



The Vision of our Furry Friends: An Exploratory Analysis of Decoding in Mice

Elijah Tai



motivation
methods + results
future direction



motivation

methods + results

future direction

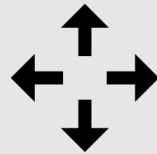
Noisy



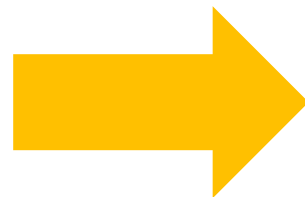
Temporal



Spatial



Noisy



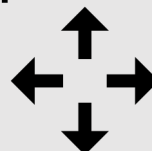
Regularization



Temporal



Spatial



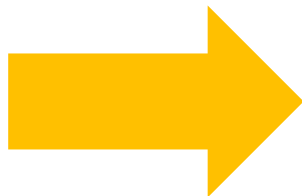
Noisy



Regularization



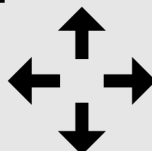
Temporal



Time Windows



Spatial



Noisy



Regularization



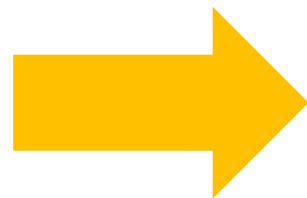
Temporal



Time Windows



Spatial



Partitions



Noisy



Regularization



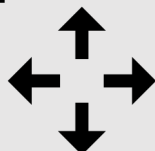
Temporal



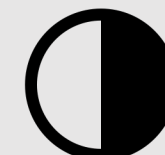
Time Windows



Spatial



Partitions



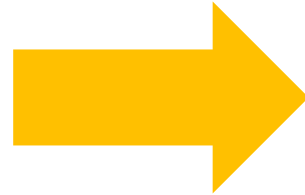
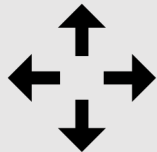
Noisy



