

Signals in the Silence: Models of Implicit Feedback in a Recommendation System for Crowdsourcing

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Outline

Matrix Factorization

Harnessing Implicit Positive Feedback for Task Recommendation in Crowdsourcing

Incorporating Implicit Negative Feedback

Experiments



5	?	?
?	1	3
4	?	2



5		
	1	3
4		2

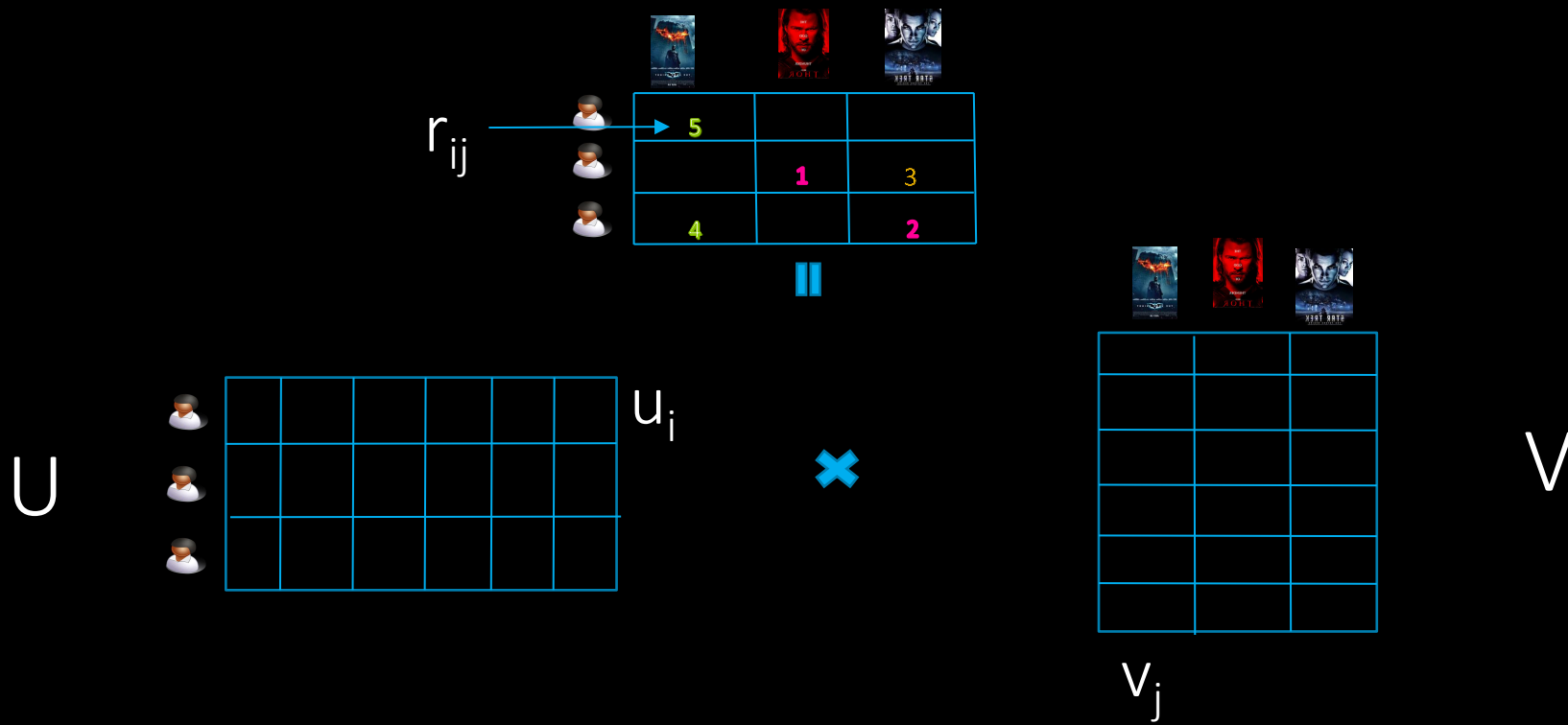






U

V

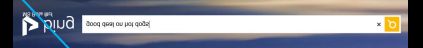


$$\sum (u_i v_j - r_{ij})^2 + \lambda (\|U\|_2^2 + \|V\|_2^2)$$

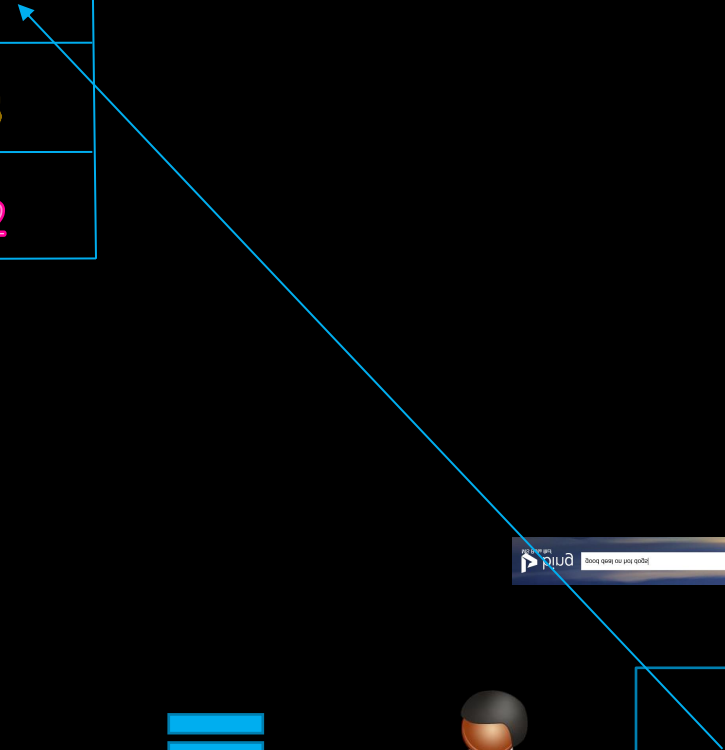


5		
	1	3
4		2





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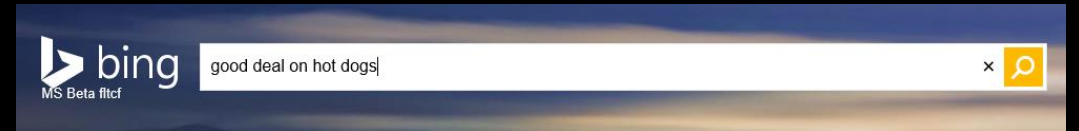
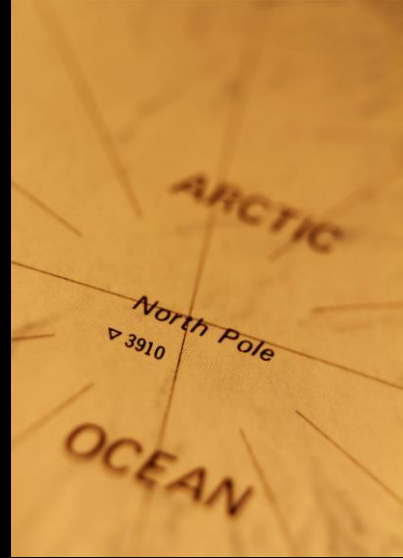
Outline

Matrix Factorization

Applying Implicit Positive Feedback (Hu et al 2008) to Task Recommendation in Crowdsourcing

Incorporating Implicit Negative Feedback

Experiments





500






1

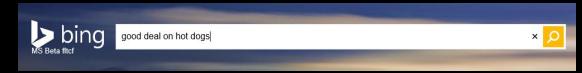
323




410

22

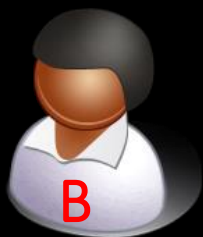
	500		
		1	323
	410		22




1		
	1	1
1		1



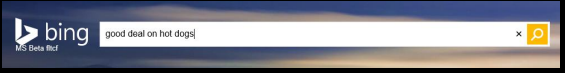
500		
	1	323
410		22



1	0	0
0	1	1
1	0	1



500		
	1	323
410		22



1	0	0
0	1	1
1	0	1



1

0

0



0

1

1




1

0




1

$$\sum w_{ij} (u_i v_j - r_{ij})^2 + \lambda (\|U\|_2^2 + \|V\|_2^2)$$
















×

=

0.82	0.42	0.17
0.78	0.23	0.41
1.08	1.01	0.06

0.82	0.42	0.17
0.78	0.23	0.41
1.08	1.01	0.06



Outline

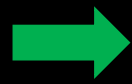
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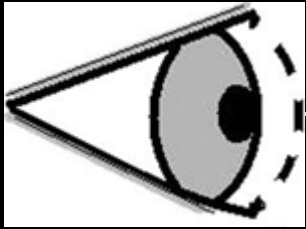


