Star Wars vs Star Trek



Star Wars vs Star Trek

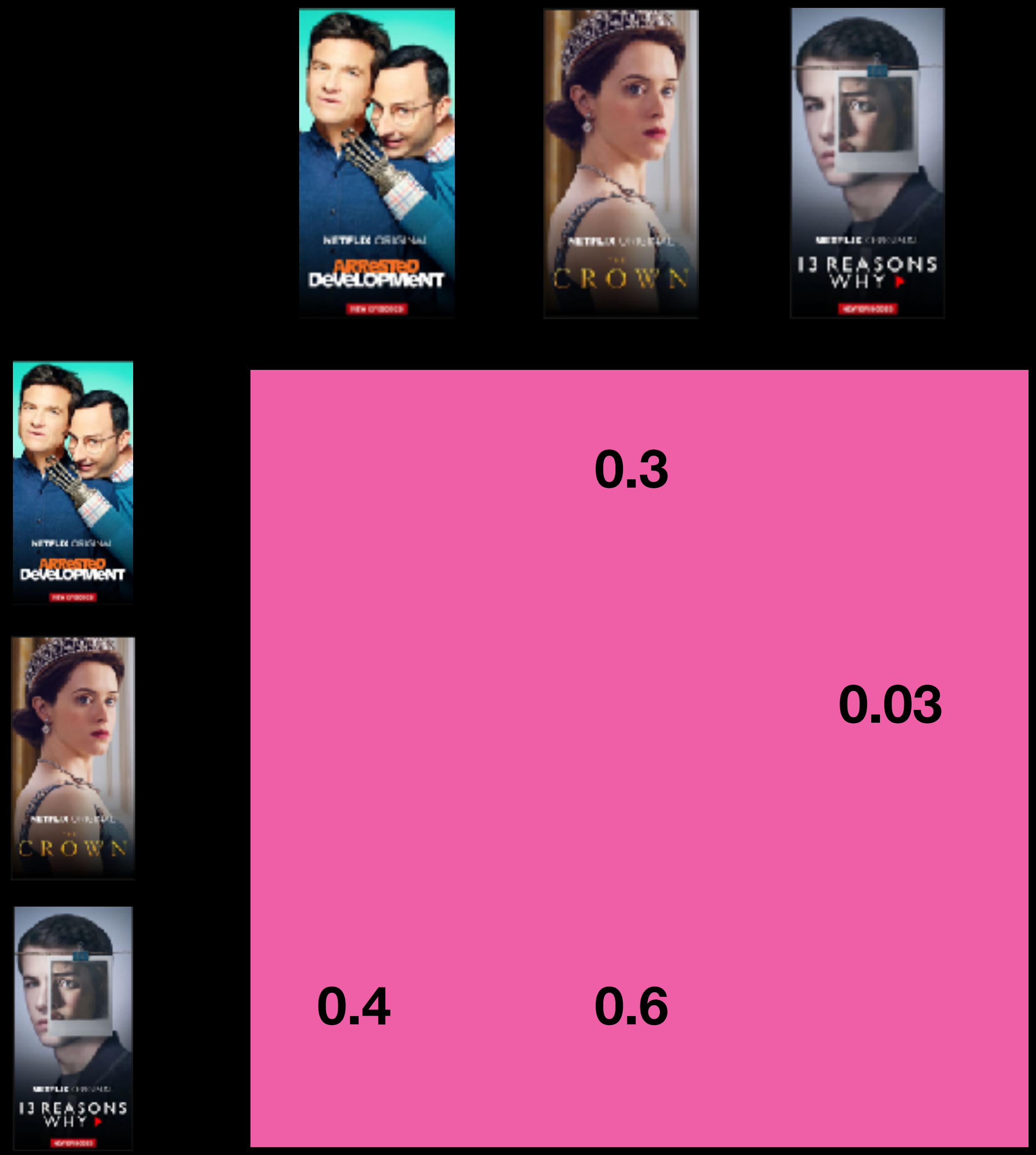


Star Wars vs Star Trek



Would this be solved by just increasing the number of latent factors?

Item-item Approaches



Are two items similar?

1	1	1	1	1		
	1	1	1	1		
1	1		1			
1	1	1		1		
1	1	1			1	1
	1	1			1	1
1	1					1

Are two items similar?

1	1	1	1	1		
	1	1	1	1		
1	1		1			
1	1	1		1		
1	1	1			1	1
	1	1			1	1
1	1					1

Are two items similar?

1	1	1	1	1		
	1	1	1	1		
1	1		1			
1	1	1		1		
1	1	1			1	1
	1	1			1	1
1	1					1

Are two items similar?

1	1	1	1	1		
	1	1	1	1		
1	1		1			
1	1	1		1		
1	1	1			1	1
	1	1			1	1
1	1					1

Are two items similar?

1	1	1	1	1		
	1	1	1	1		
1	1		1			
1	1	1		1		
1	1	1			1	1
	1	1			1	1
1	1					1

Are two items similar?

1	1	1	1	1		
	1	1	1	1		
1	1		1			
1	1	1		1		
1	1	1			1	1
	1	1			1	1
1	1					1

Are two items similar?

1	1	1	1	1		
	1	1	1	1		
1	1		1			
1	1	1		1		
1	1	1			1	1
	1	1			1	1
1	1					1

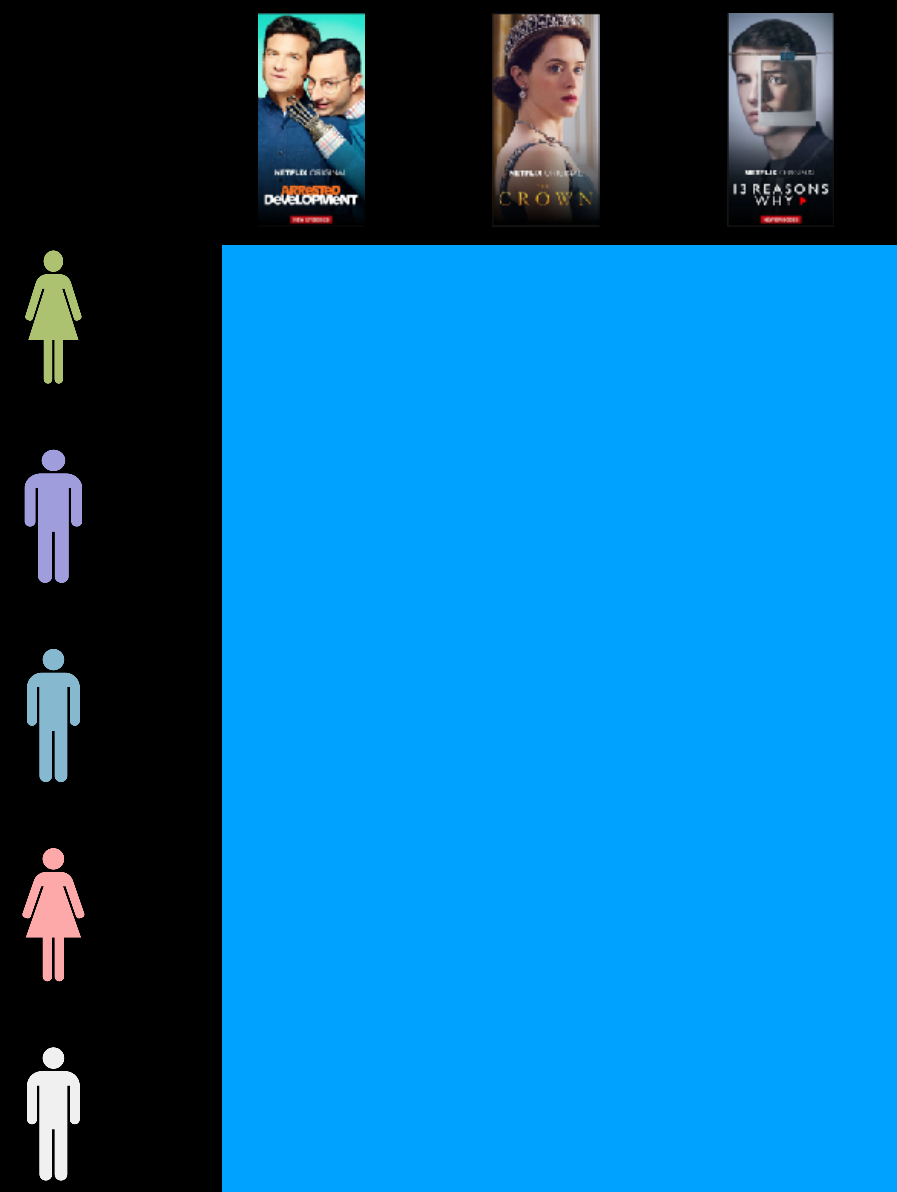
Are two items similar?

1	1	1	1	1		
	1	1	1	1		
1	1		1			
1	1	1		1		
1	1	1			1	1
	1	1			1	1
1	1					1

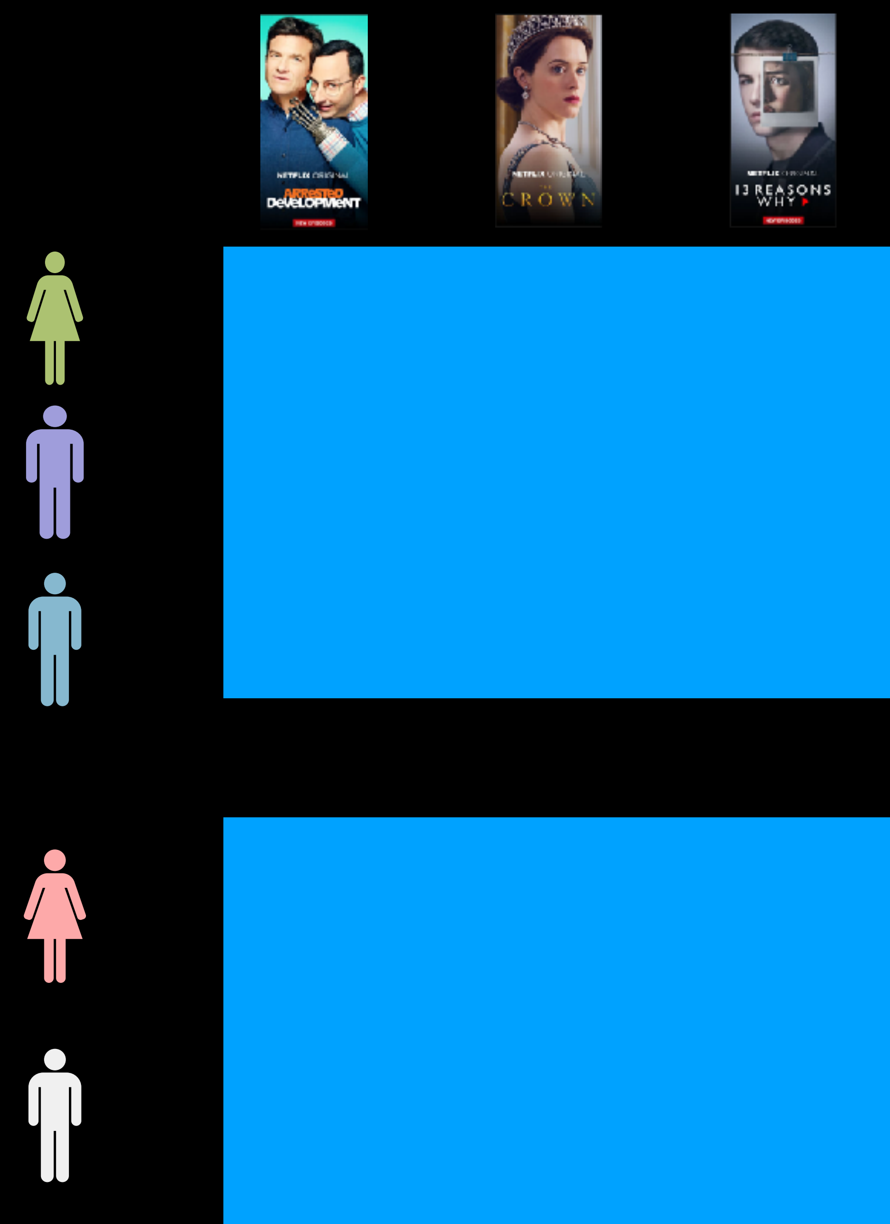
Are two items similar?