Temporal



Spatial



Visualization



motivation



methods + results

future direction

Noisy



Regularization



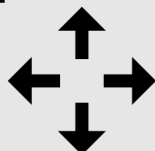
Temporal



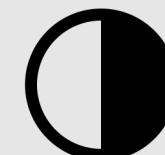
Time Windows

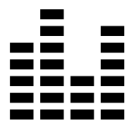


Spatial



Partitions

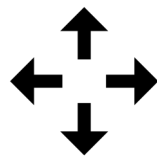




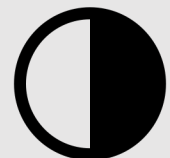
Regularization



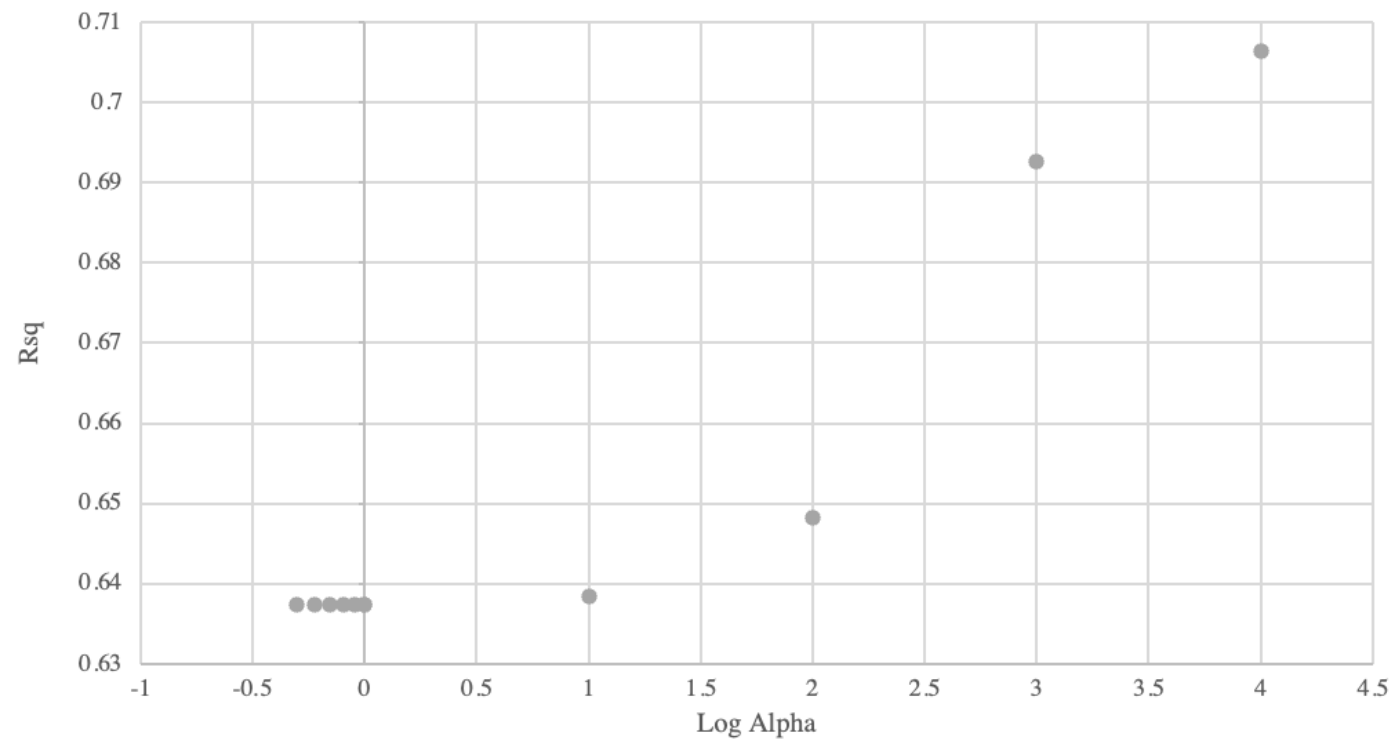
Time Windows

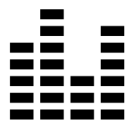


Partitions



Full Data: Rsq vs Alpha

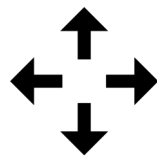




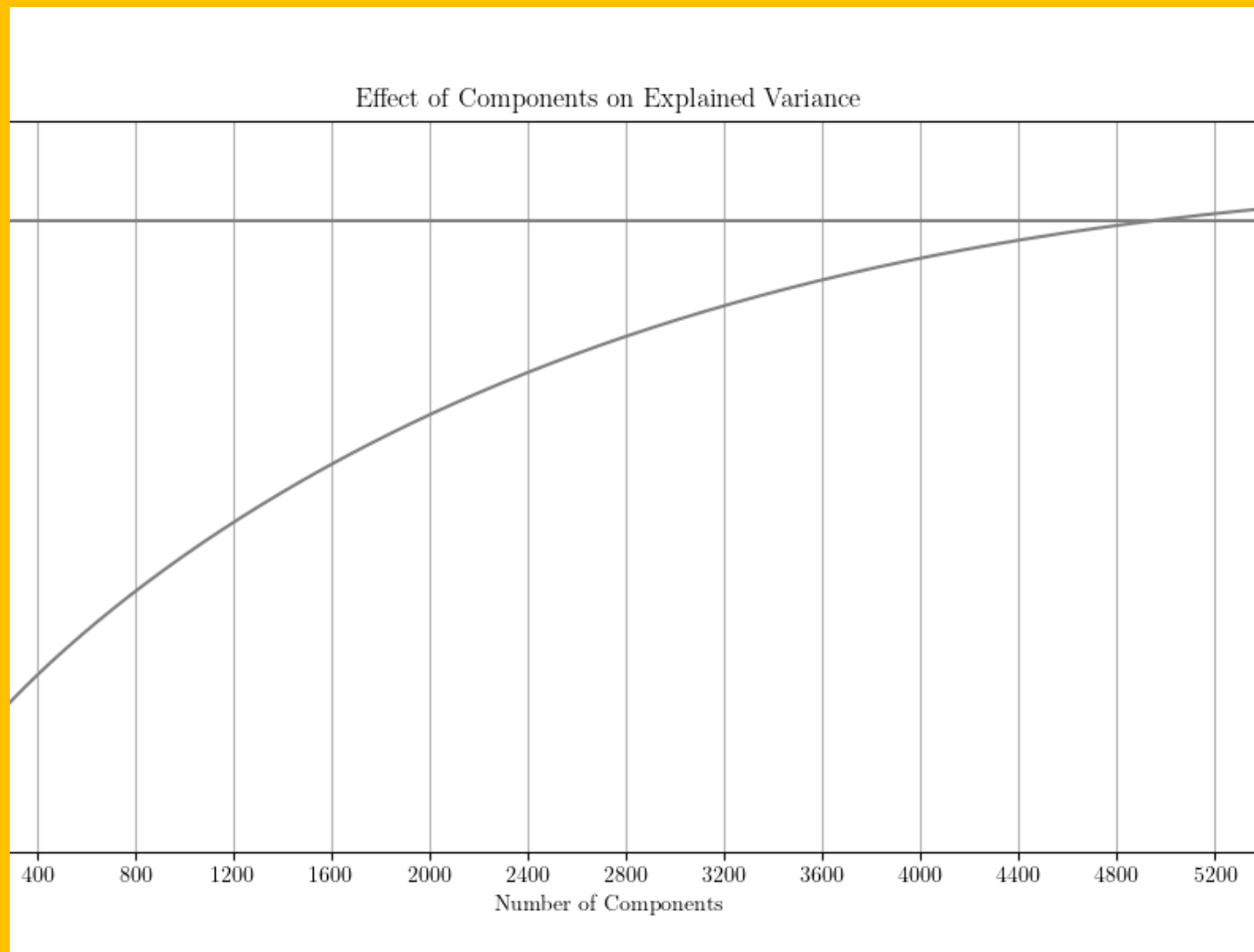
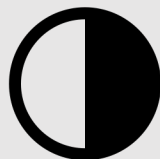
Regularization