0.12	0.42	0.17
0.78	0.23	0.41
1.08	1.01	0.06





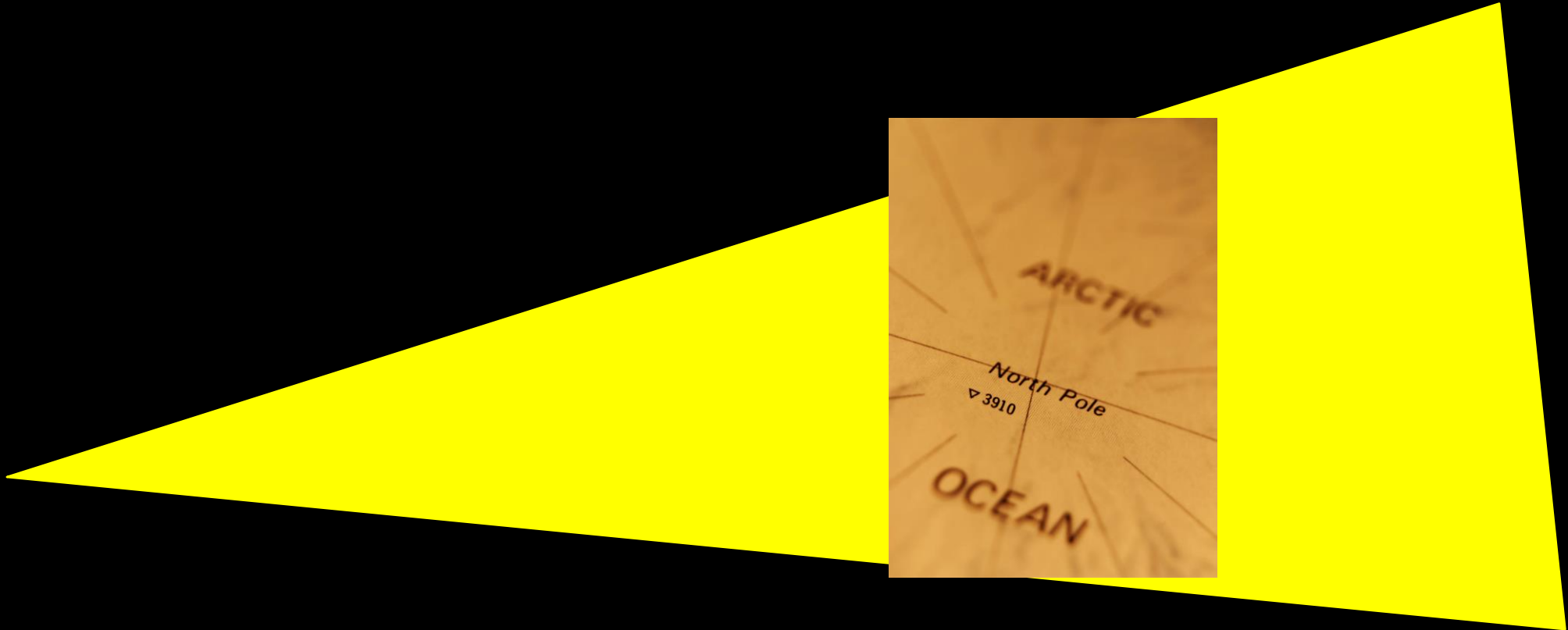
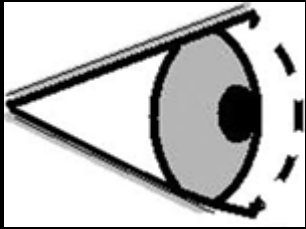
1	0	0
0	1	1
1	0	1



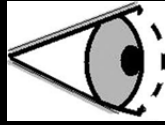
MS Beta fltcf

good deal on hot dogs|

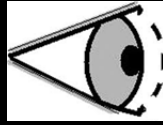




A screenshot of a Bing search engine interface. The Bing logo is on the left, followed by the text "bing MS Beta fltcf". The search bar contains the text "good deal on hot dogs|". To the right of the search bar is a magnifying glass icon and a small "x" icon.



1	0	0
0	1	1
1	0	1



1

0

0



0

1

1



1

0

1

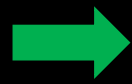
1	0	0
0	1	1
1	0	1






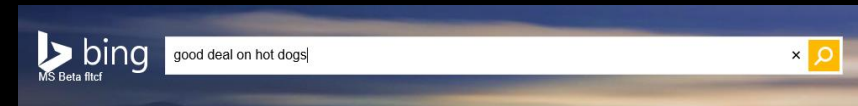
1	0	0
0	1	1
1	0	1

$$\sum w_{ij}(u_i v_j - r_{ij})^2 + \lambda(\|U\|_2^2 + \|V\|_2^2)$$

Theorem: If all zero weights are the same in one column, or the same in one row, then we can learn efficiently.



		
0.82	0.42	0.17
0.78	0.23	0.41
1.08	1.01	0.06





0.82	0.17	0.42	
0.78	0.23	0.41	
1.08	1.01	0.06	



Outline

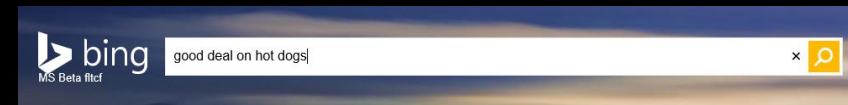
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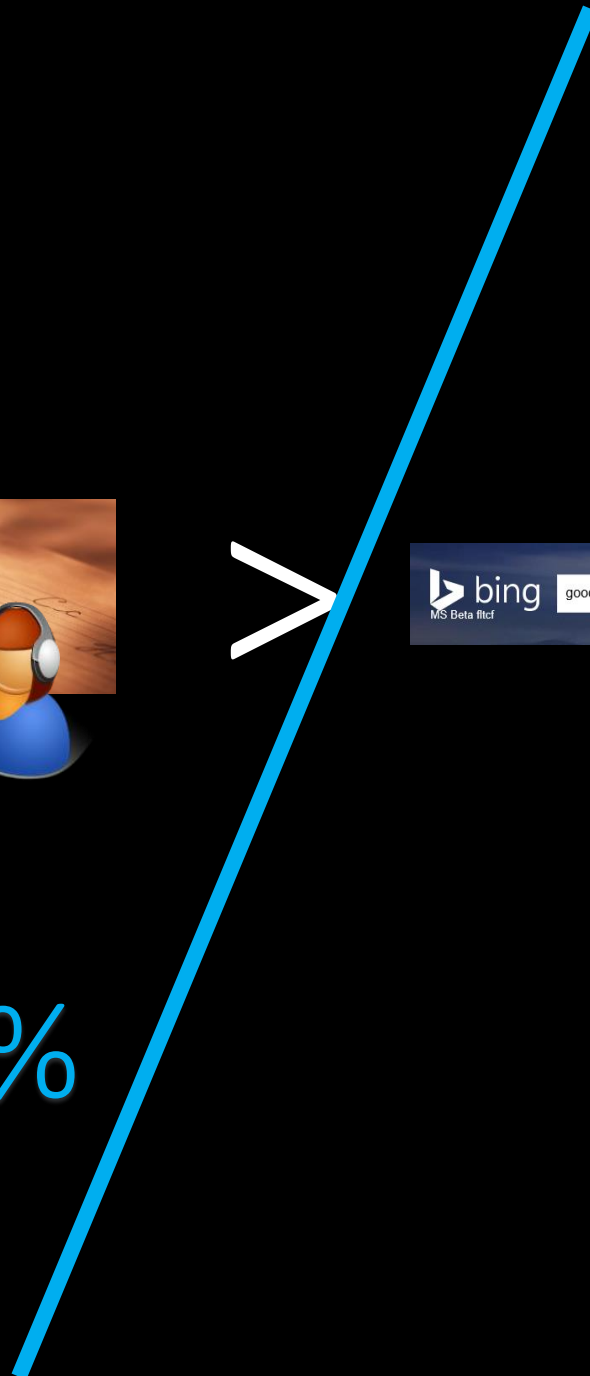