1	1	1	1	1		
	1	1	1	1		
1	1		1			
1	1	1		1		
1	1	1			1	1
	1	1			1	1
1	1					1

Global & Local Approaches

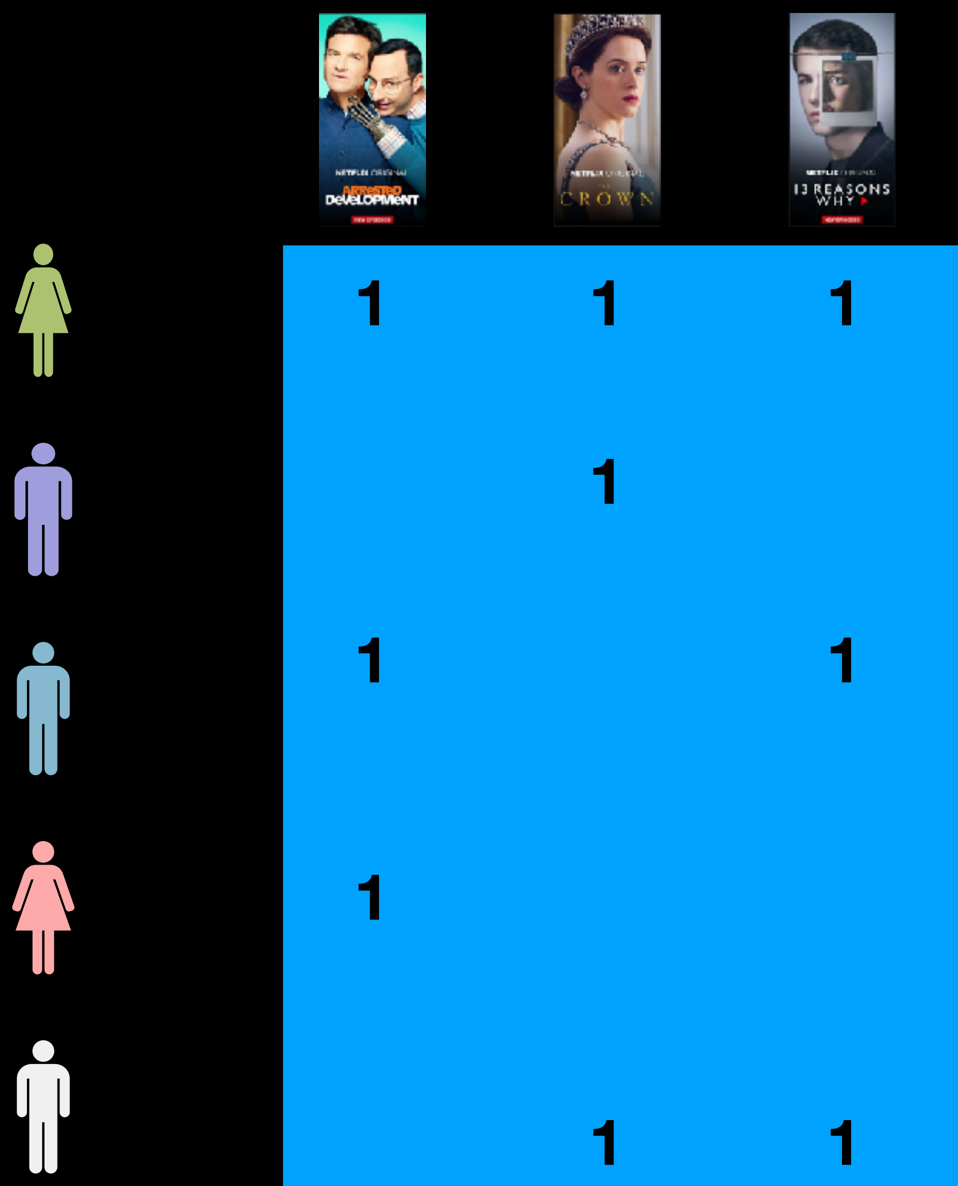


Global

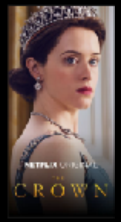


Local

Global & Local SVD with varying Ranks

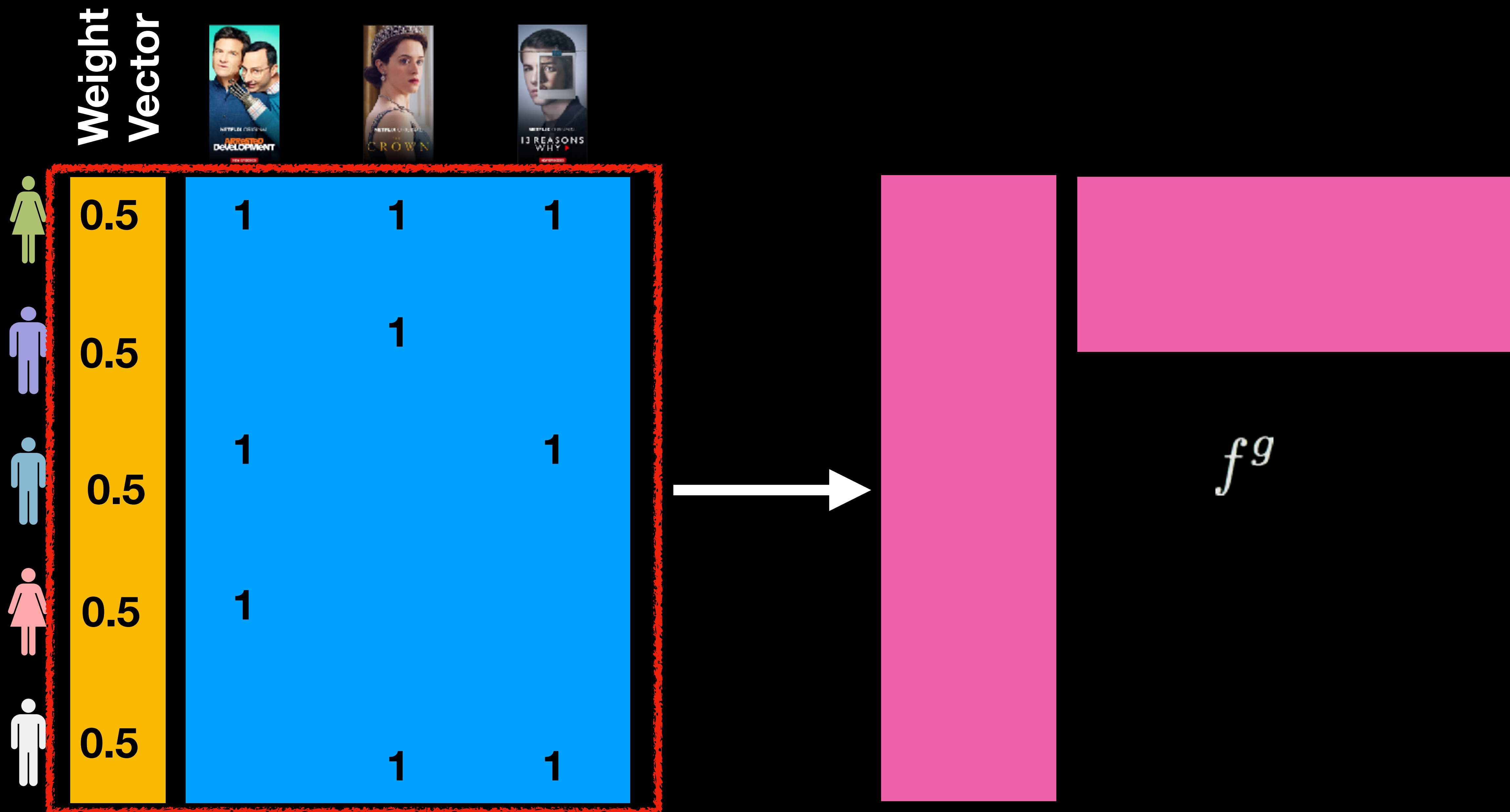


Global & Local SVD with varying Ranks

