

Thresholding

Is my gene expressed?

Alexis Weinreb

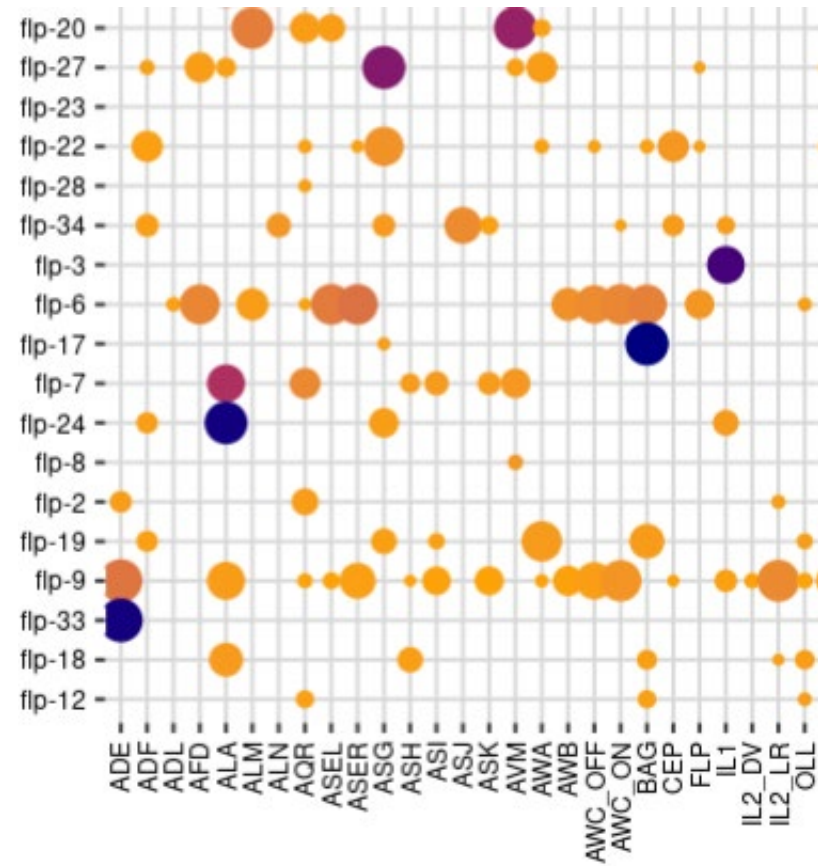
Hammarlund lab (Yale)



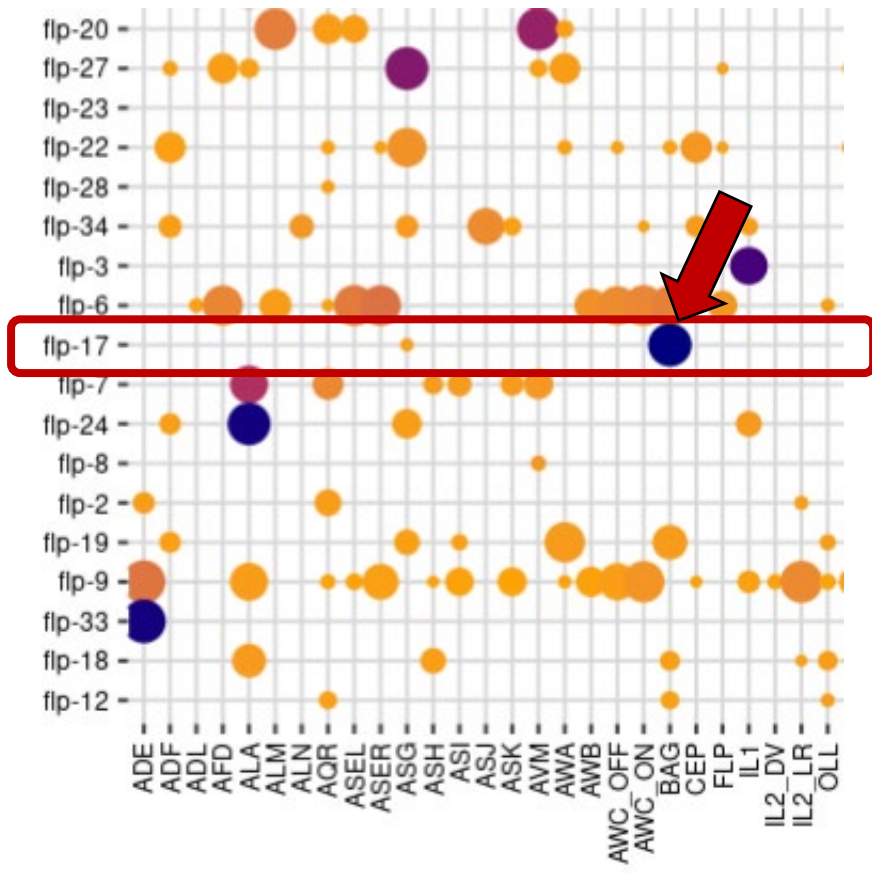
Yale University

- Differential expression (enrichment)