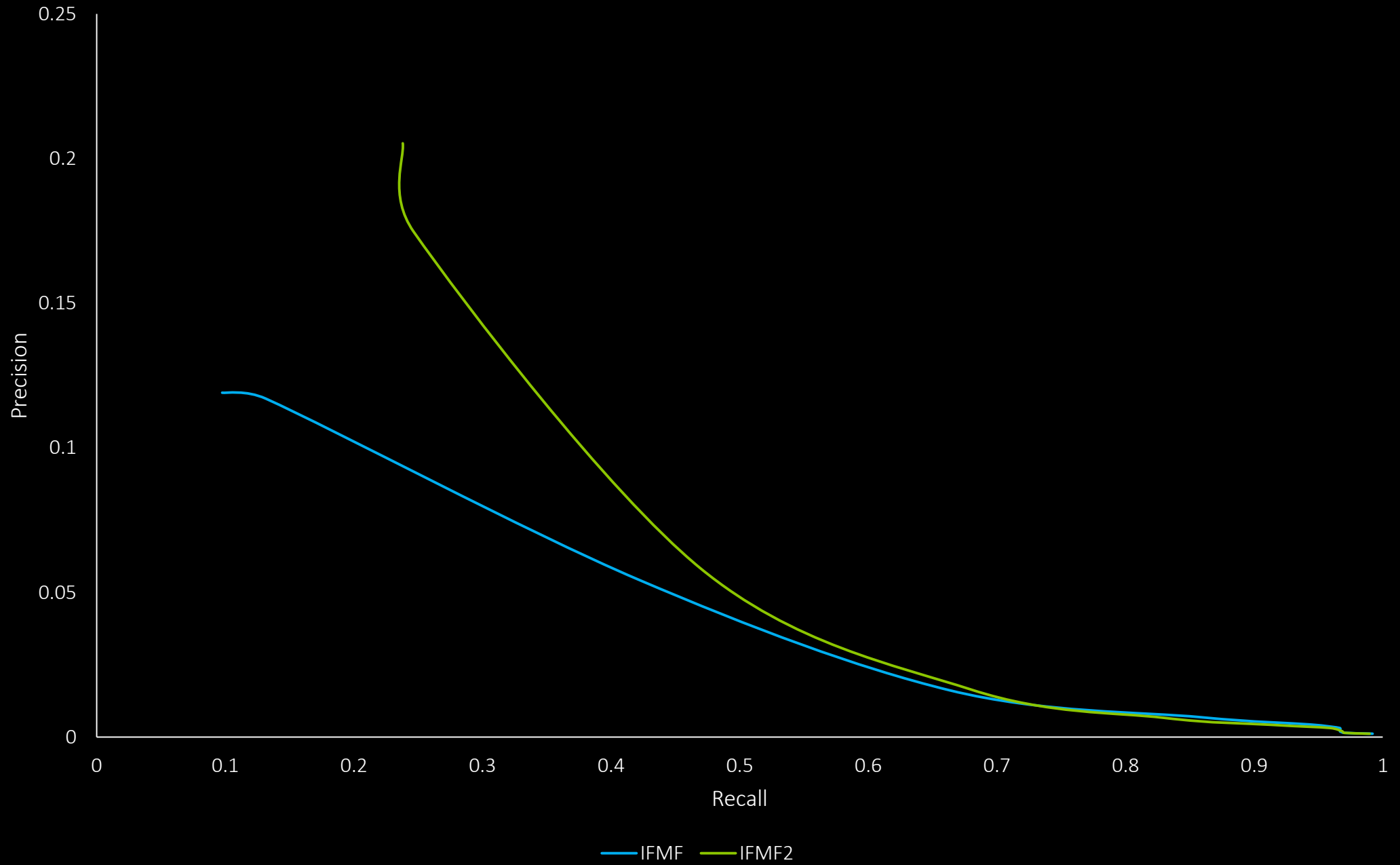


0%

50%

100%

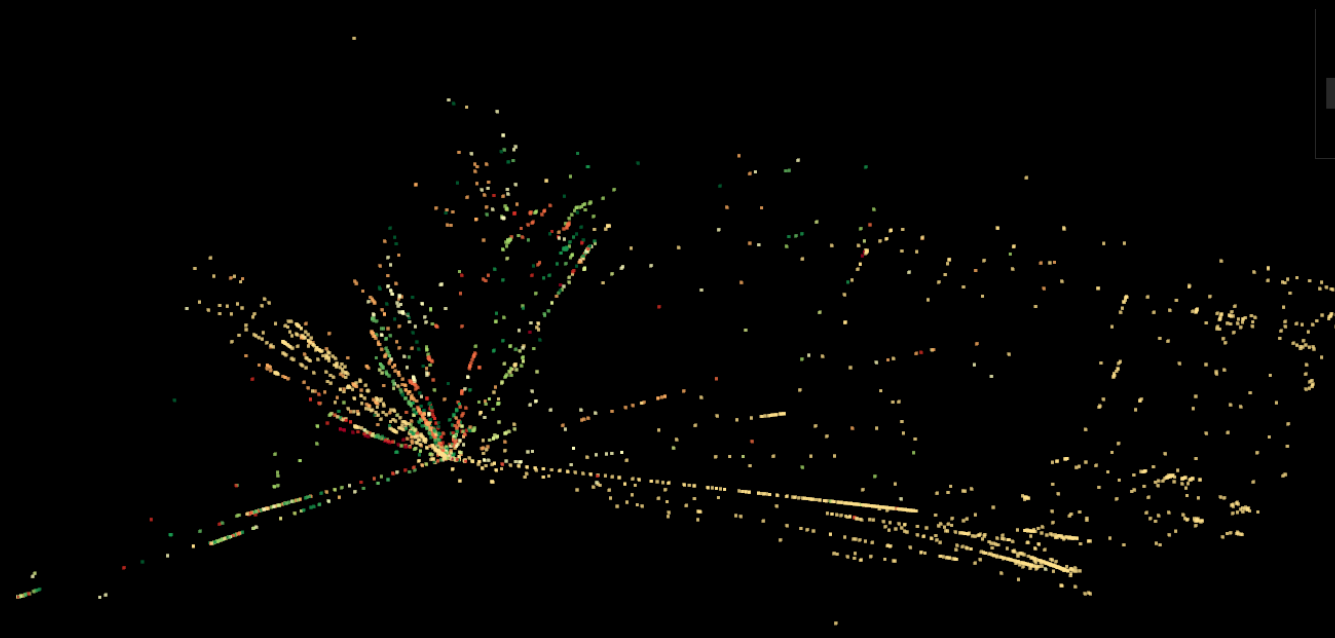




Other Contributions

Sampling-Based Learning

Understanding the Learned Factors



Questions?

Outline

Matrix Factorization for Collaborative Filtering

Harnessing Implicit Positive Feedback for Task Recommendation in Crowdsourcing

Incorporating Implicit Negative Feedback

Sampling-Based Learning

Experiments



1	0	0
0	1	1
1	0	1



1

0



0



1

0



0.12

0.42

-.17



0.78

0.23

0.41



1.08

1.01

0.06

	0.12	0.42	-.17
	0.78	0.23	0.41
	1.08	1.01	0.06



1

0



0



1

0

1



0.12

0.42

-.17



0.78

0.23

0.41



1.08

1.01

0.06

	0.12	0.42	-.17
	0.78	0.23	0.41
	1.08	1.01	0.06



1

0

0



1



1

0



0.12

0.42

-.17



0.78

0.23

0.41

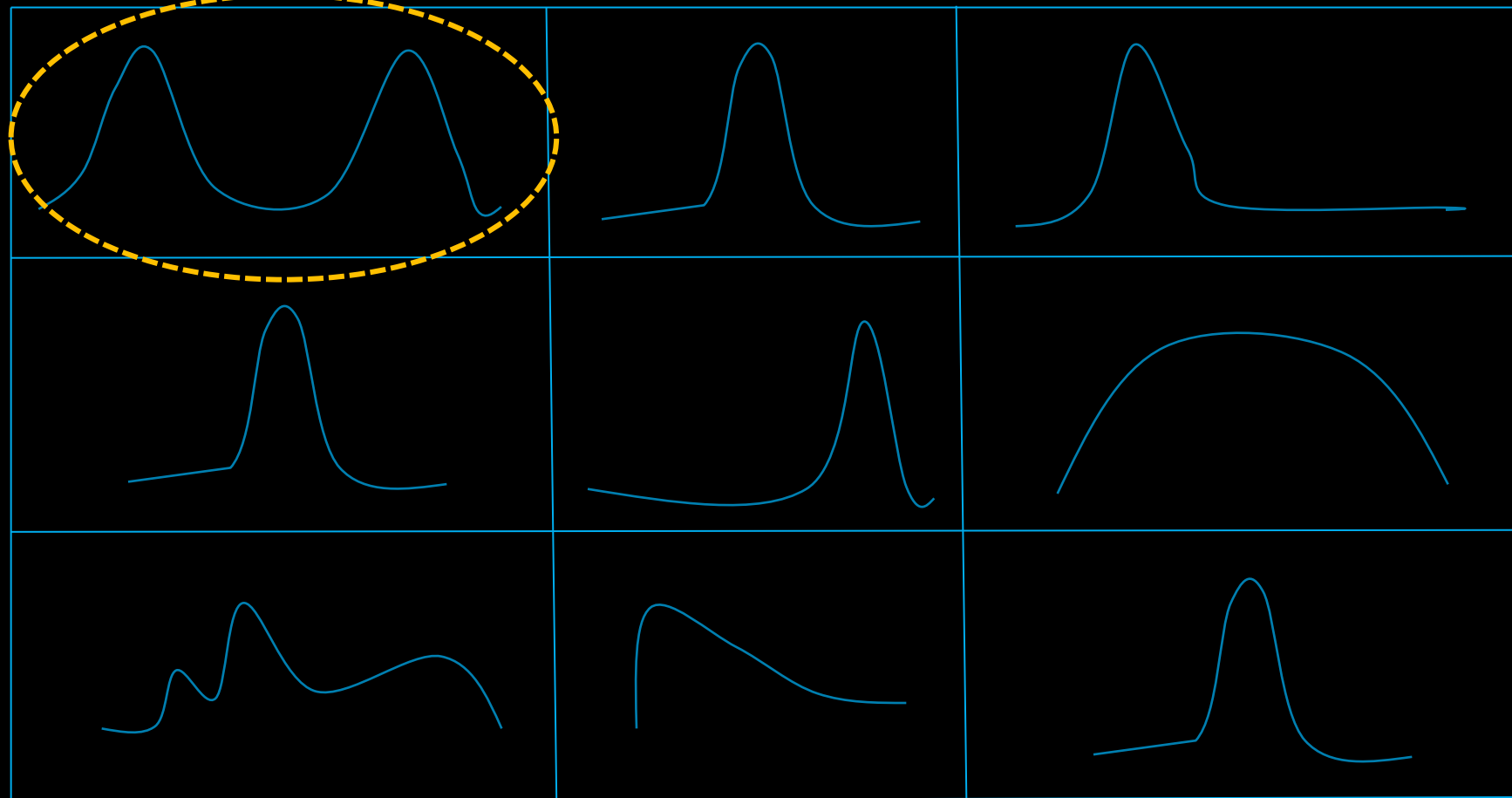
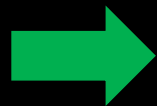