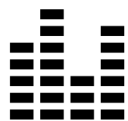


Time Windows



Partitions

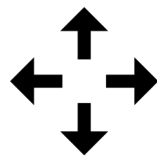




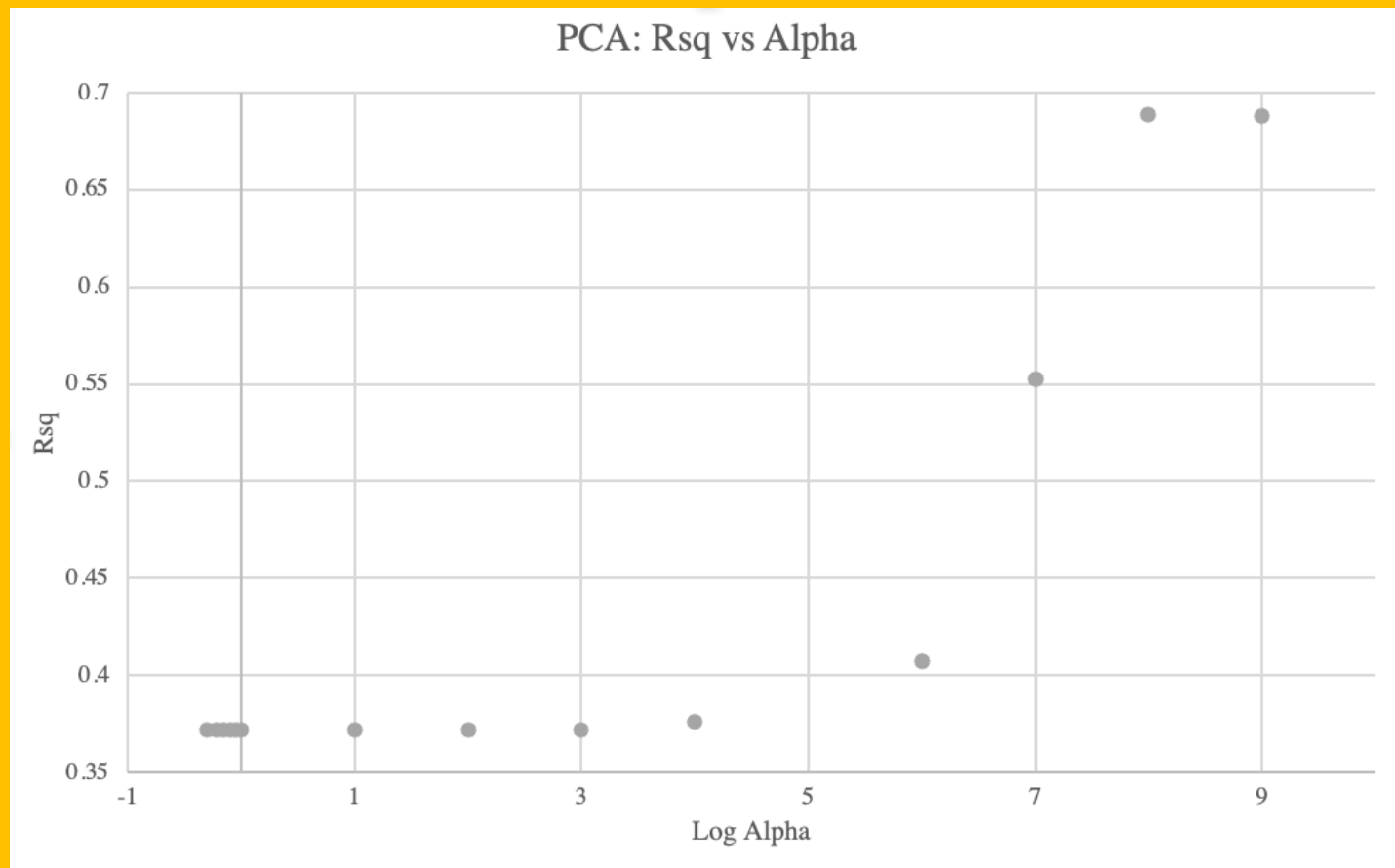
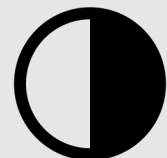
Regularization