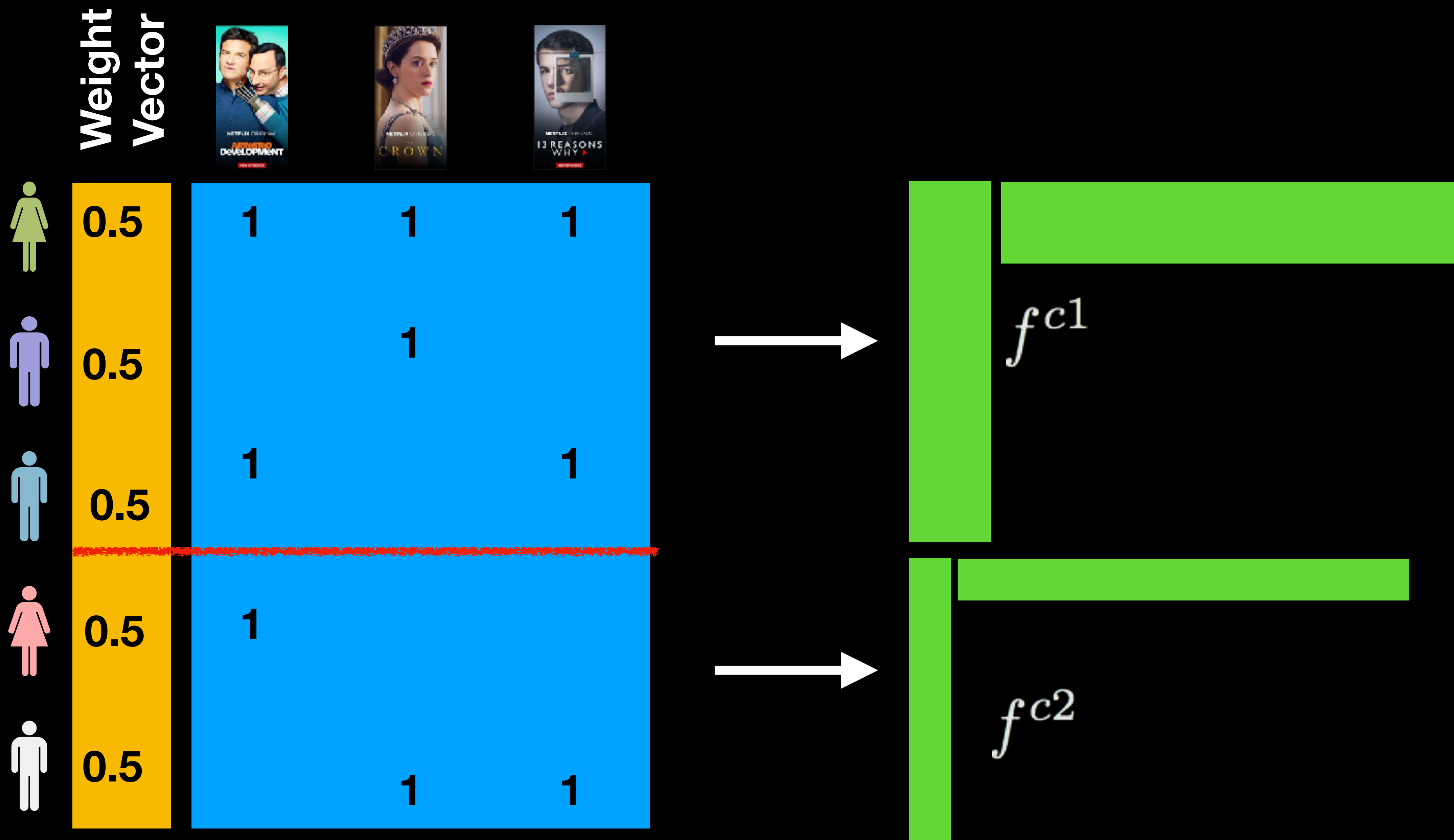


Weight Vector			
0.5	1	1	1
0.5		1	
0.5	1		1
0.5	1		
0.5		1	1

Global & Local SVD with varying Ranks



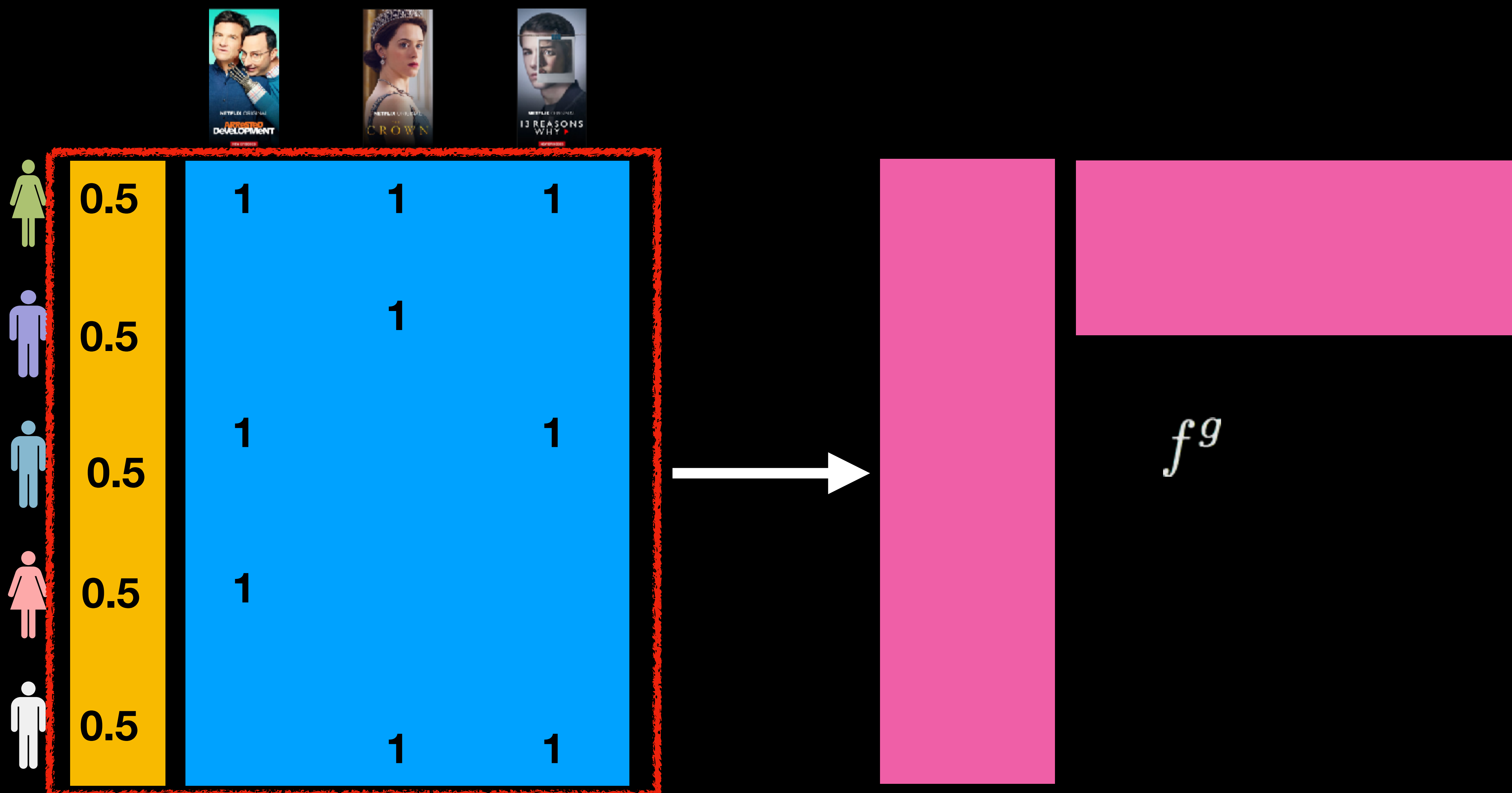
Global & Local SVD with varying Ranks



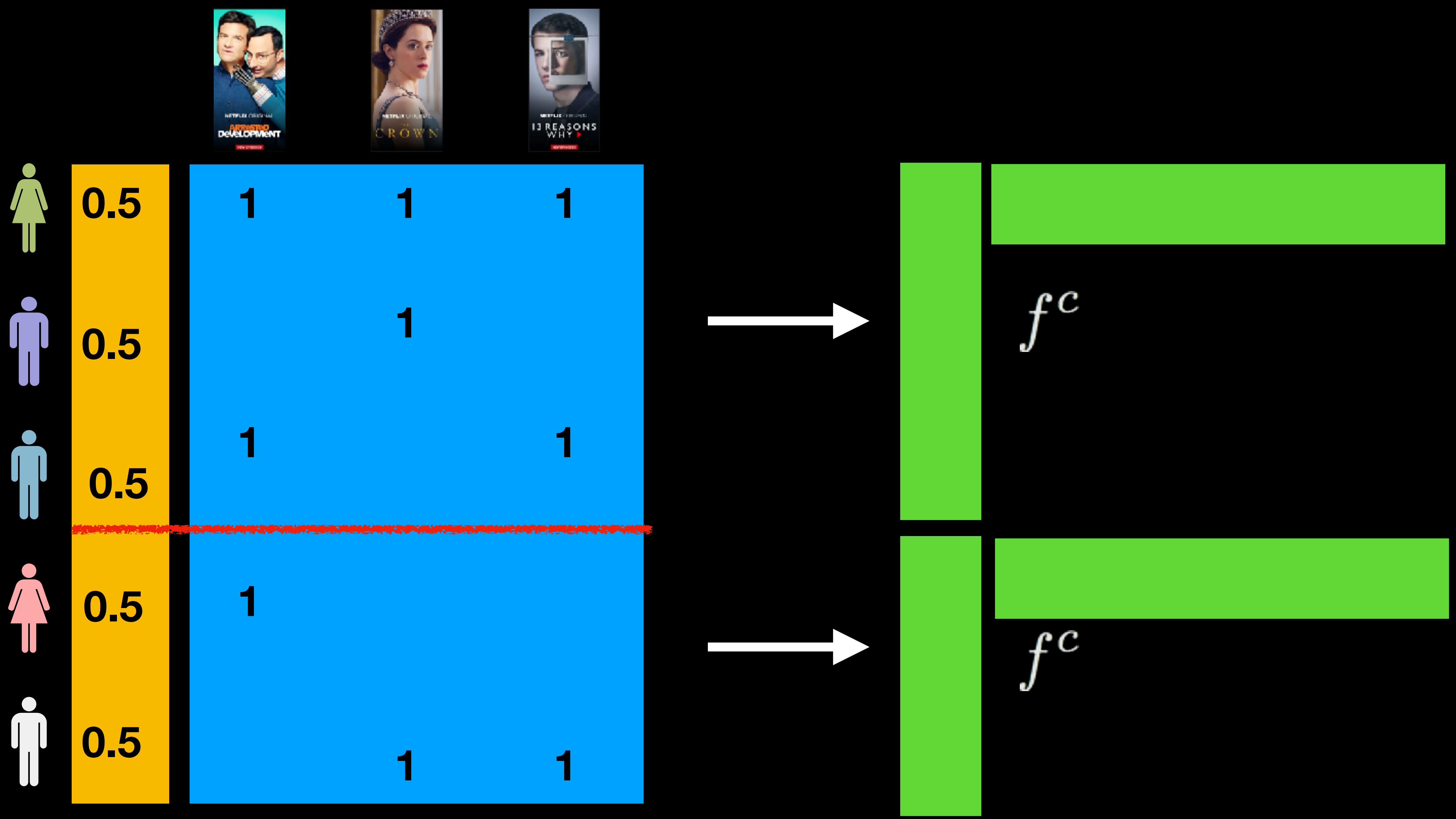
Global & Local SVD with varying Ranks

Weight Vector			
0.7	1	1	1
0.3		1	