1.08

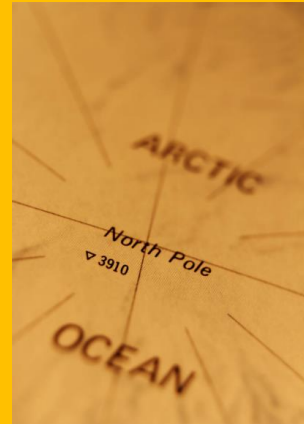
1.01

0.06

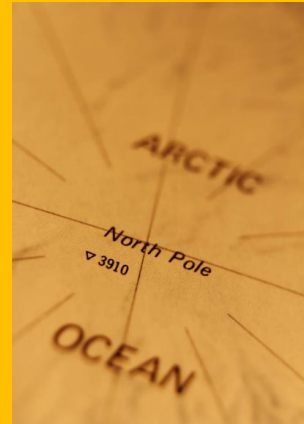
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	0.78	0.23	0.41
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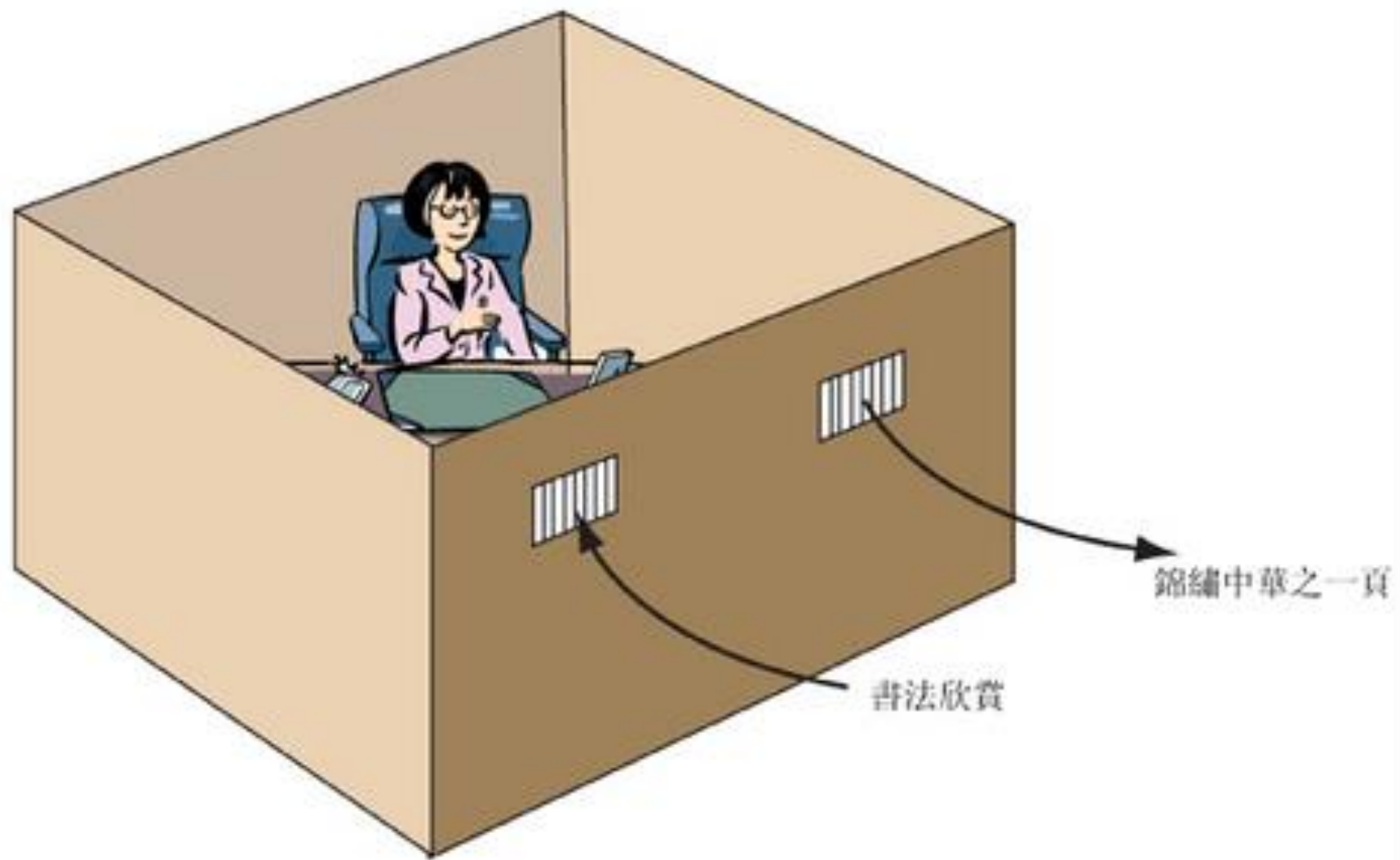