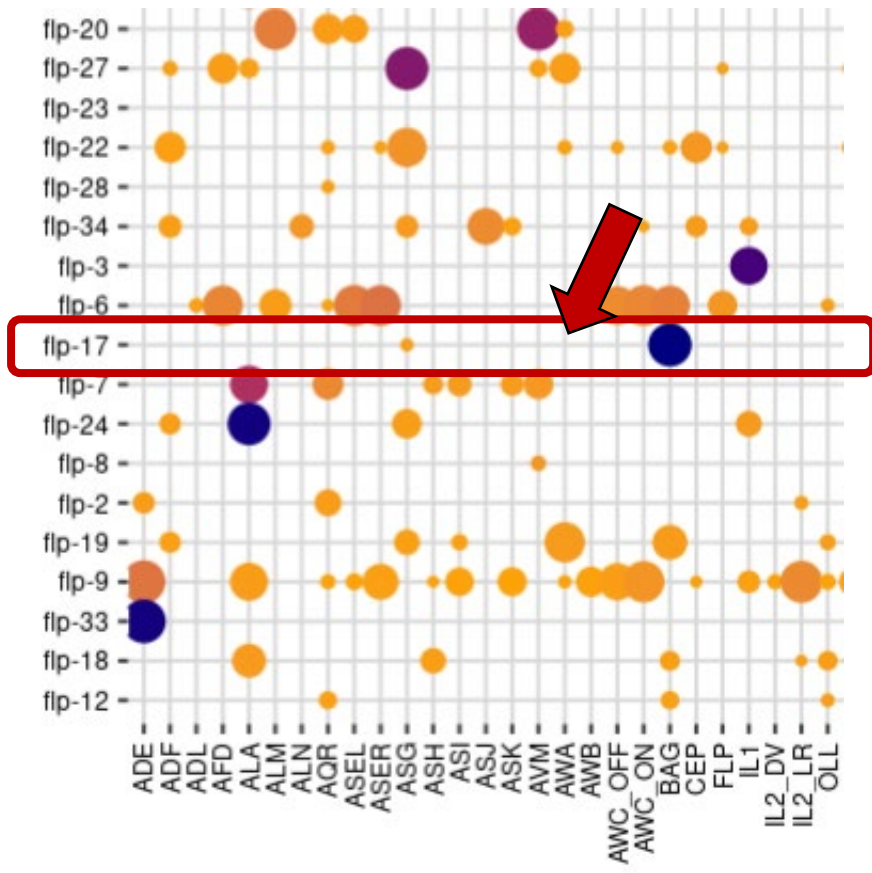
- Differential expression (enrichment)
- Expression (binary)



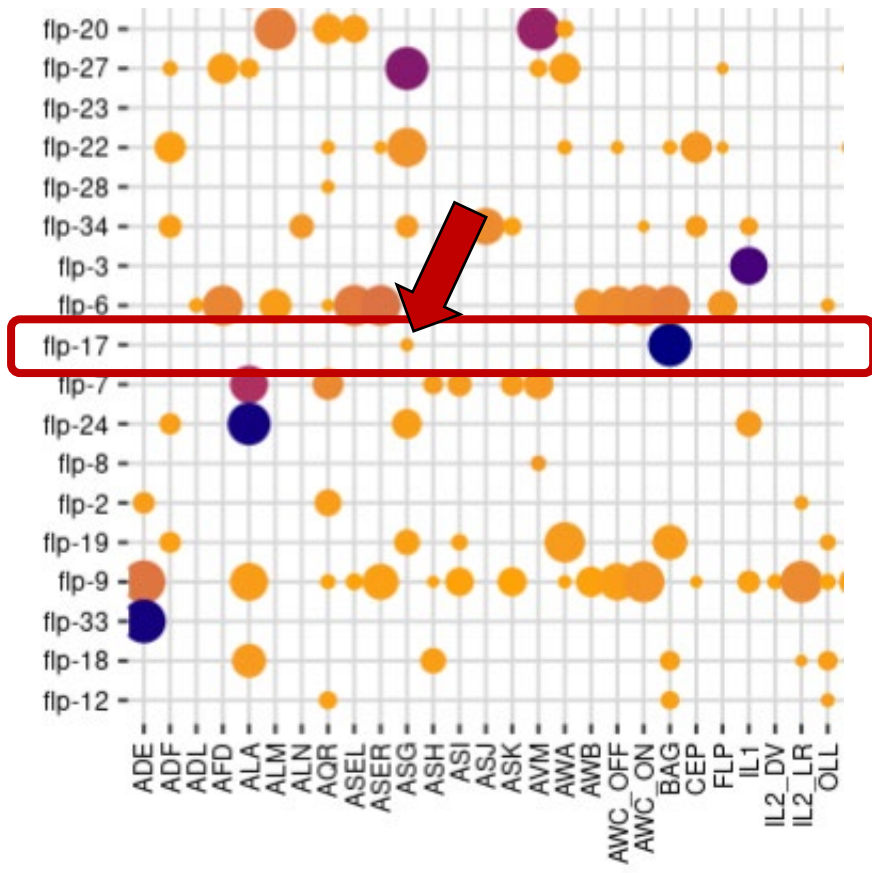
Easiest way: look at the expression levels
 Data-based threshold selection?