0.4	1		1
0.1	1		
0.3		1	1

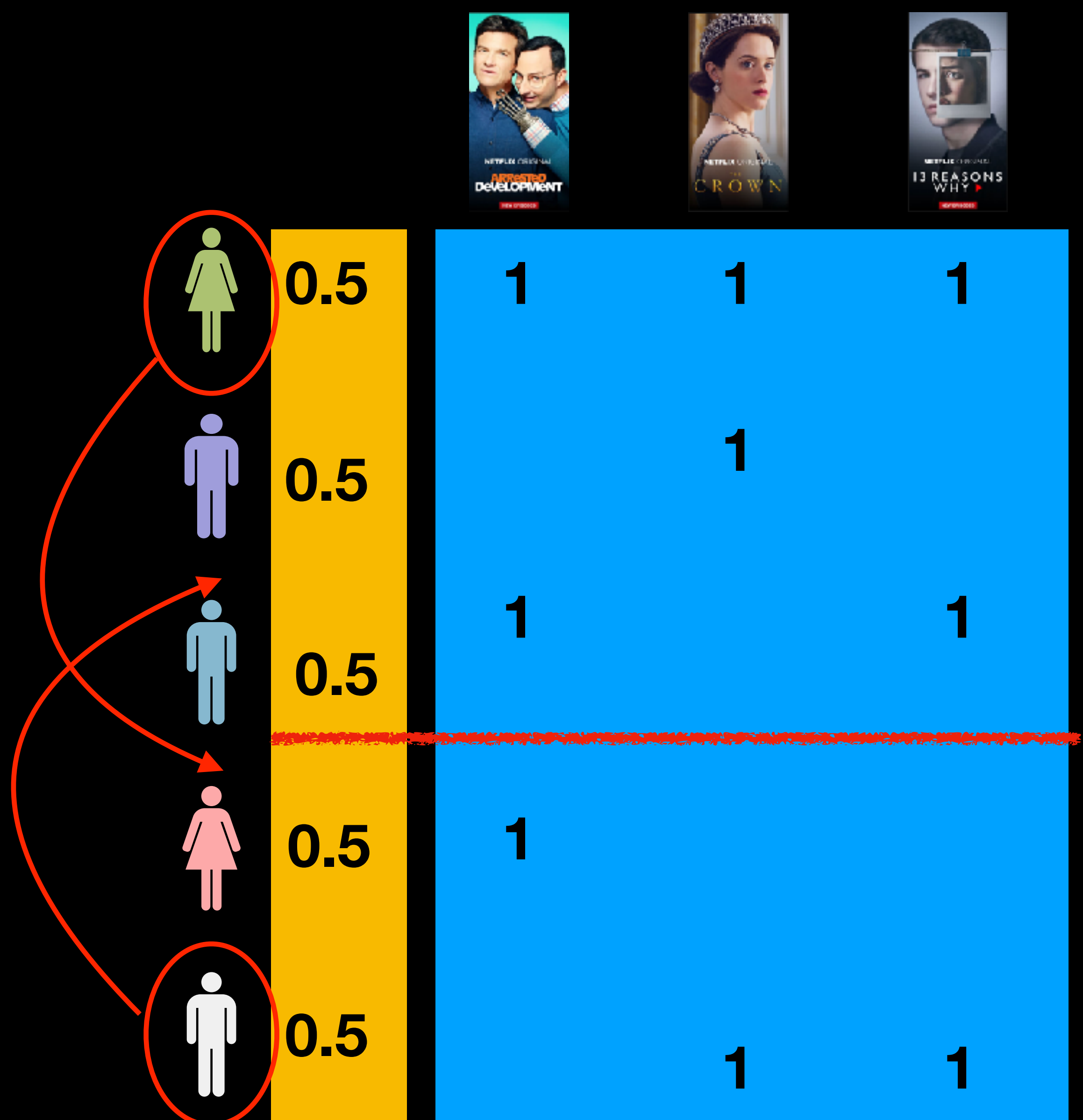
Global & Local SVD with varying Subsets



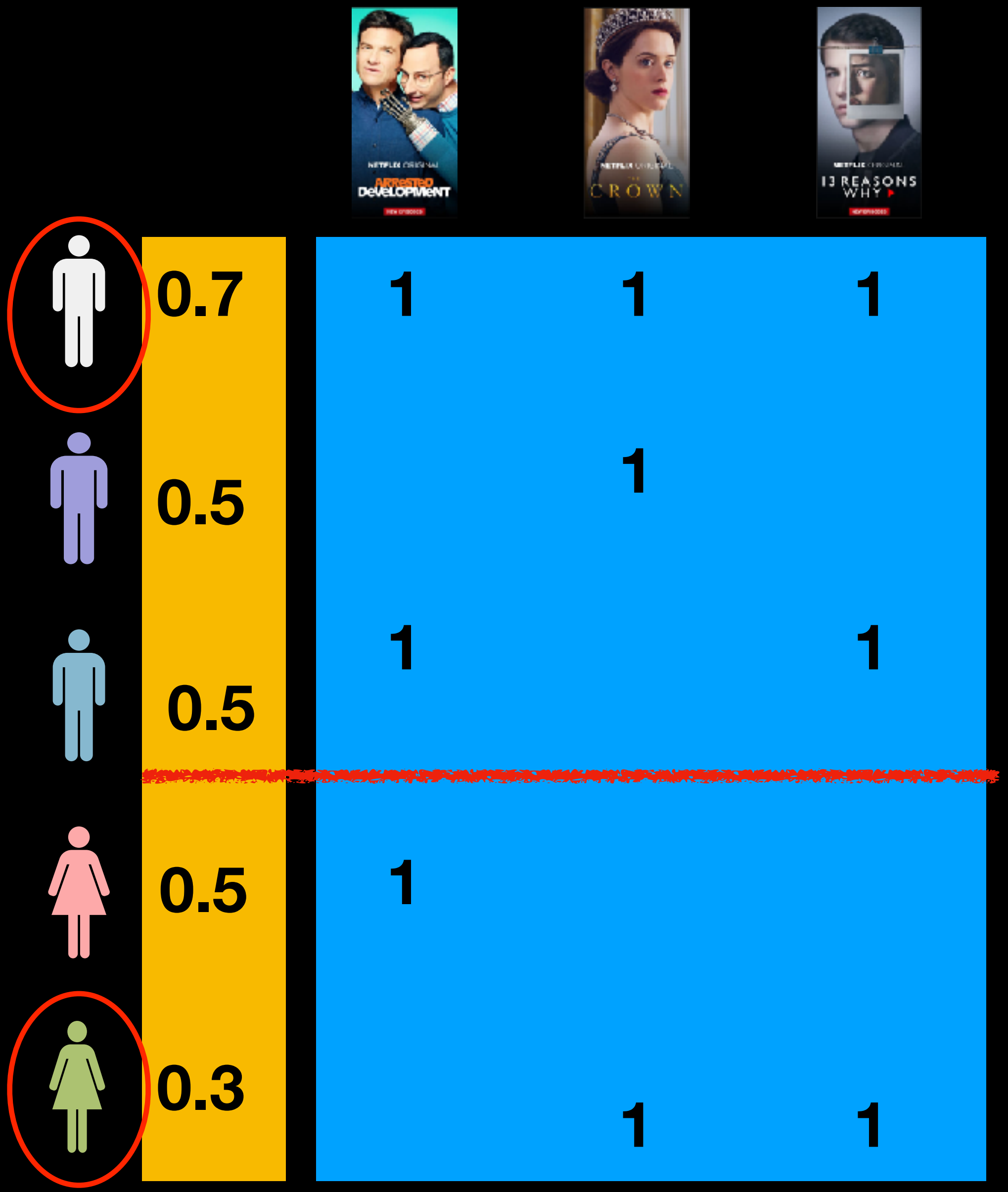
Global & Local SVD with varying Subsets



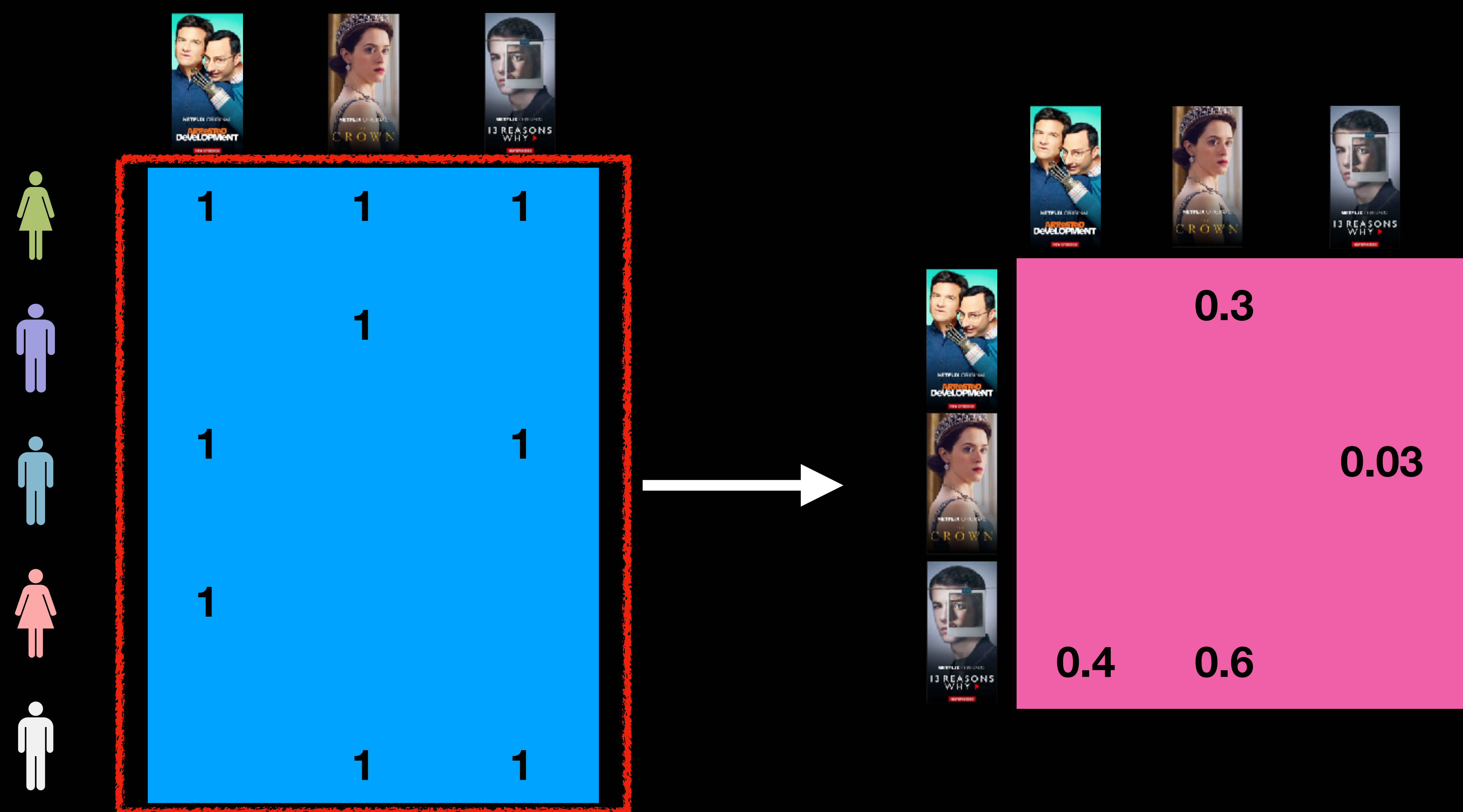
Global & Local SVD with varying Subsets



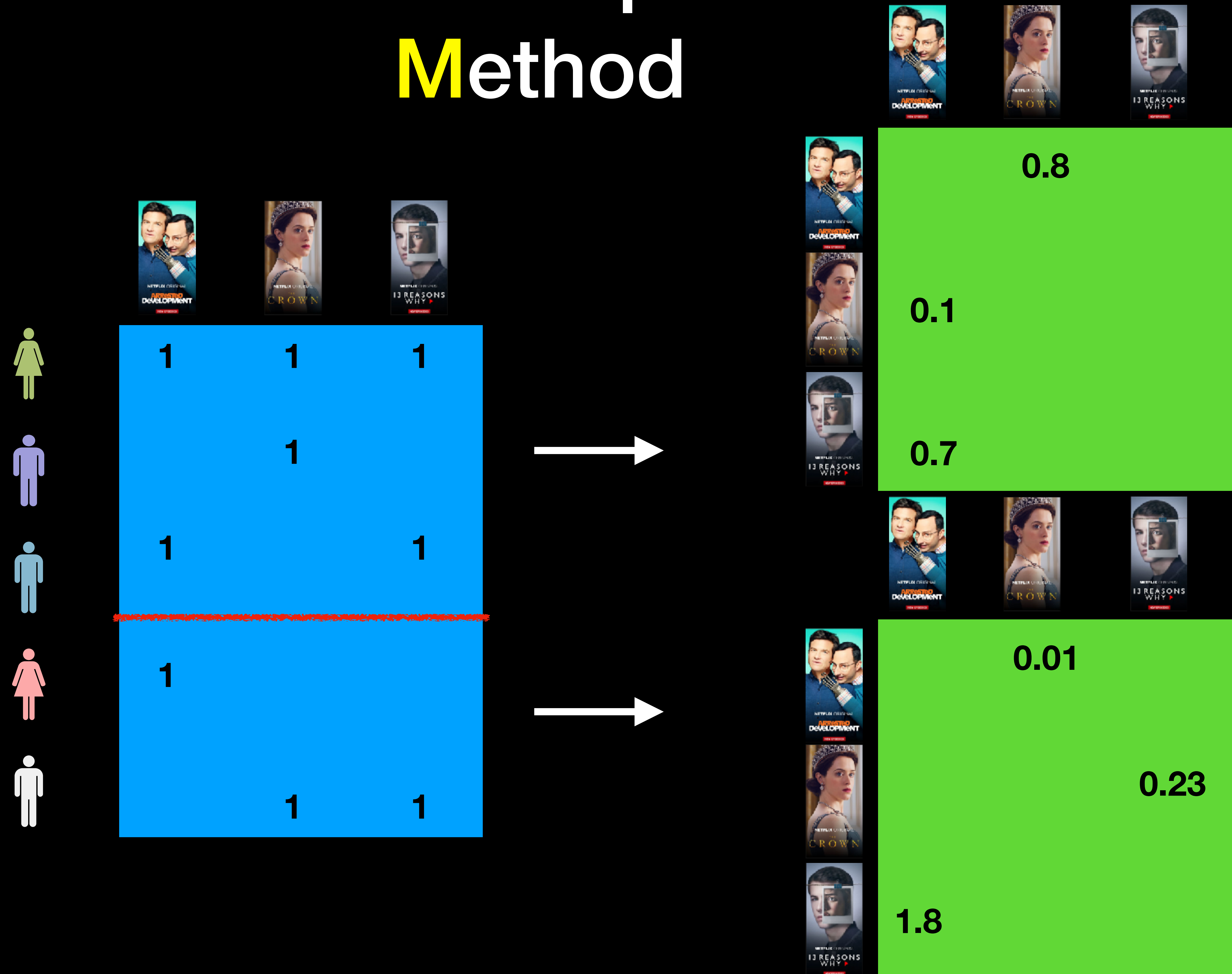