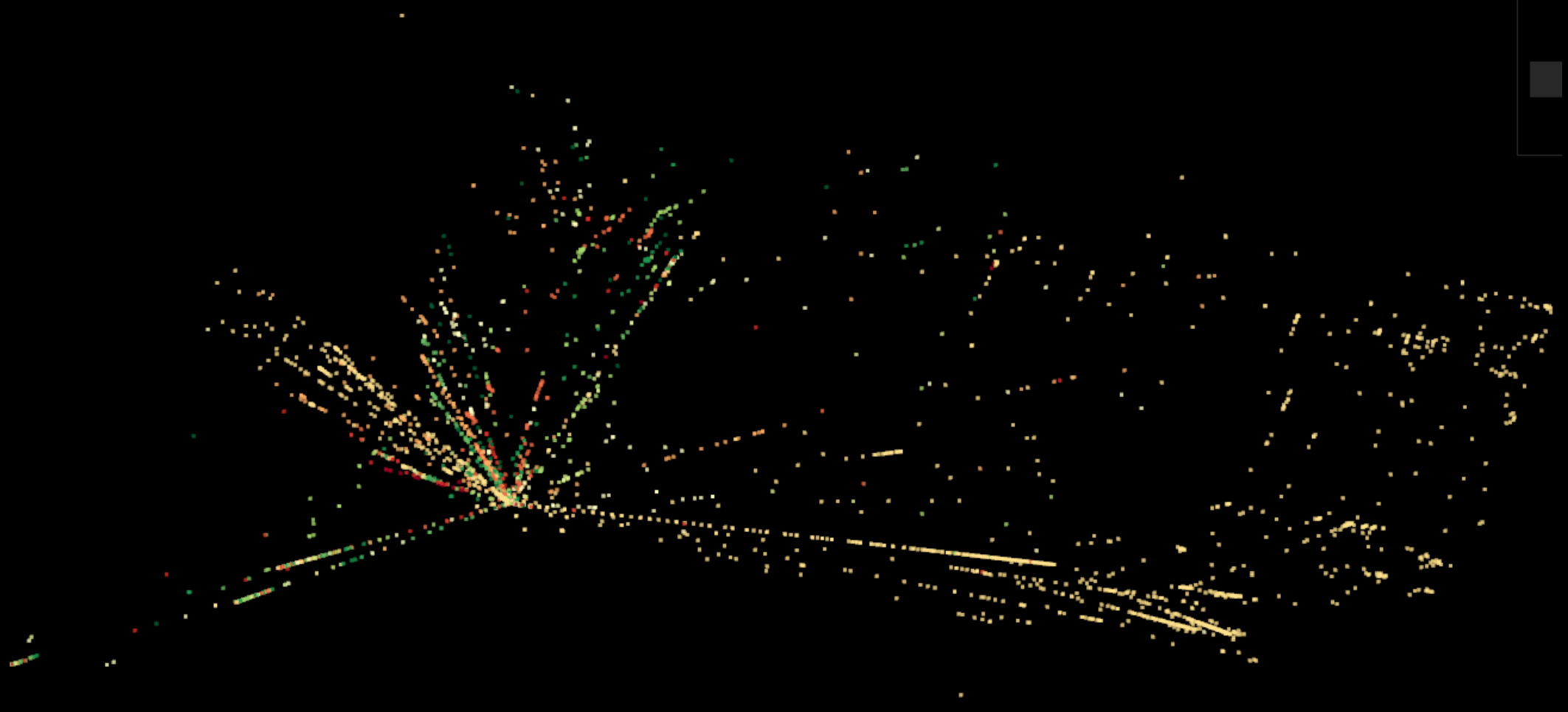
Billy Bob's Recommendations

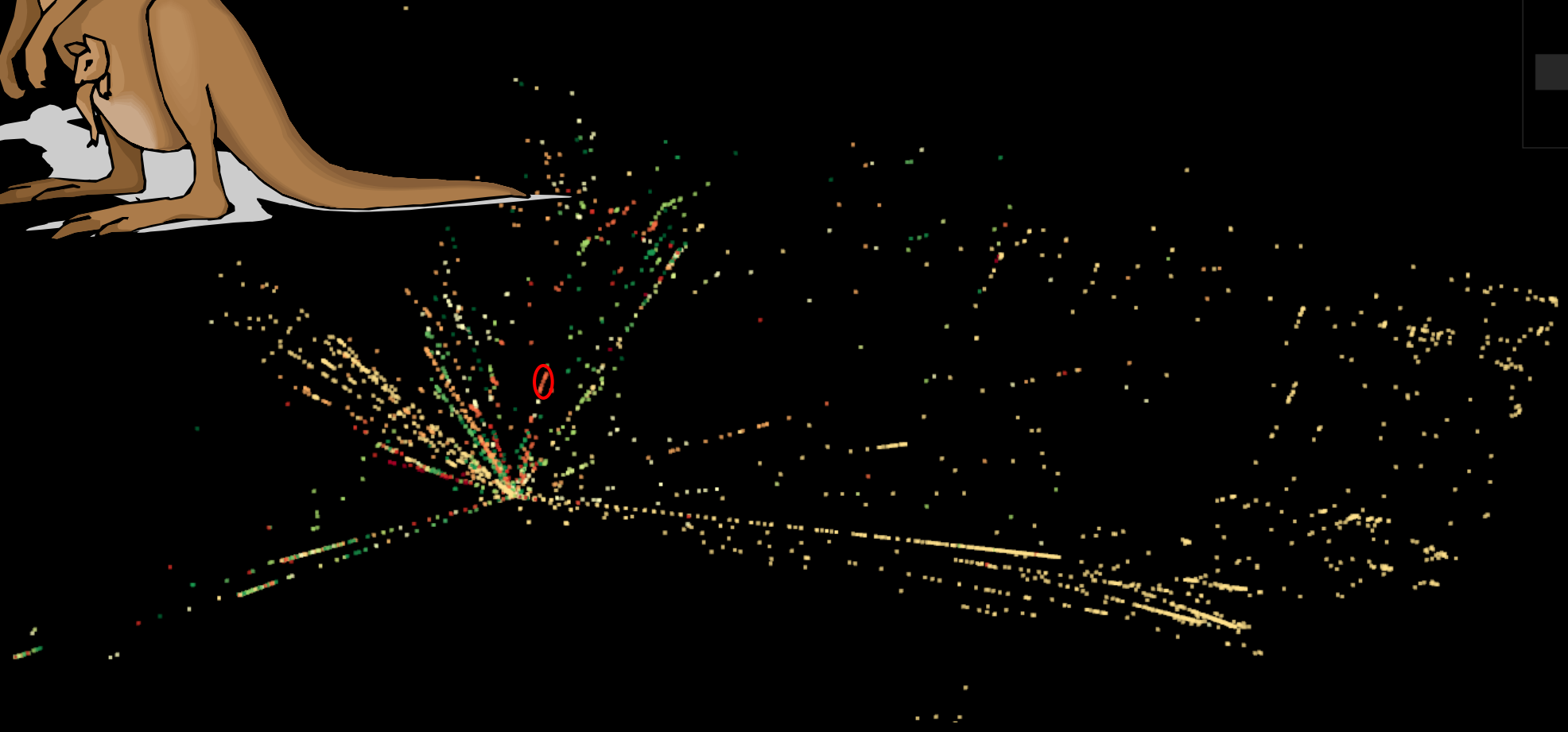


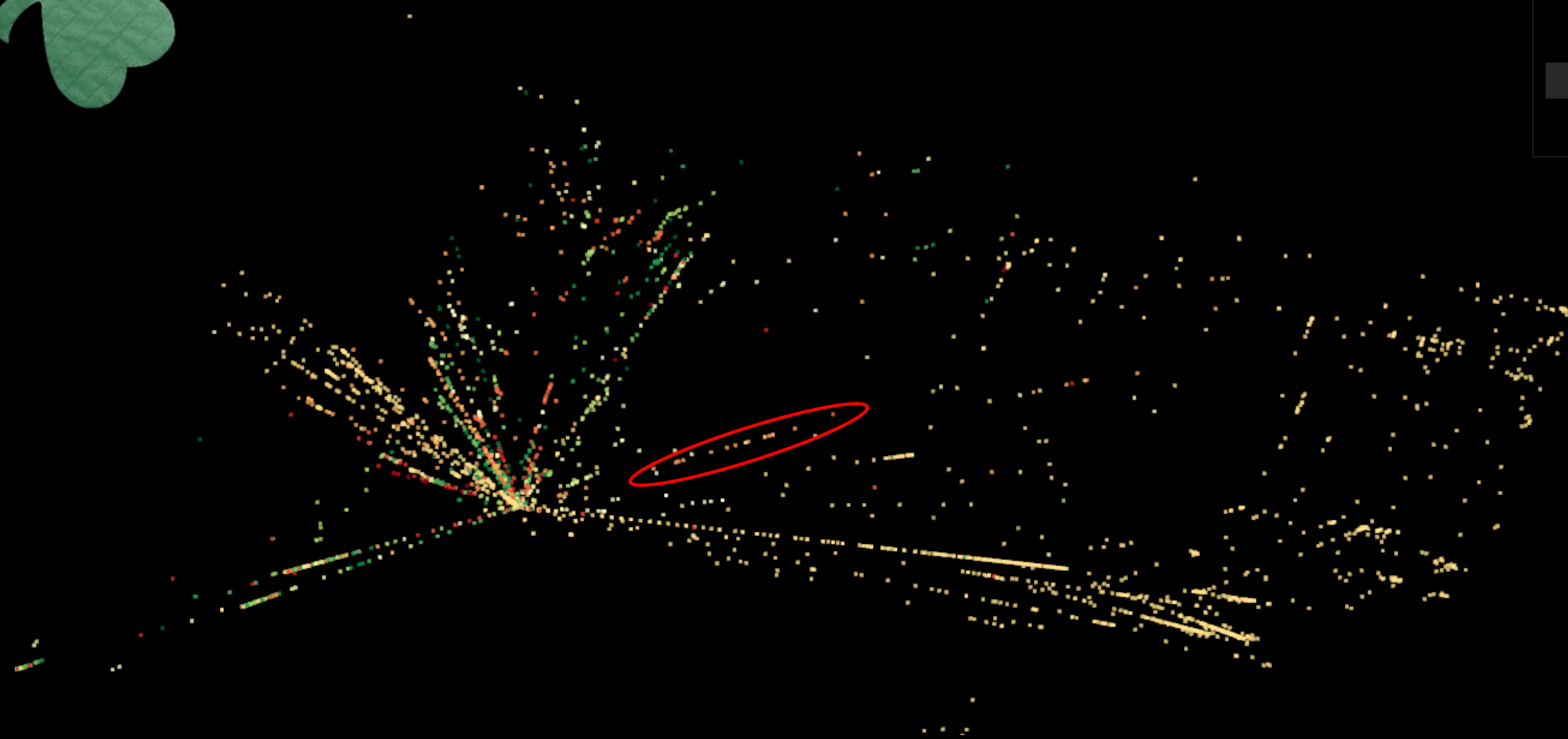