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“Ground truth” data

- 103 homeobox genes (Reilly et al., 2020)
- 14 innexins (Bhattacharya et al., 2019)
- 8 metabotropic receptors to neurotransmitters (Yemini et al., 2019)
- 23 pan-neuronal genes (Stefanakis et al., 2015)
- 12 non-neuronal genes (no single reference)

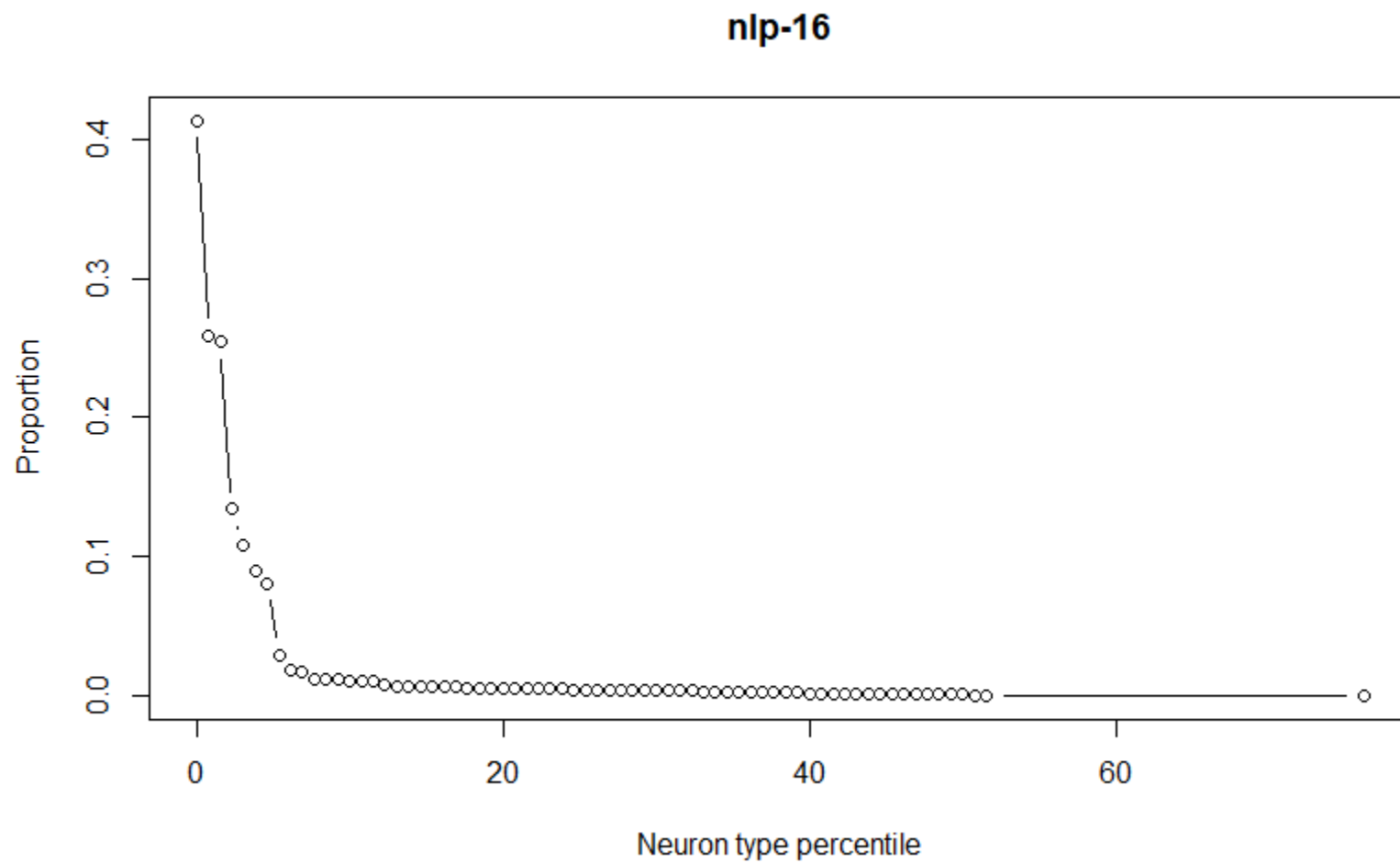
Thresholding approach

- For (gene,cluster): Compute proportion of cells with expression

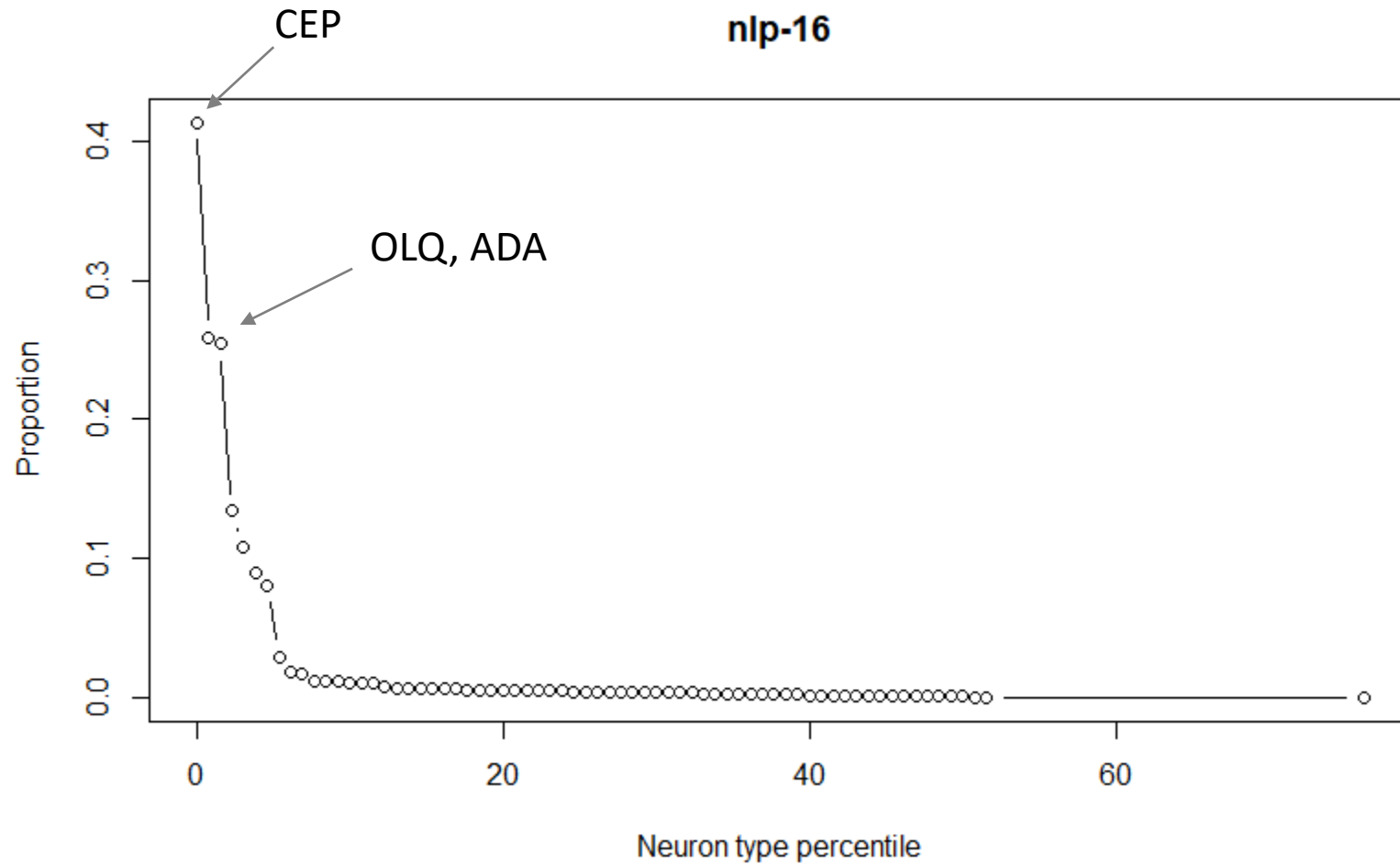
Thresholding approach

- For (gene,cluster): Compute proportion of cells with expression
- Threshold 1: pan-neuronal
- Threshold 2: non-neuronal
- Else: percentile threshold