Global & Local SVD with varying Subsets



Global & Local Sparse LInear Method



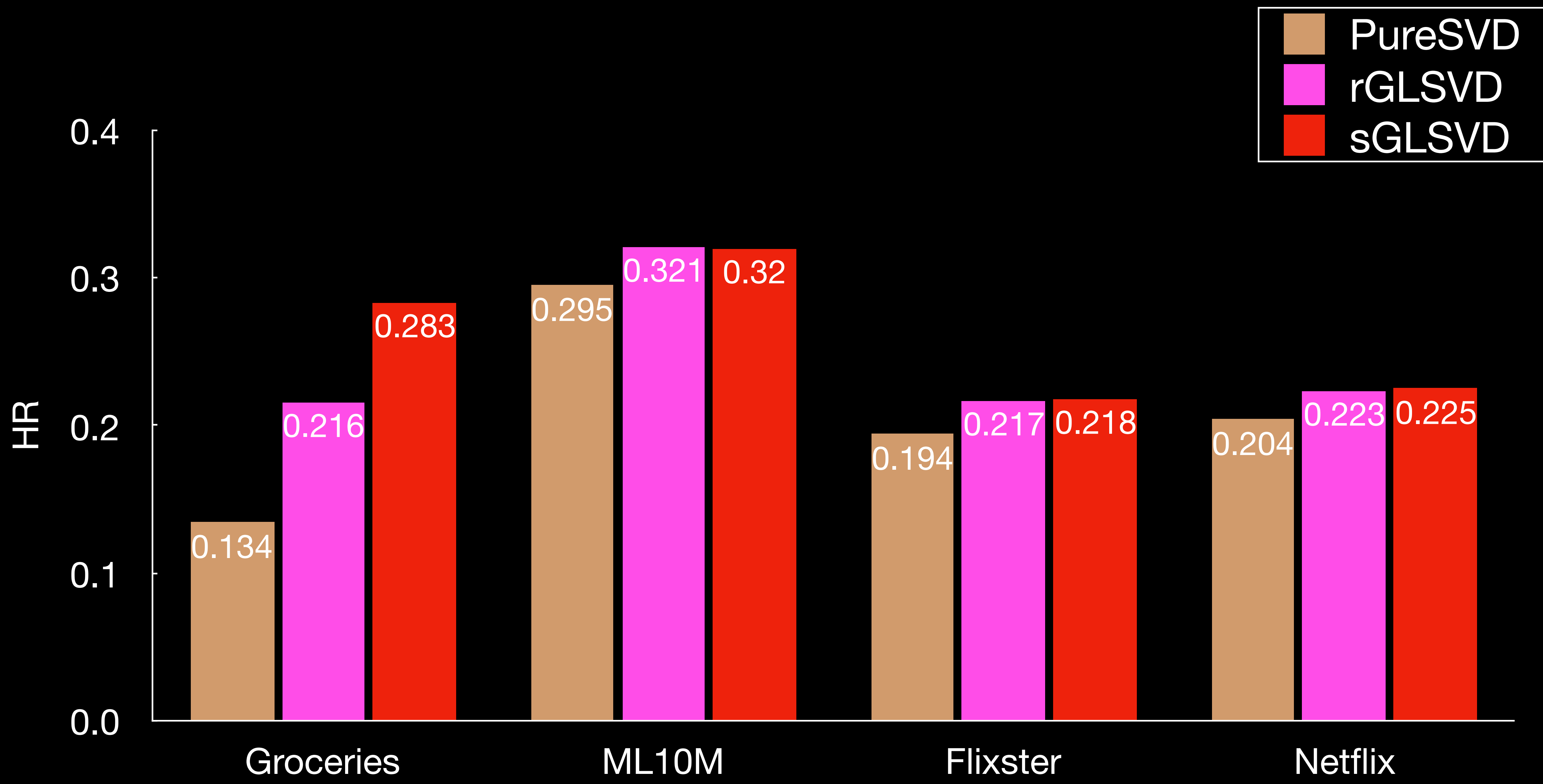
Global & Local Sparse LInear Method



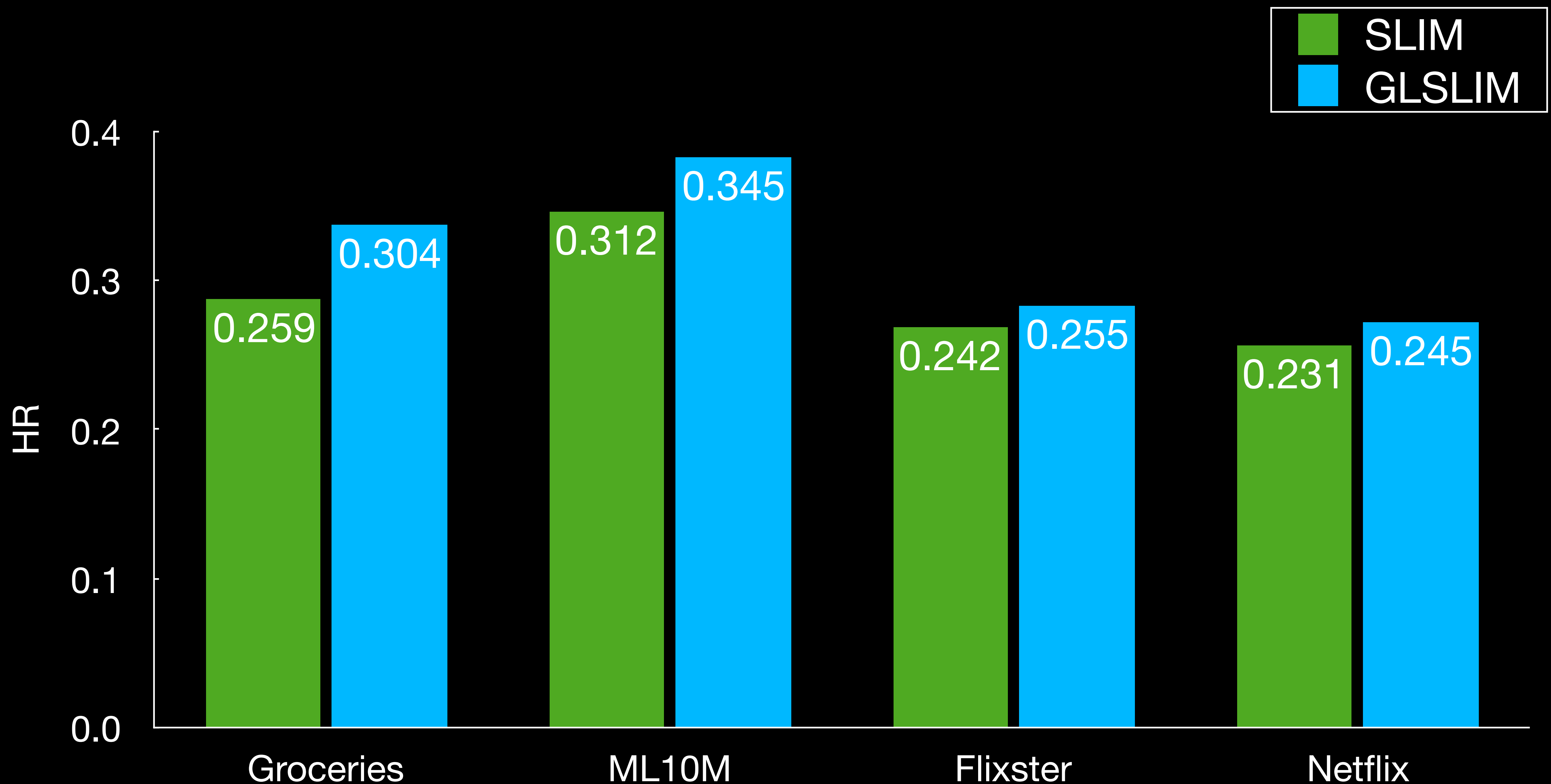
Global & Local Sparse LInear Method

Updated weight.

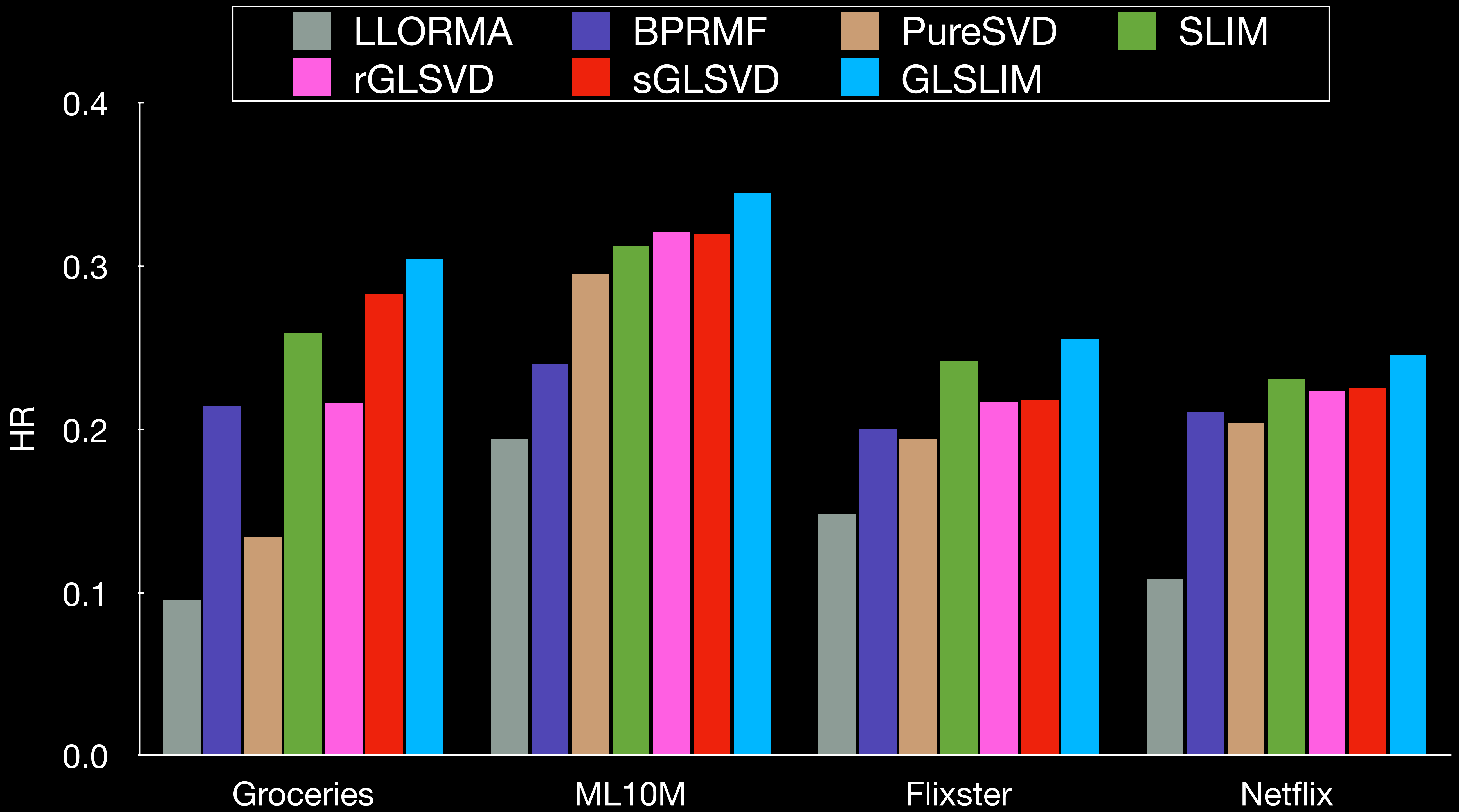
Comparison of PureSVD with sGLSVD and rGLSVD