Billy Bob's Recommendations

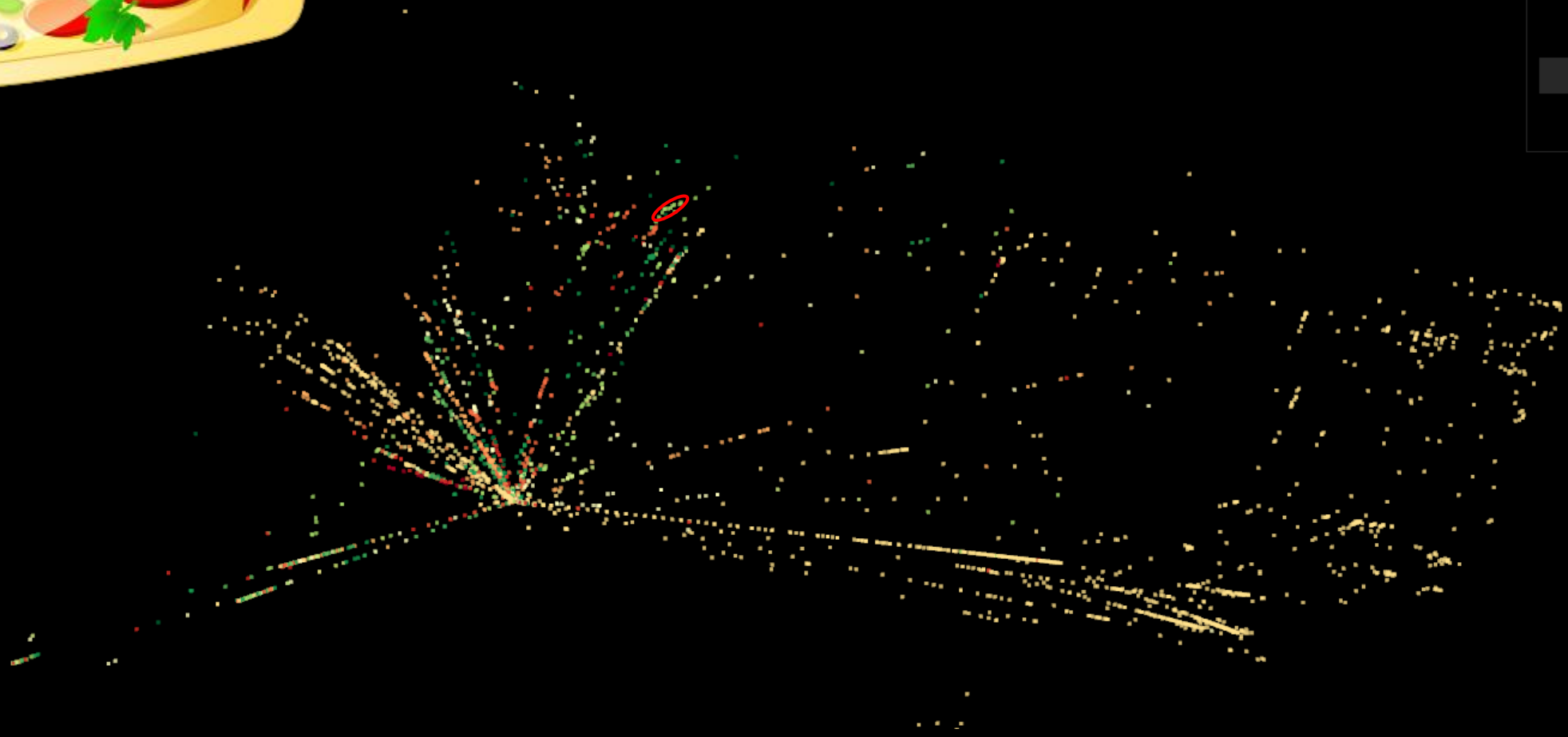


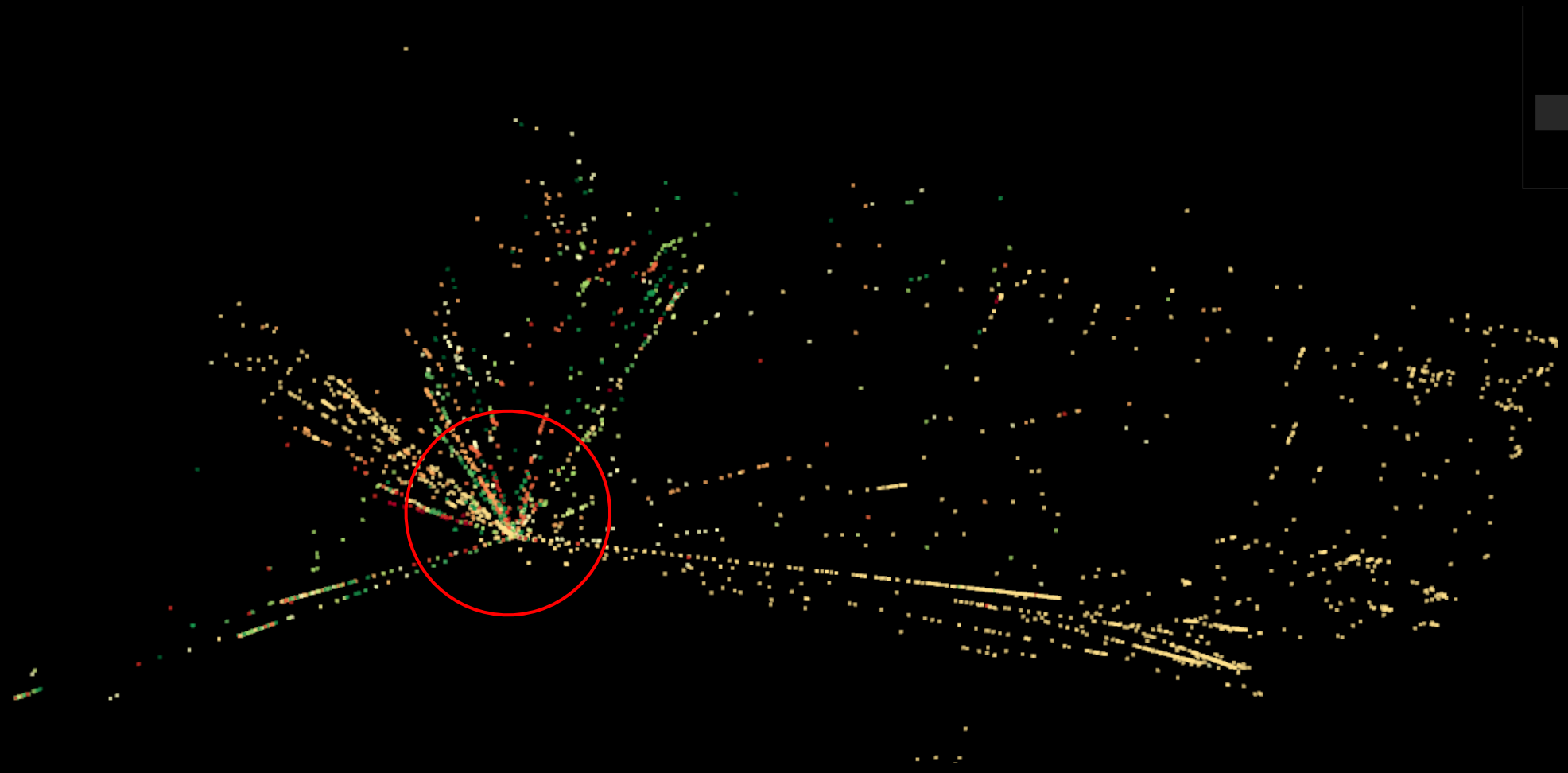