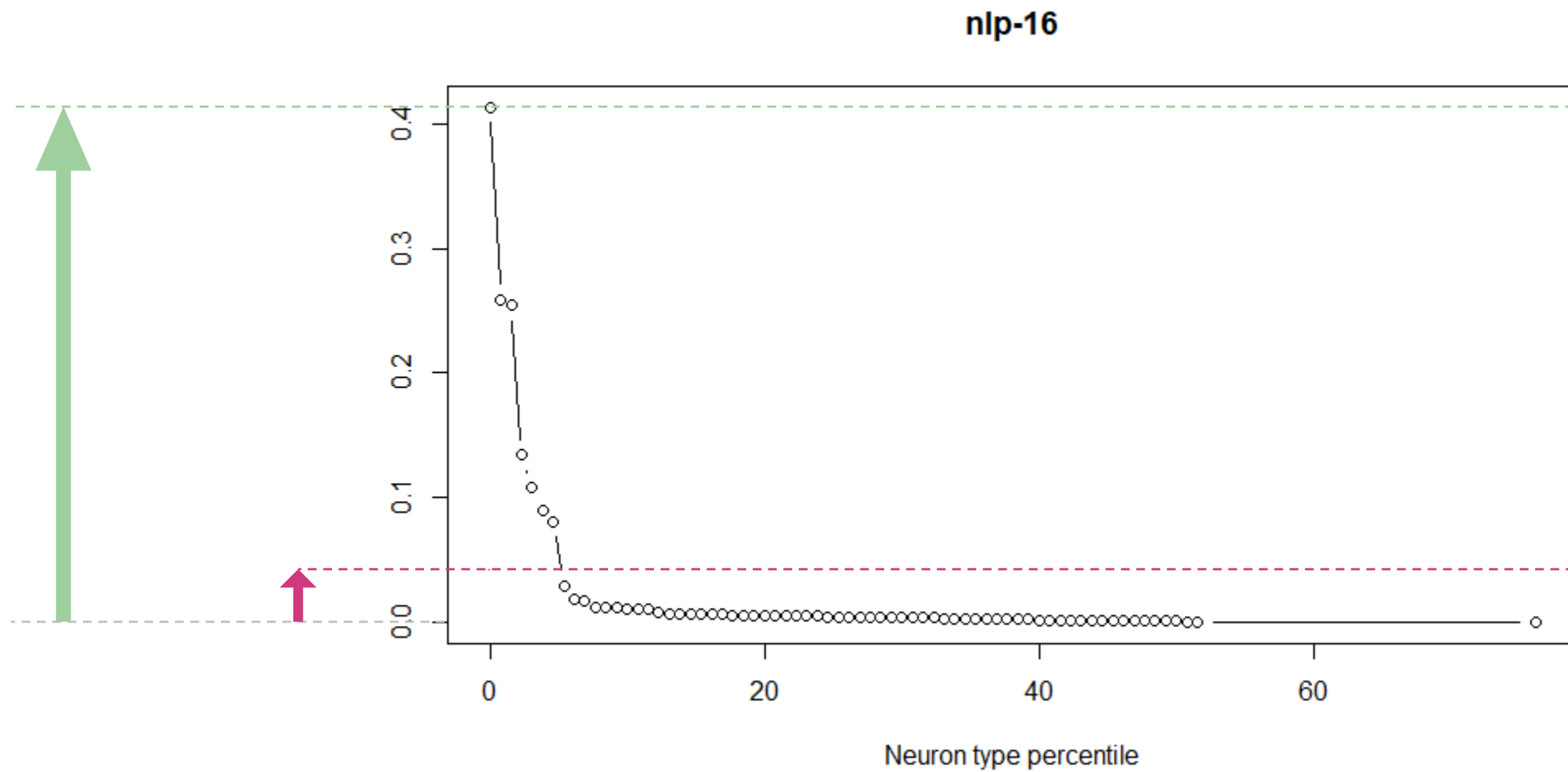
Percentile thresholding



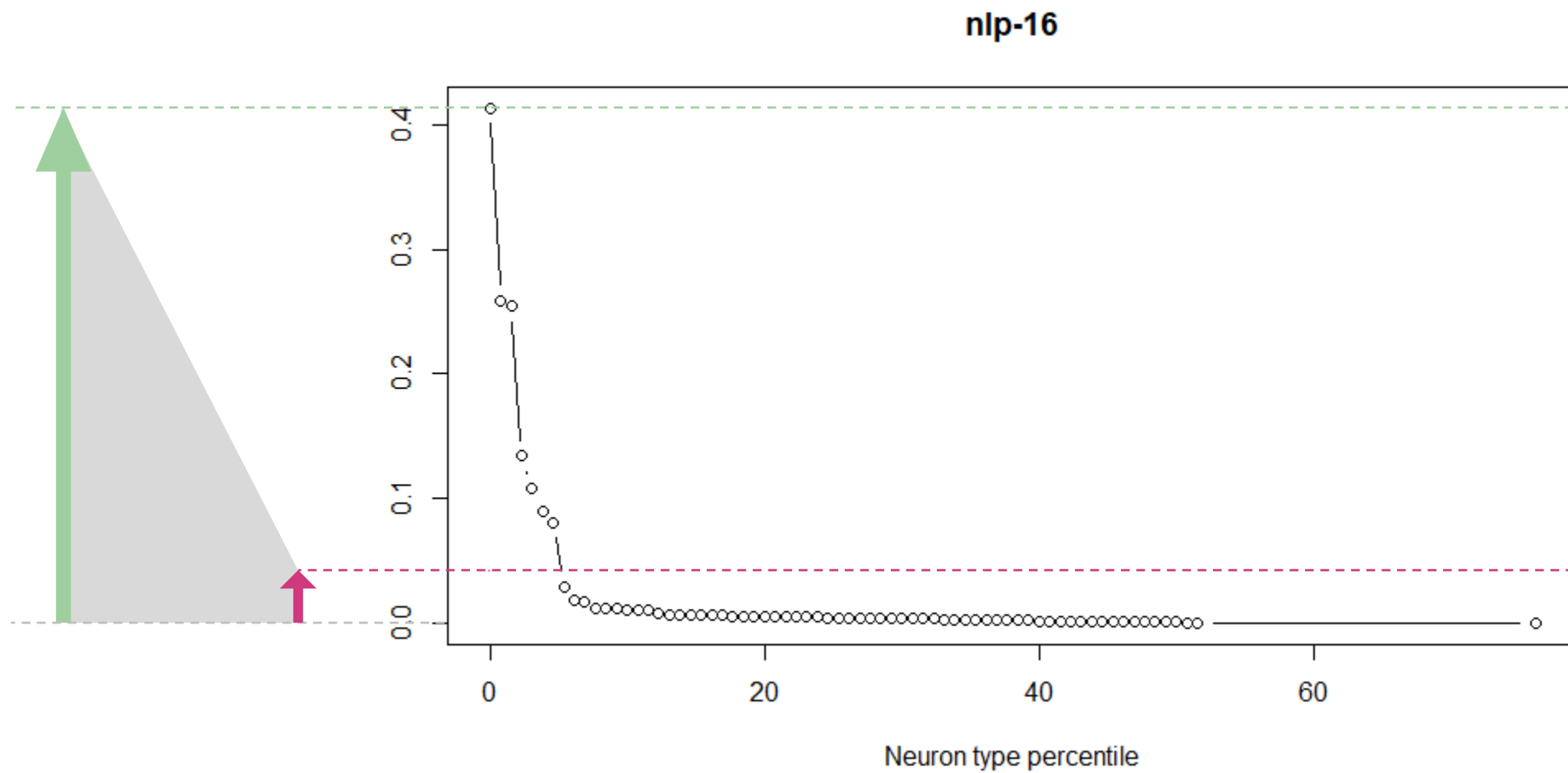
Percentile thresholding



Percentile thresholding



Percentile thresholding

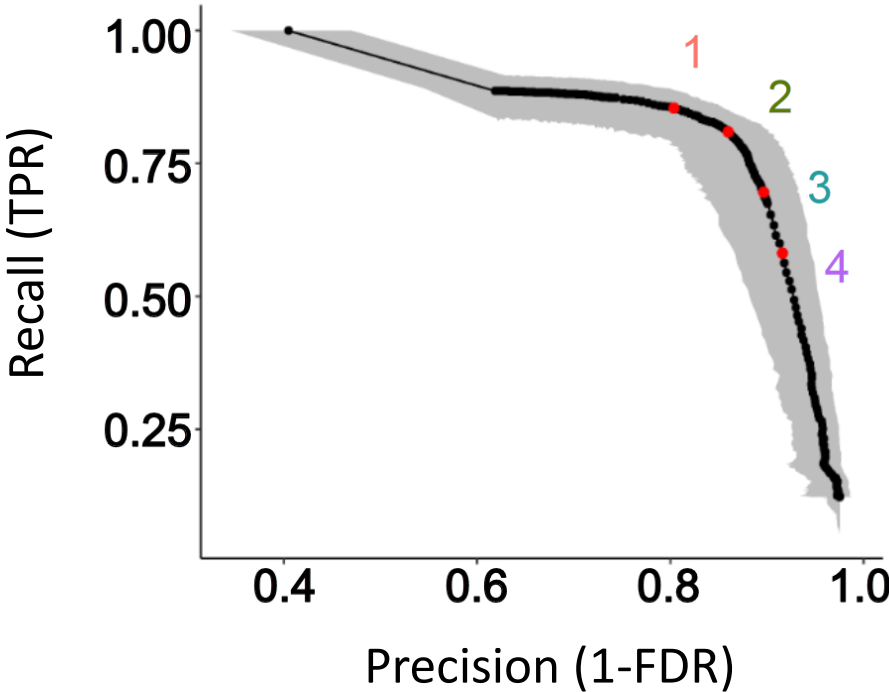


Threshold evaluation