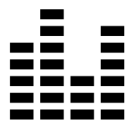


Time Windows



Partitions

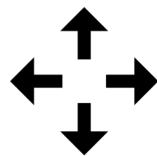




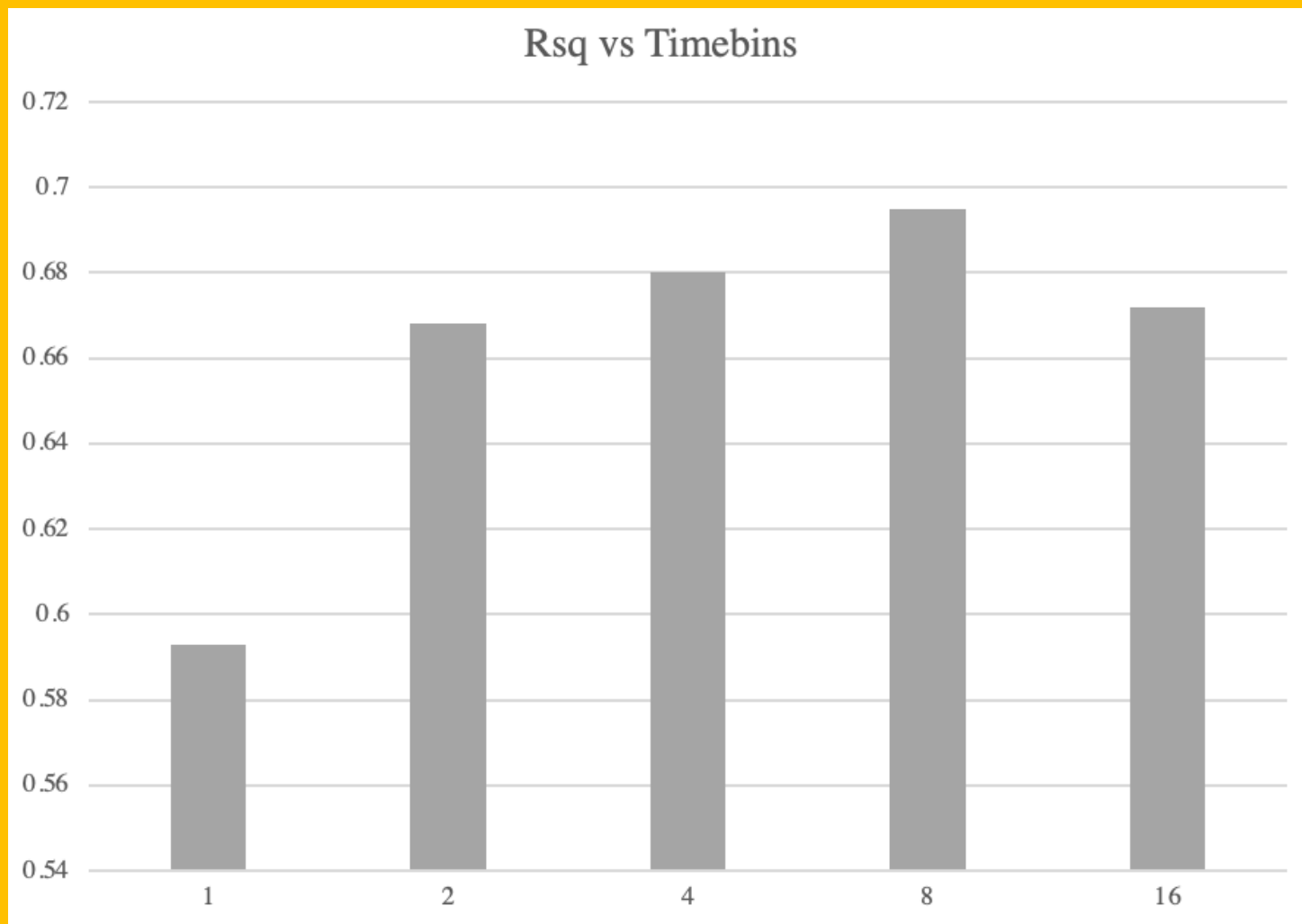
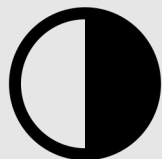
Regularization