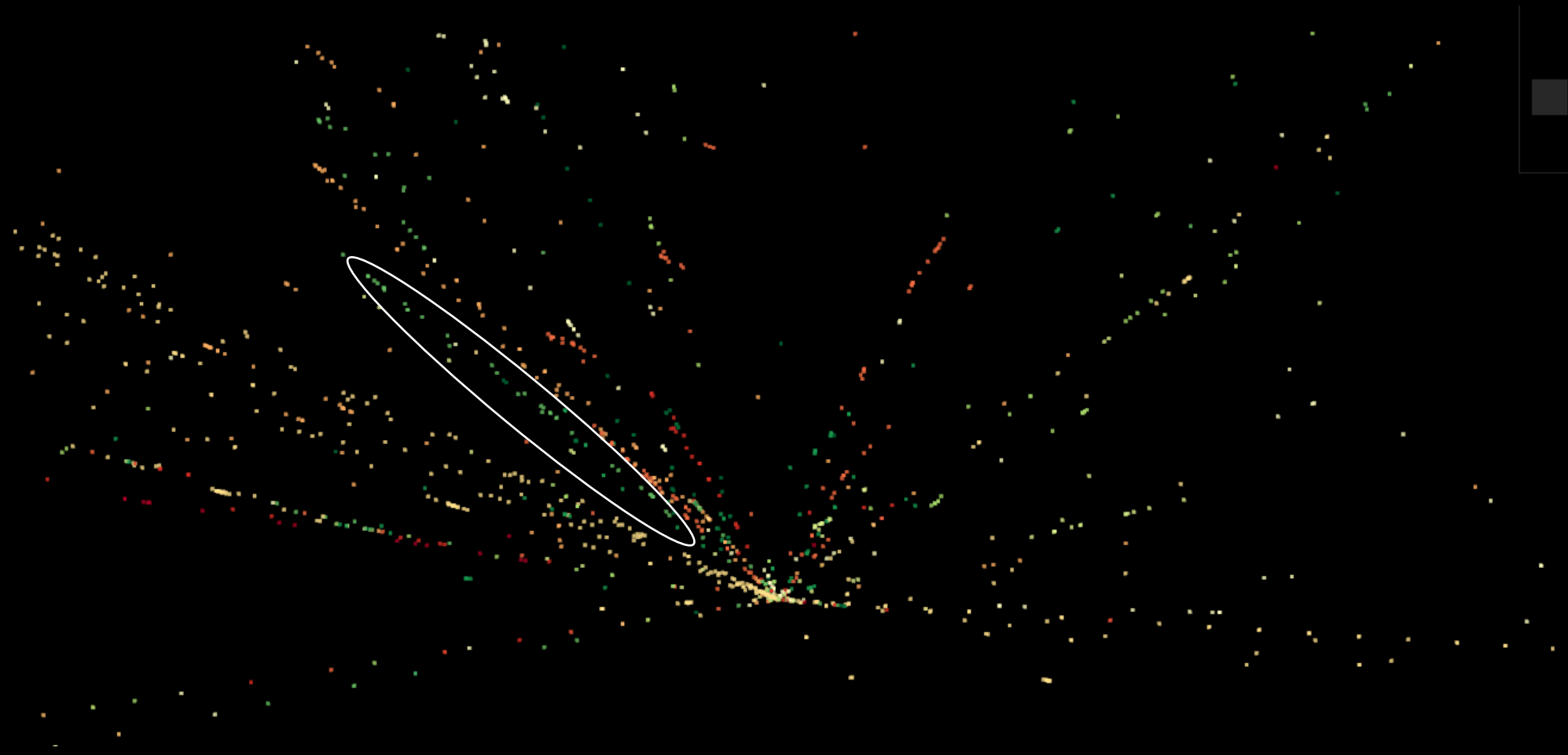


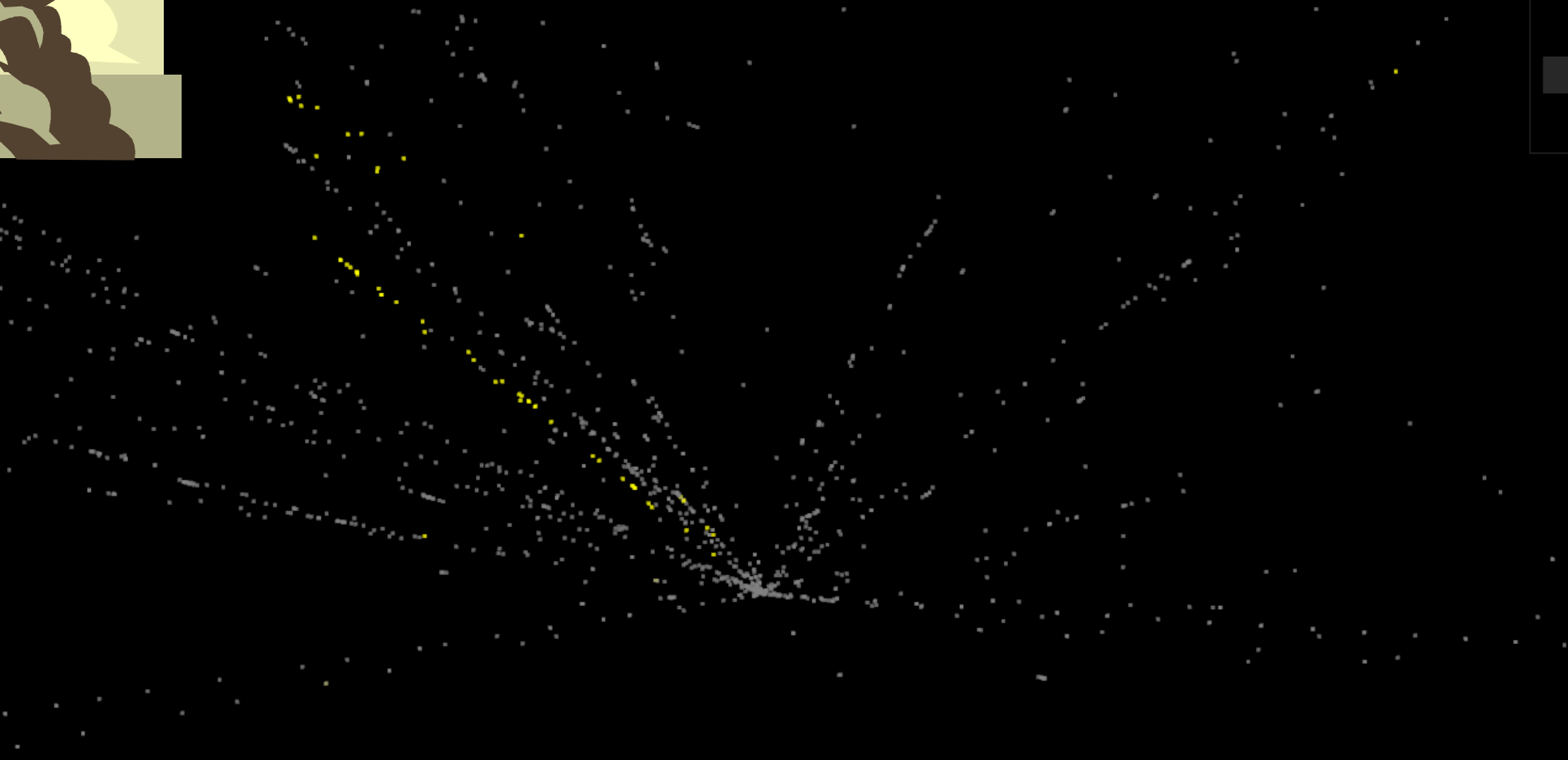


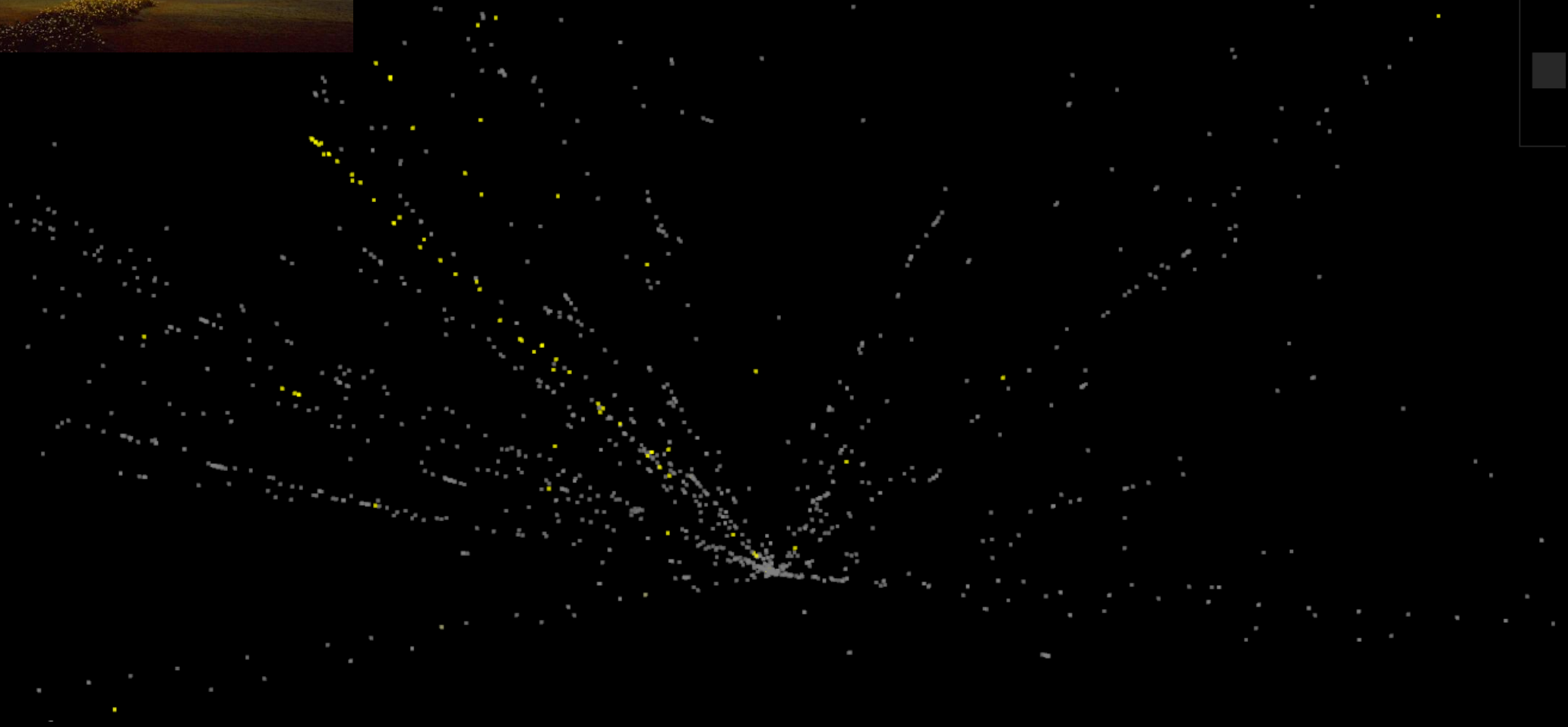