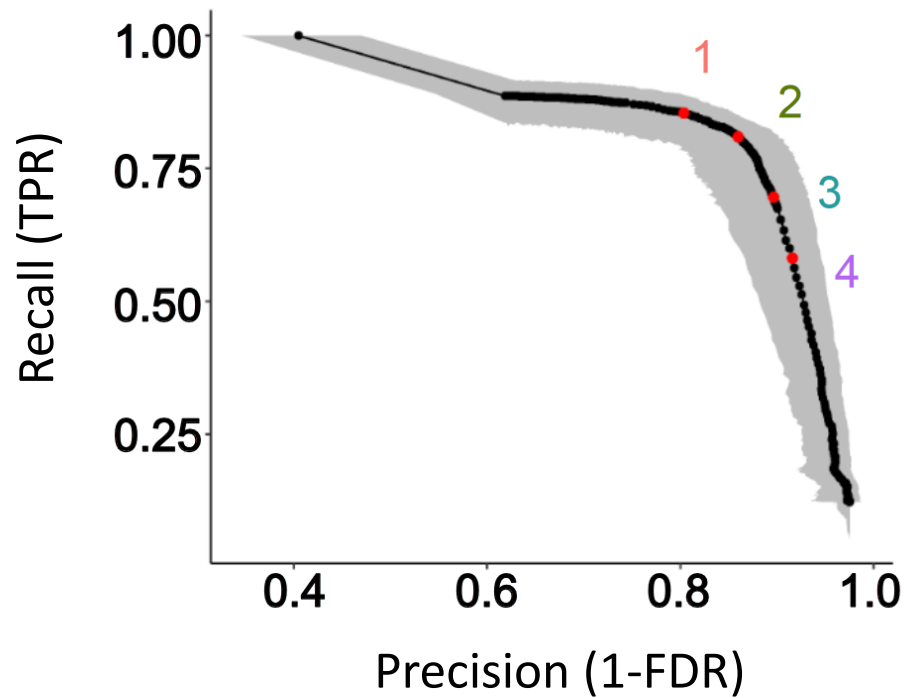
True Positive Rate: $TPR = \frac{\#correctly\ called}{\#expressed}$

False Discovery Rate: $FDR = \frac{\#incorrectly\ called}{\#called}$

Threshold evaluation

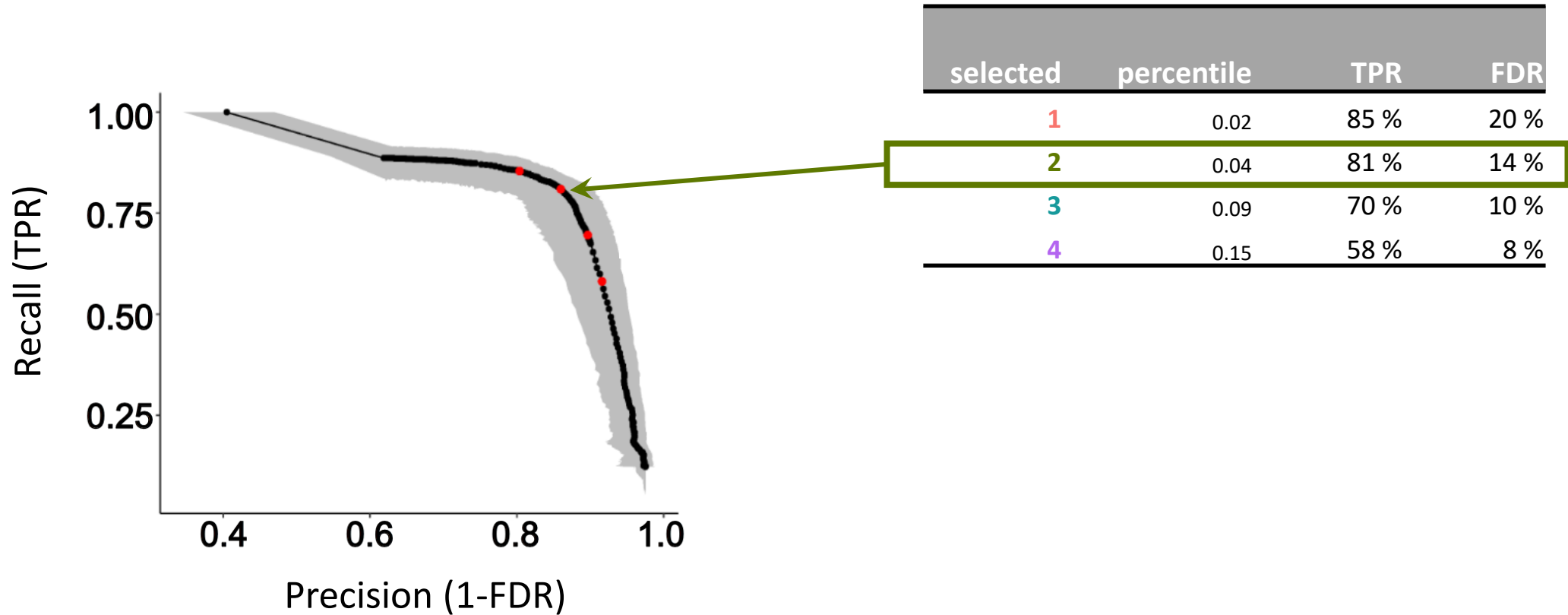


Threshold evaluation



selected	percentile	TPR	FDR
1	0.02	85 %	20 %
2	0.04	81 %	14 %
3	0.09	70 %	10 %
4	0.15	58 %	8 %

Threshold evaluation



Acknowledgments

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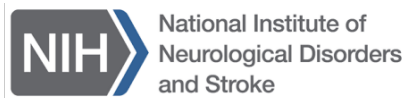