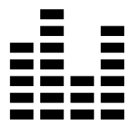


Time Windows



Partitions

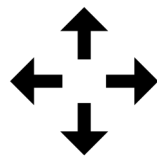




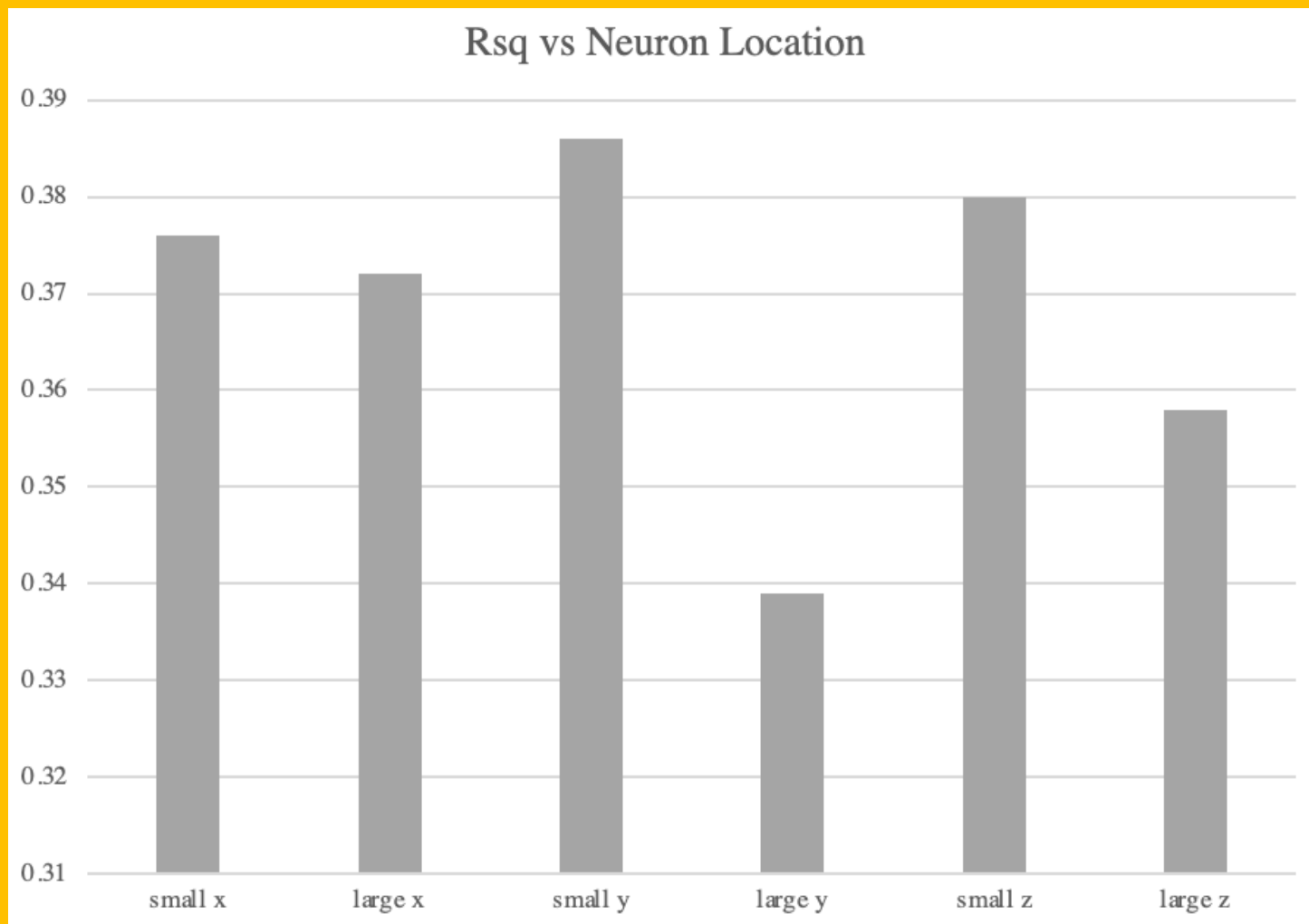
Regularization

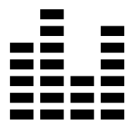


Time Windows



Partitions

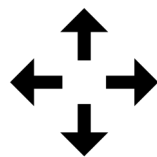