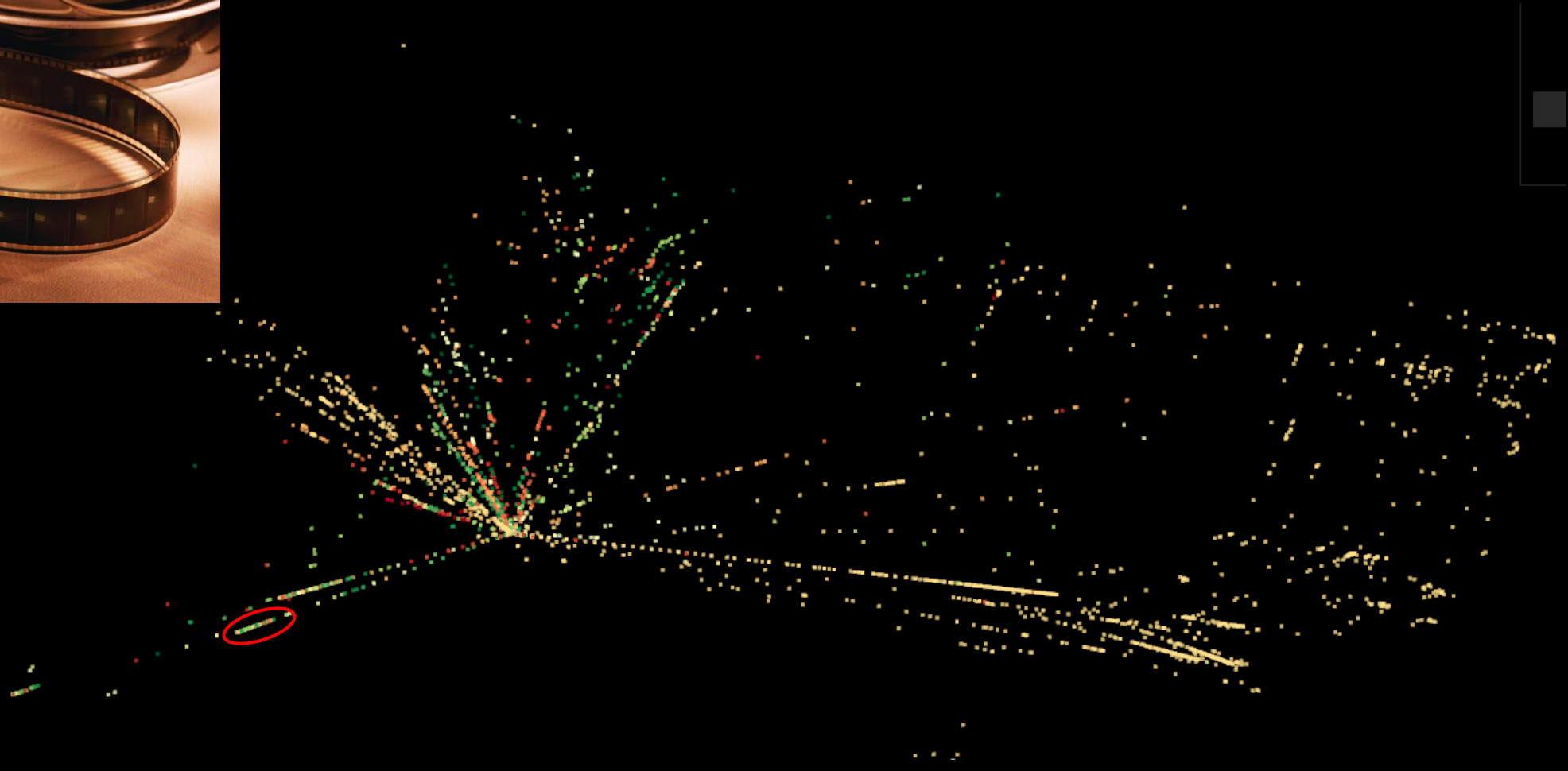


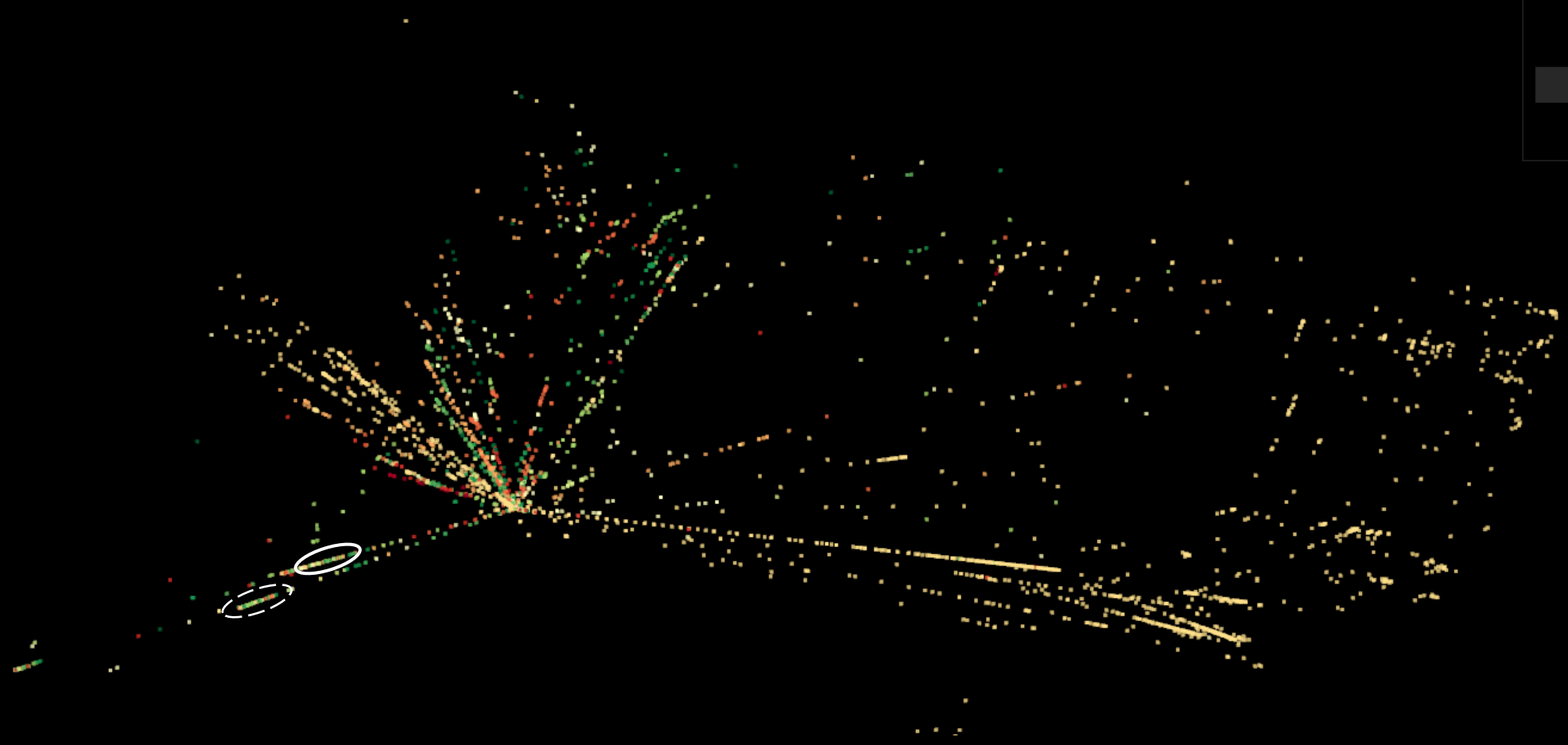












Future Work

Task Routing

Parameter Learning