Comparison of SLIM with GLSLIM



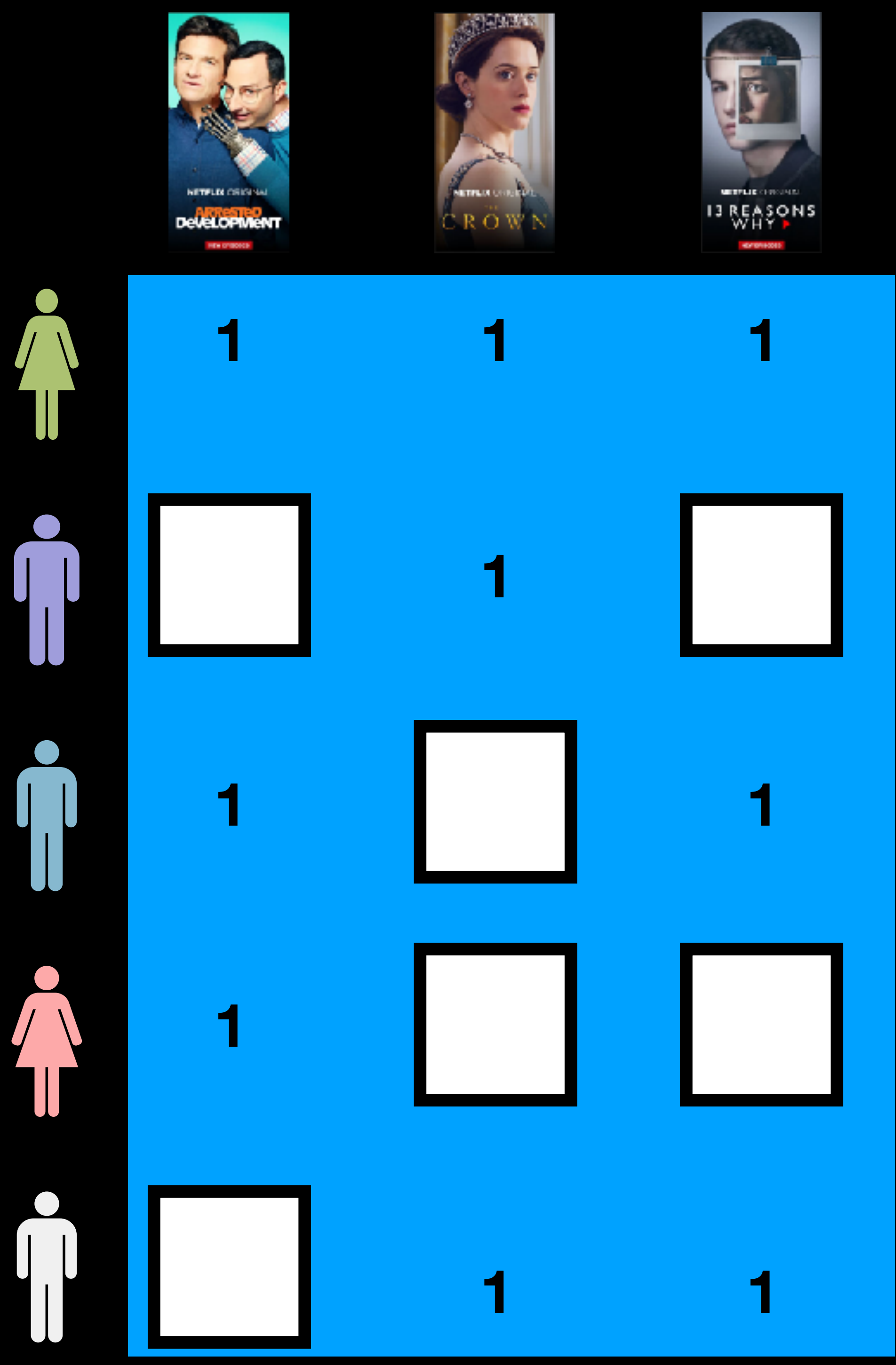
Comparison with Competing Approaches



Error in Top-N Recommendation

1	1	1
	1	
1		1
1		
	1	1

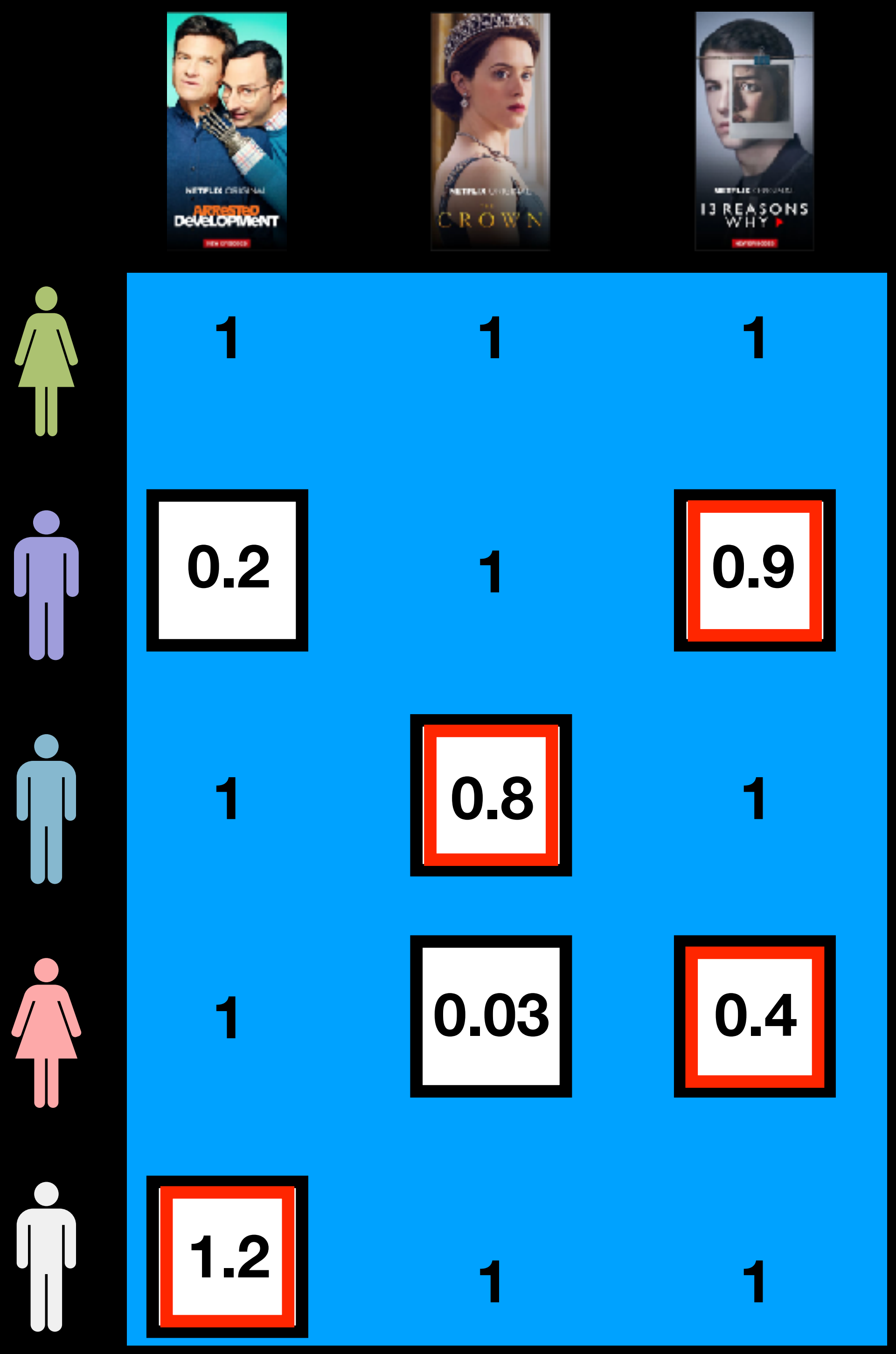
Error in Top-N Recommendation



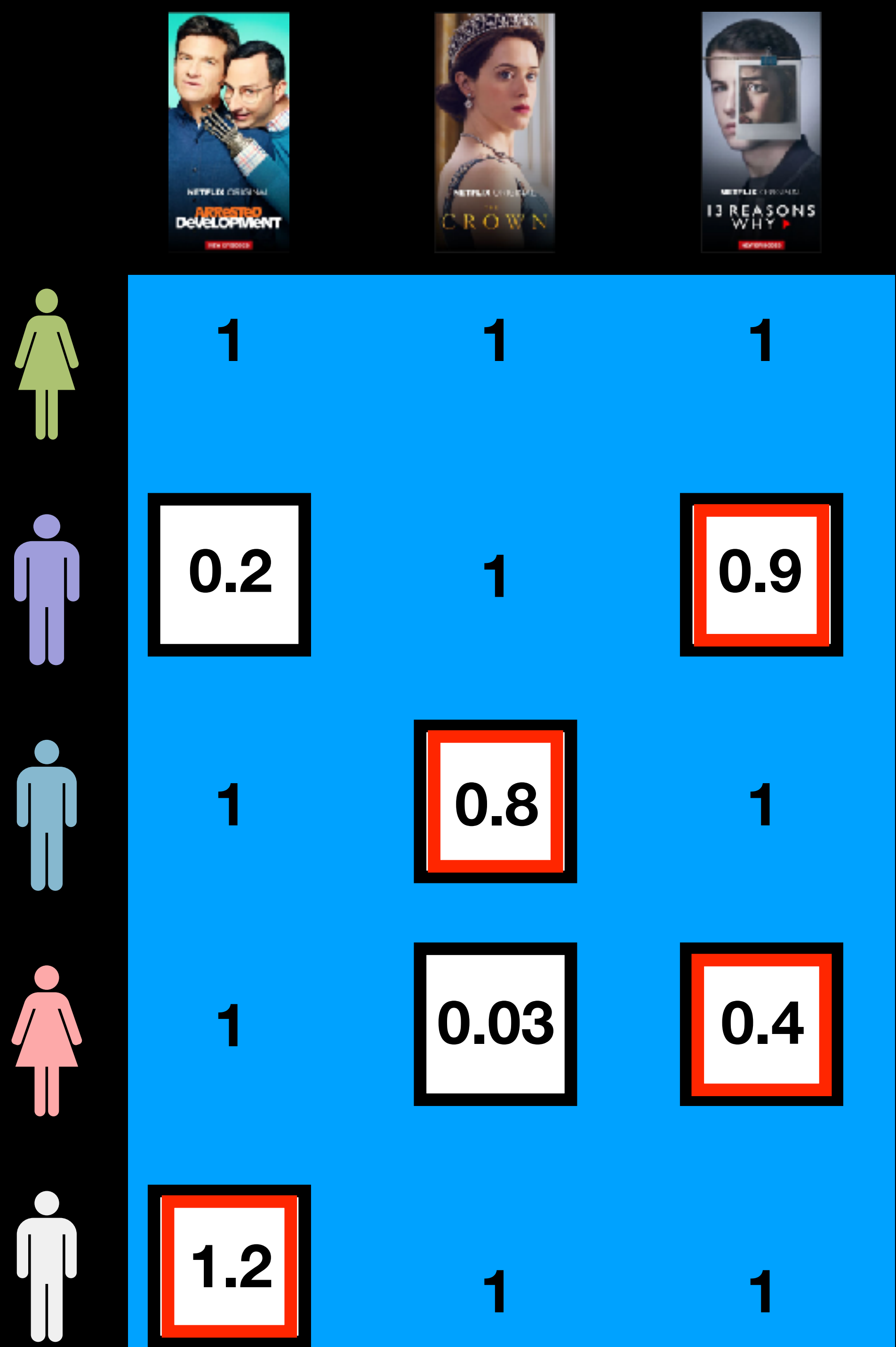
Error in Top-N Recommendation

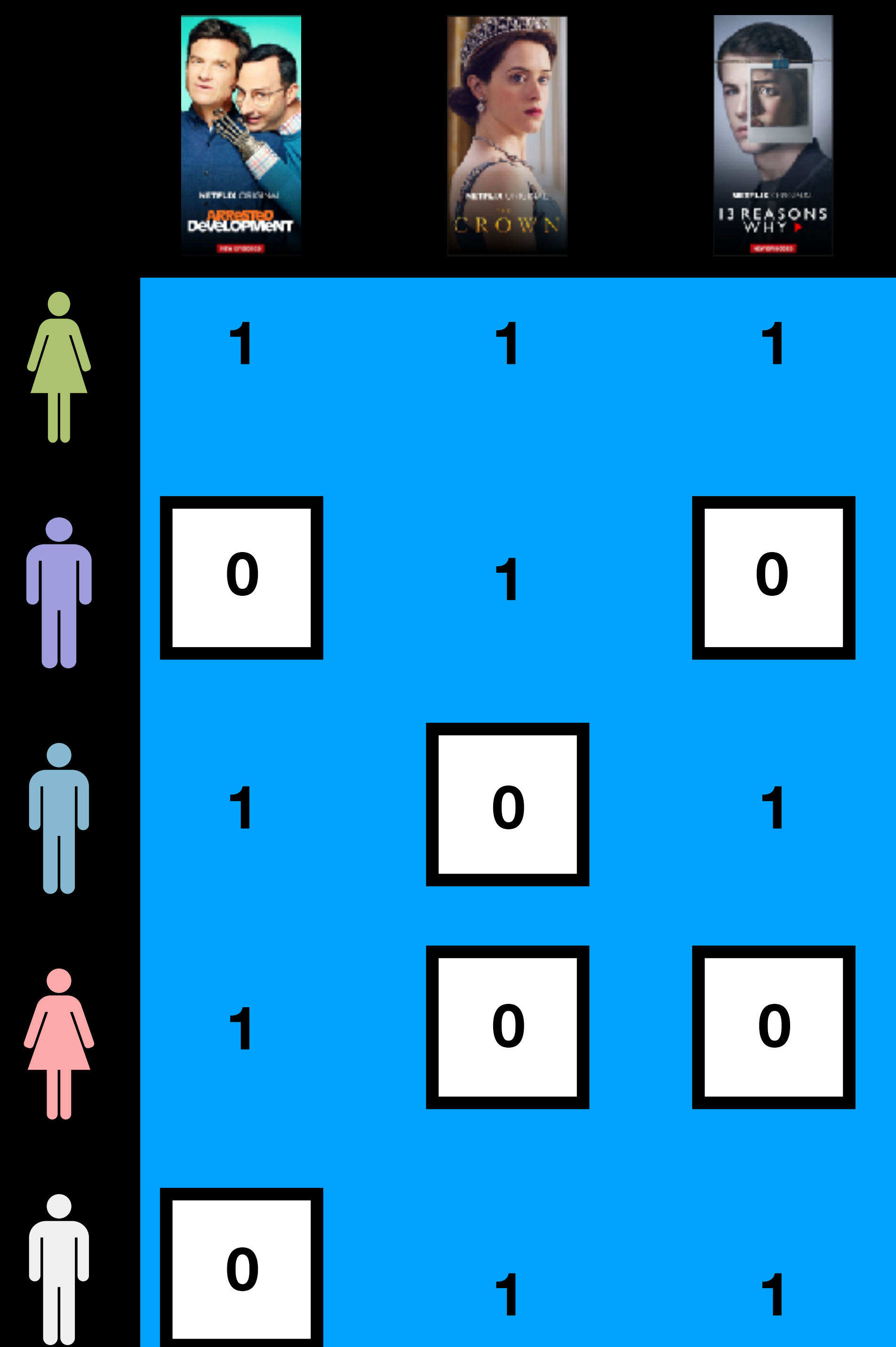
1	1	1
0.2	1	0.9
1	0.8	1
1	0.03	0.4
1.2	1	1