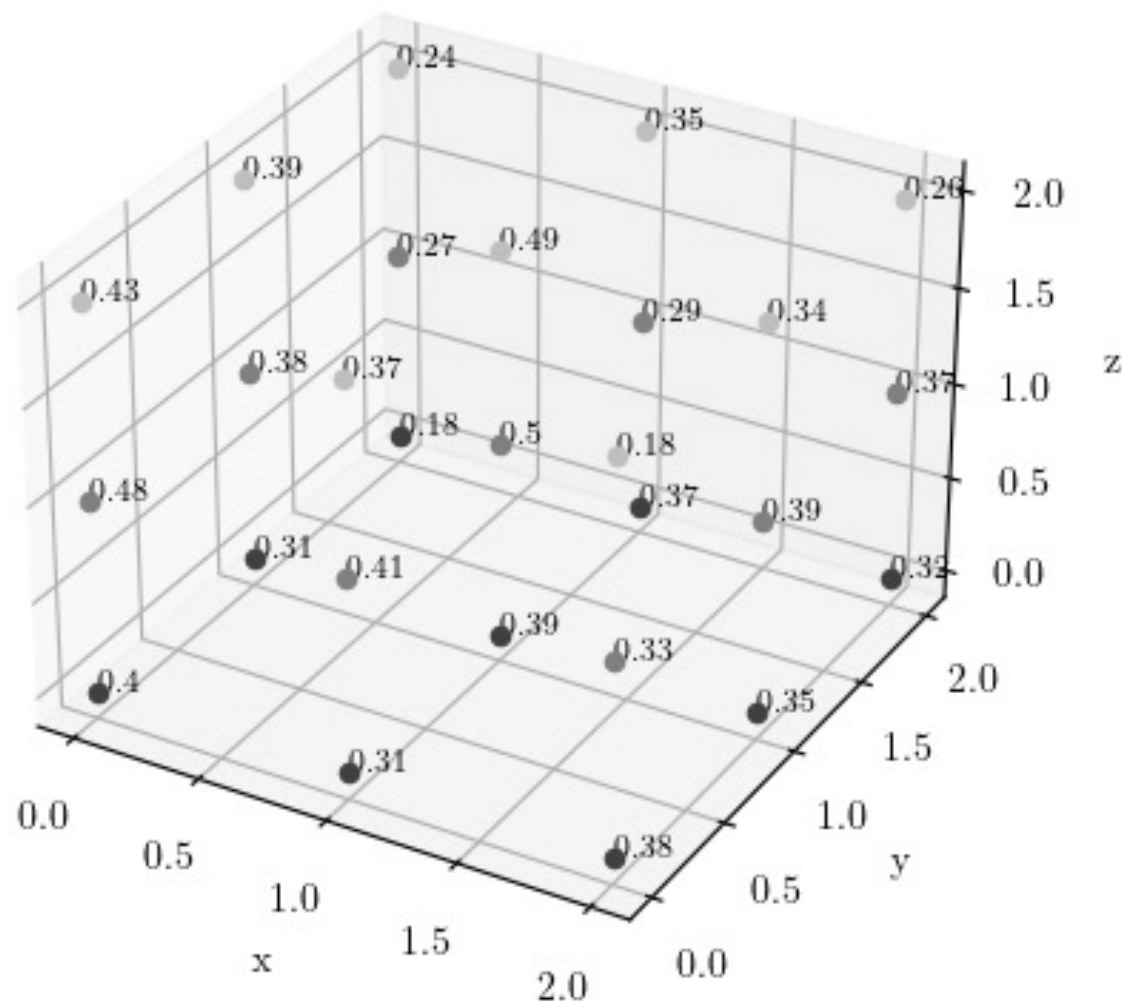
Regularization

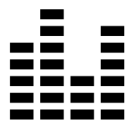


Time Windows



Partitions

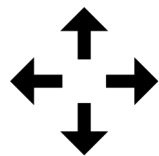




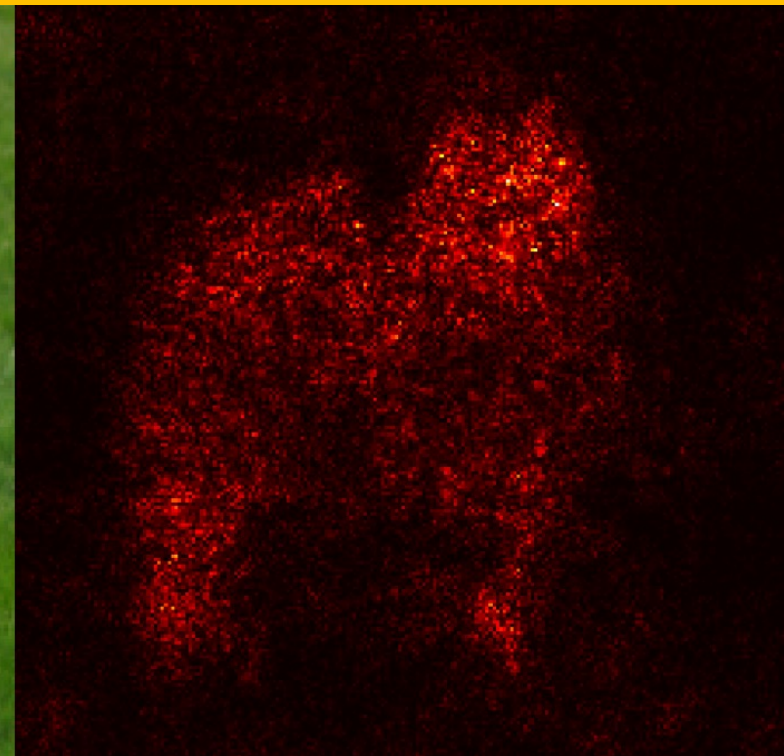
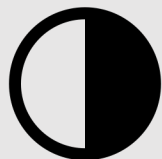
Regularization