CeNGEN

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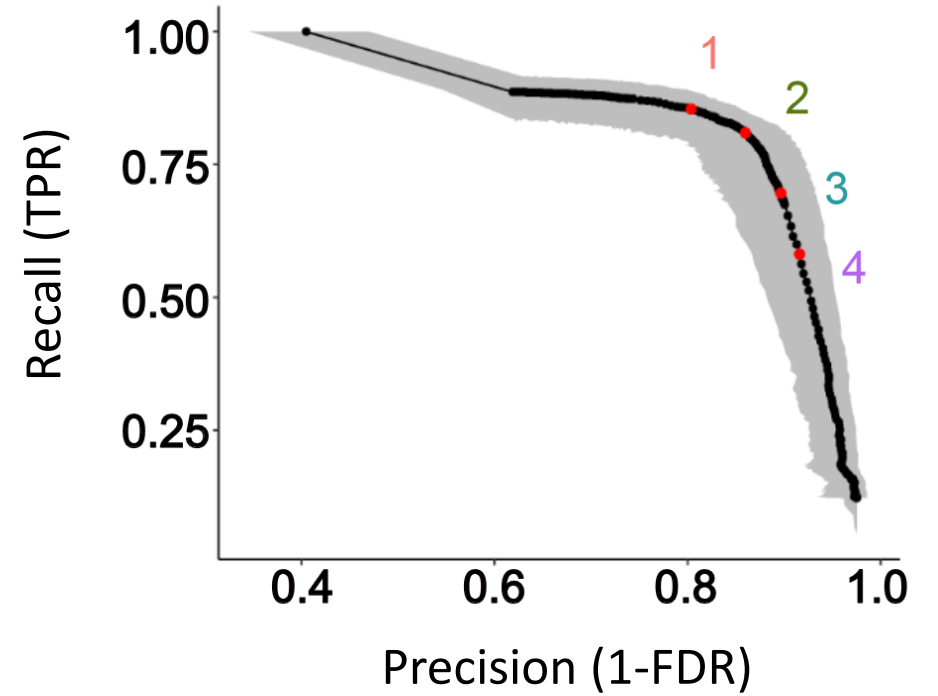
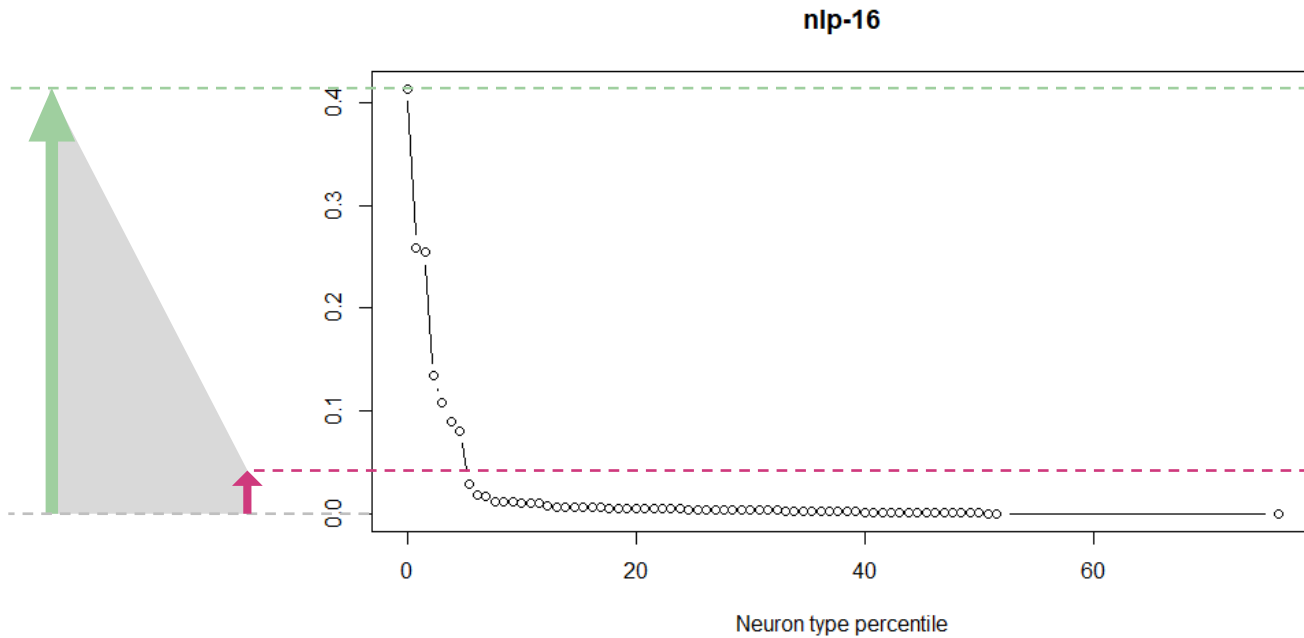


Yale University

VANDERBILT UNIVERSITY

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

Questions



selected	percentile	TPR	FDR
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