Error in Top-N Recommendation



Error in Top-N Recommendation

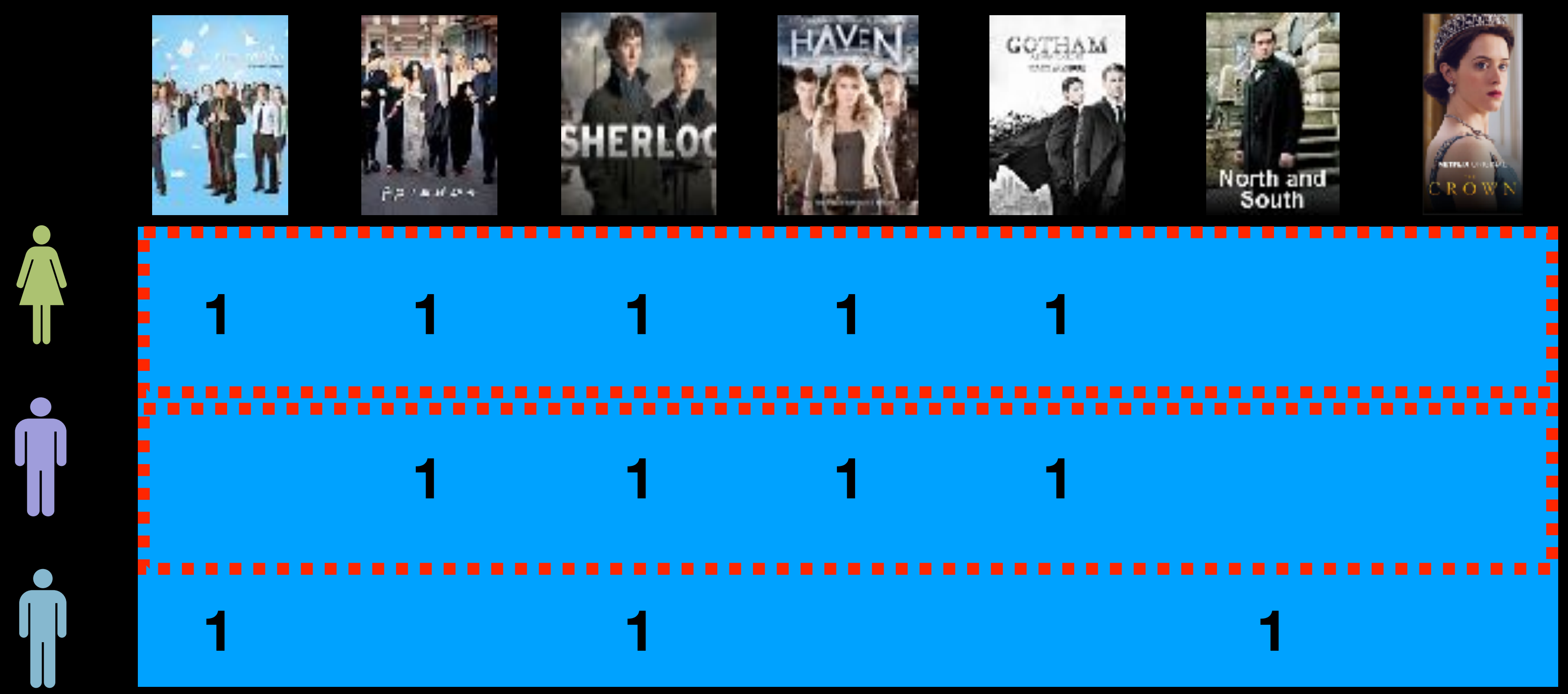




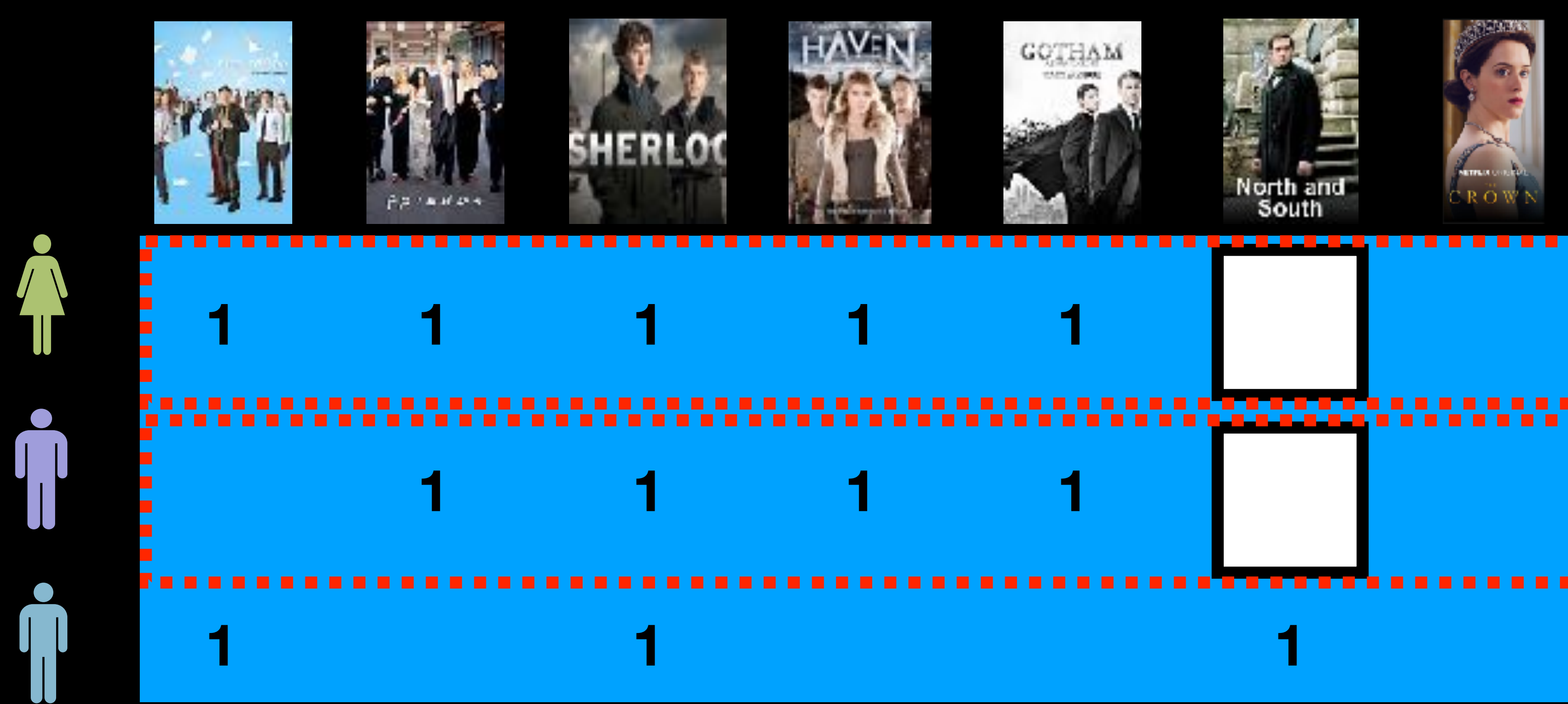
Exploring similar users

1	1	1	1	1		
	1	1	1	1		
1		1			1	

Exploring similar users



Exploring similar users



Exploring similar users

1	1	1	1	1		
	1	1	1	1		
1		1			1	

User Similarity Matrices

1	0.4	0.6
0.4	1	0.7
0.6	0.7	1

In terms of their ratings

1	0.2	0.1
0.2	1	0.3
0.1	0.3	1

In terms of their error

User Similarity Matrices

1	0.4	0.6
0.4	1	0.7
0.6	0.7	1

In terms of their ratings

Cosine Similarity

1	0.2	0.1
0.2	1	0.3
0.1	0.3	1

In terms of their error

User Similarity Matrices

1	0.4	0.6
0.4	1	0.7
0.6	0.7	1

In terms of their ratings

— Cosine Similarity —

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0.2	1	0.3
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In terms of their error

User Similarity Matrices

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In terms of their ratings

Cosine
Similarity

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In terms of their error

User Similarity Matrices

1	0.4	0.6
0.4	1	0.7
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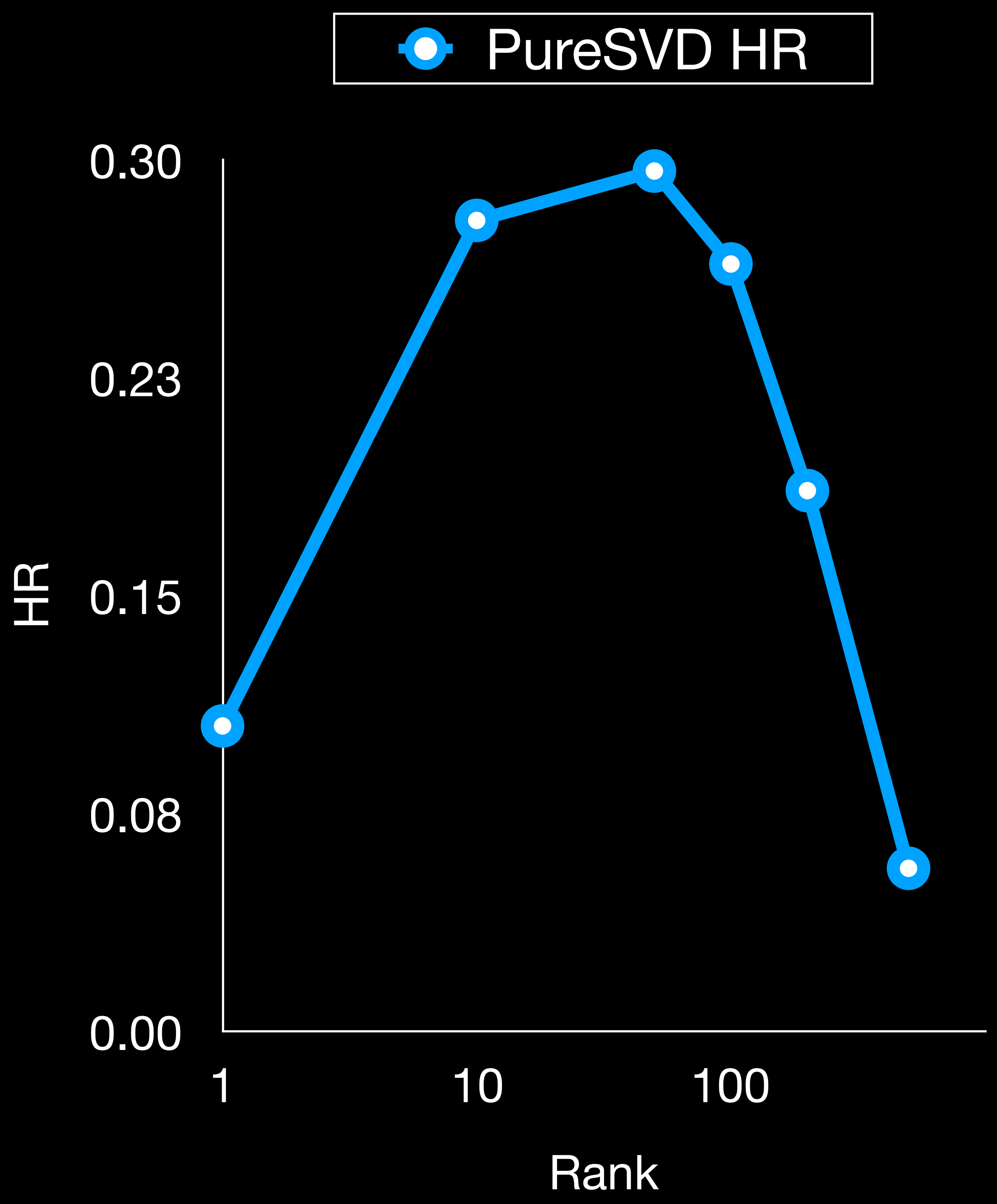
In terms of their ratings

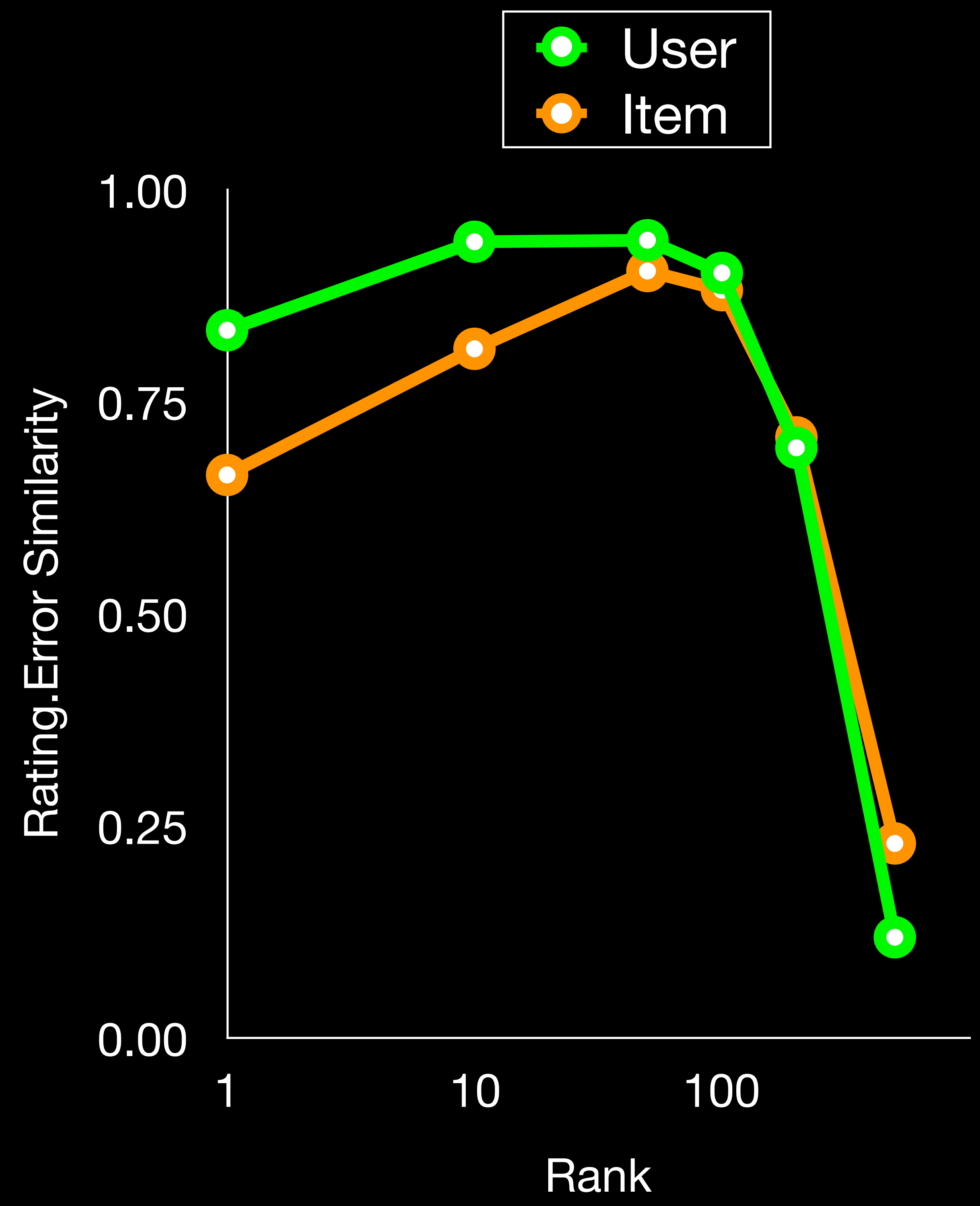
Cosine Similarity

1	0.2	0.1
0.2	1	0.3
0.1	0.3	1

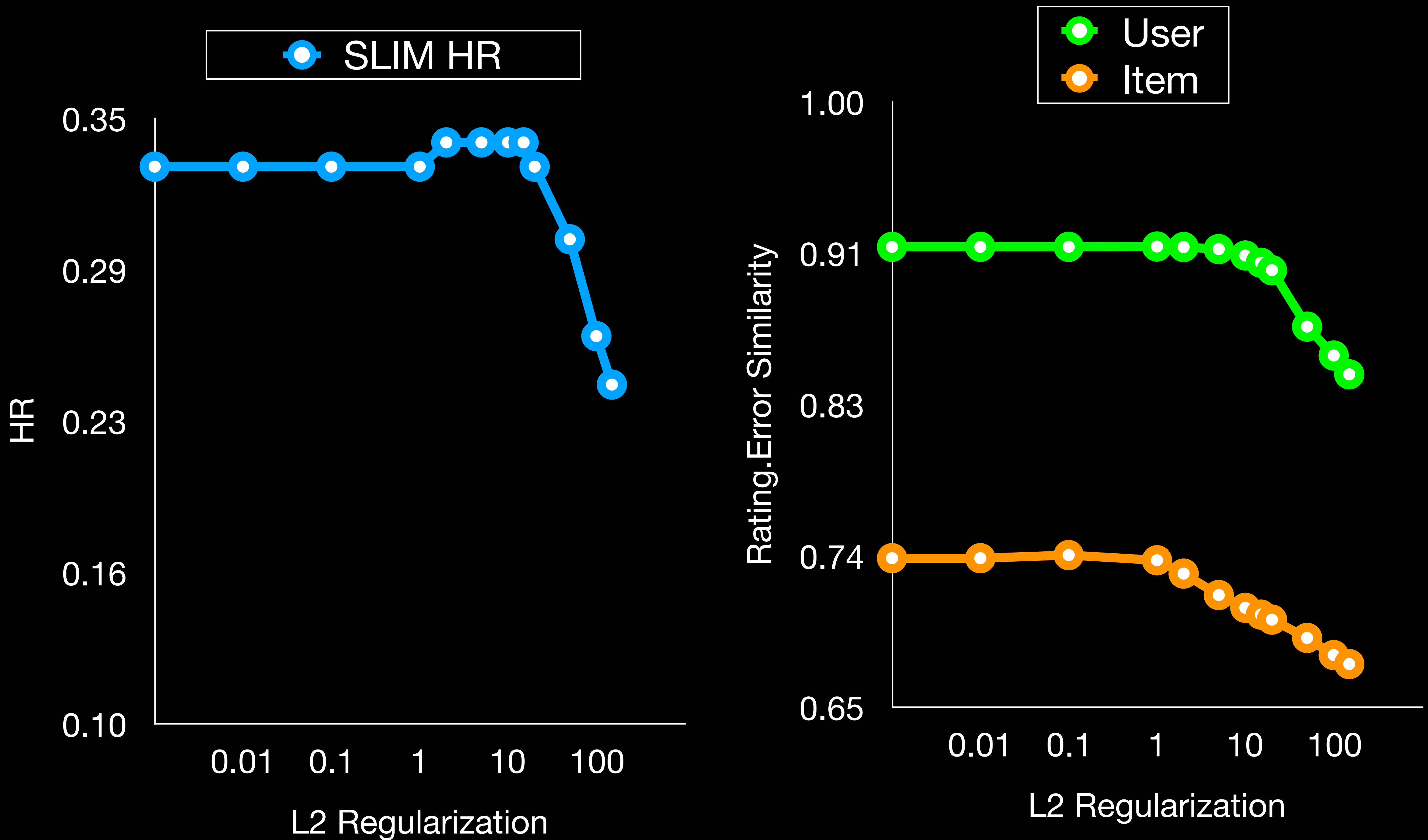
In terms of their error

Rating.Error Similarities vs Top-N Performance

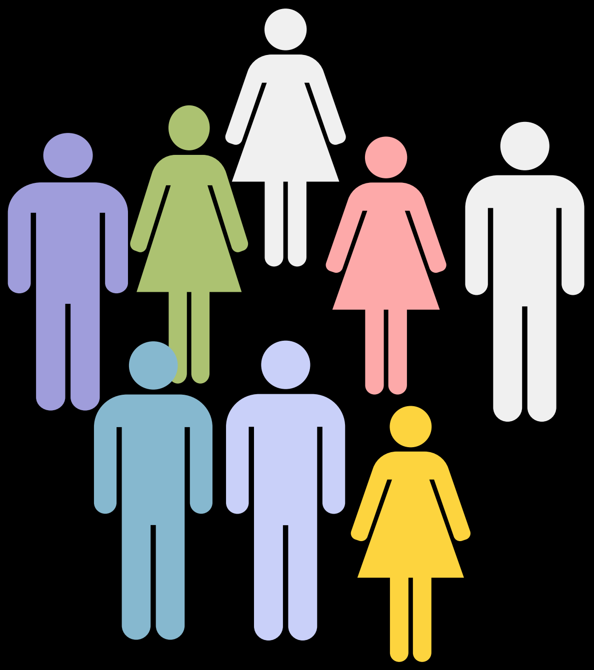




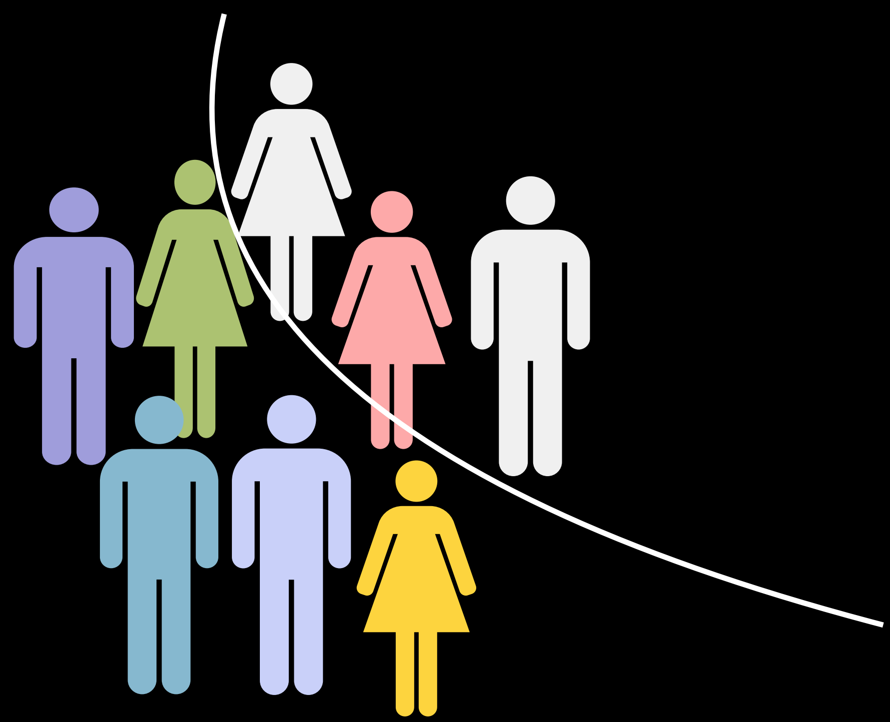
Rating.Error Similarities vs Top-N Performance



Focus on similar users

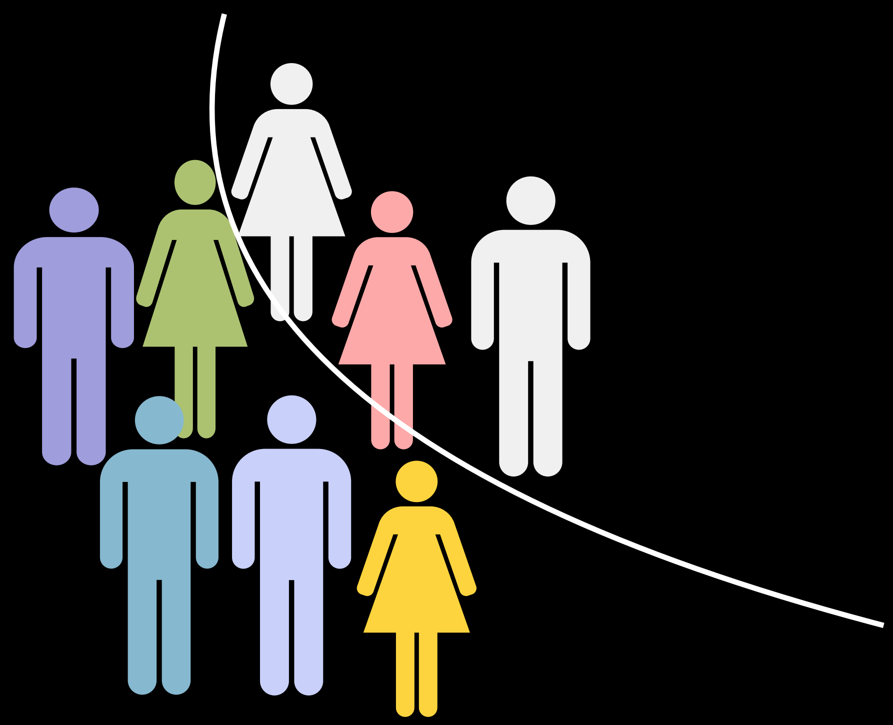


Focus on similar users



Focus on similar users

Local Models



Focus on similar users

Local Models

Similar users =>
Similar performance

More details

- ***Local Item-Item Models for Top-N Recommendation***
  Evangelia Christakopoulou and George Karypis, RecSys 2016

- ***Local Latent Space Models for Top-N Recommendation***
  Evangelia Christakopoulou and George Karypis, KDD 2018

- ***Investigating & Using the Error in Top-N Recommendation***
  Evangelia Christakopoulou and George Karypis, Under Review

- https://www-users.cs.umn.edu/~chri2951/code.html

Thank you!!