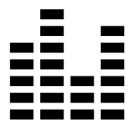


Time Windows



Partitions

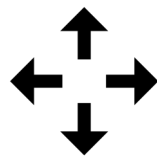




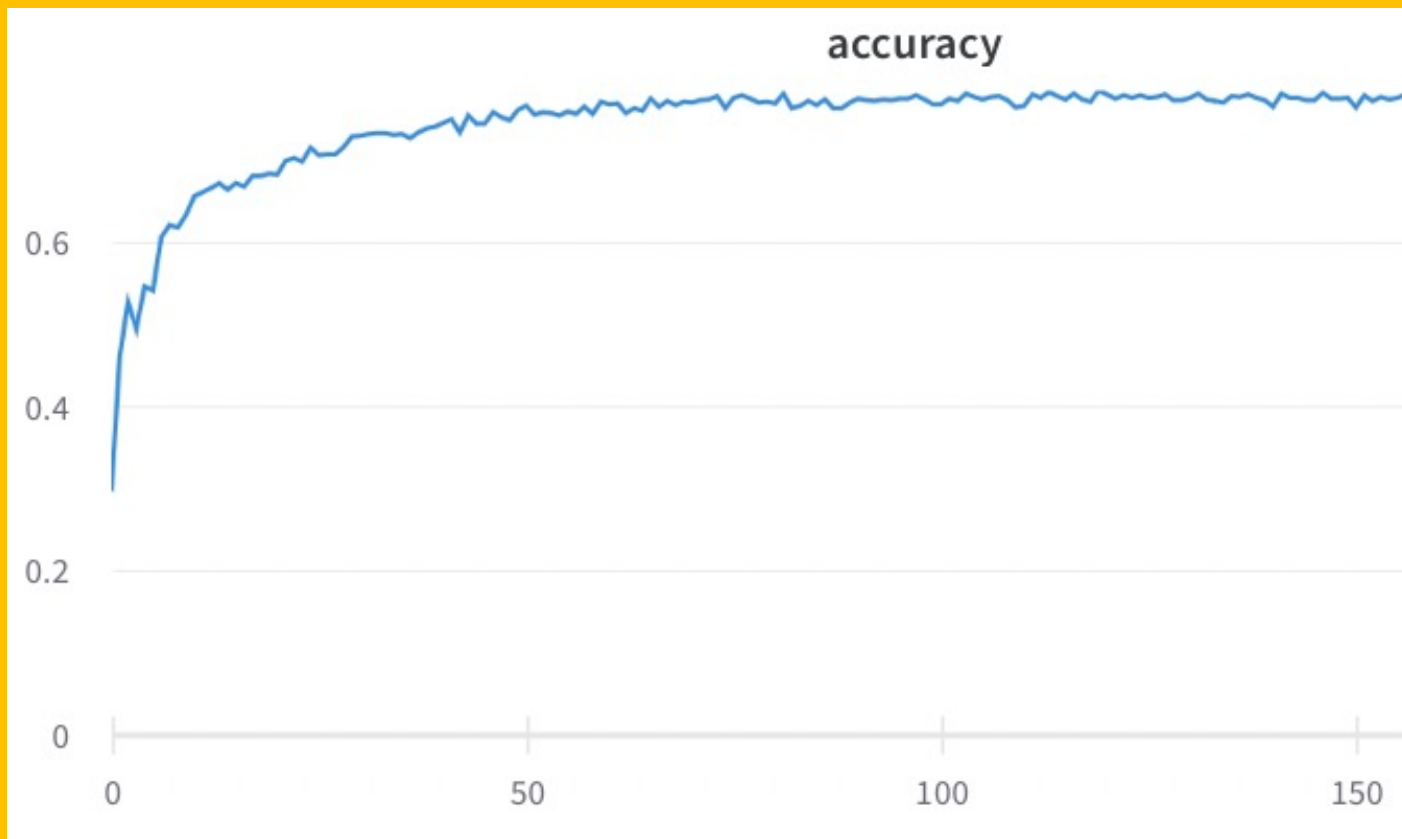
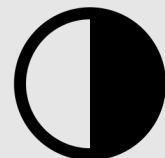
Regularization

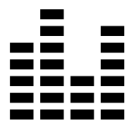


Time Windows



Partitions

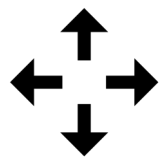




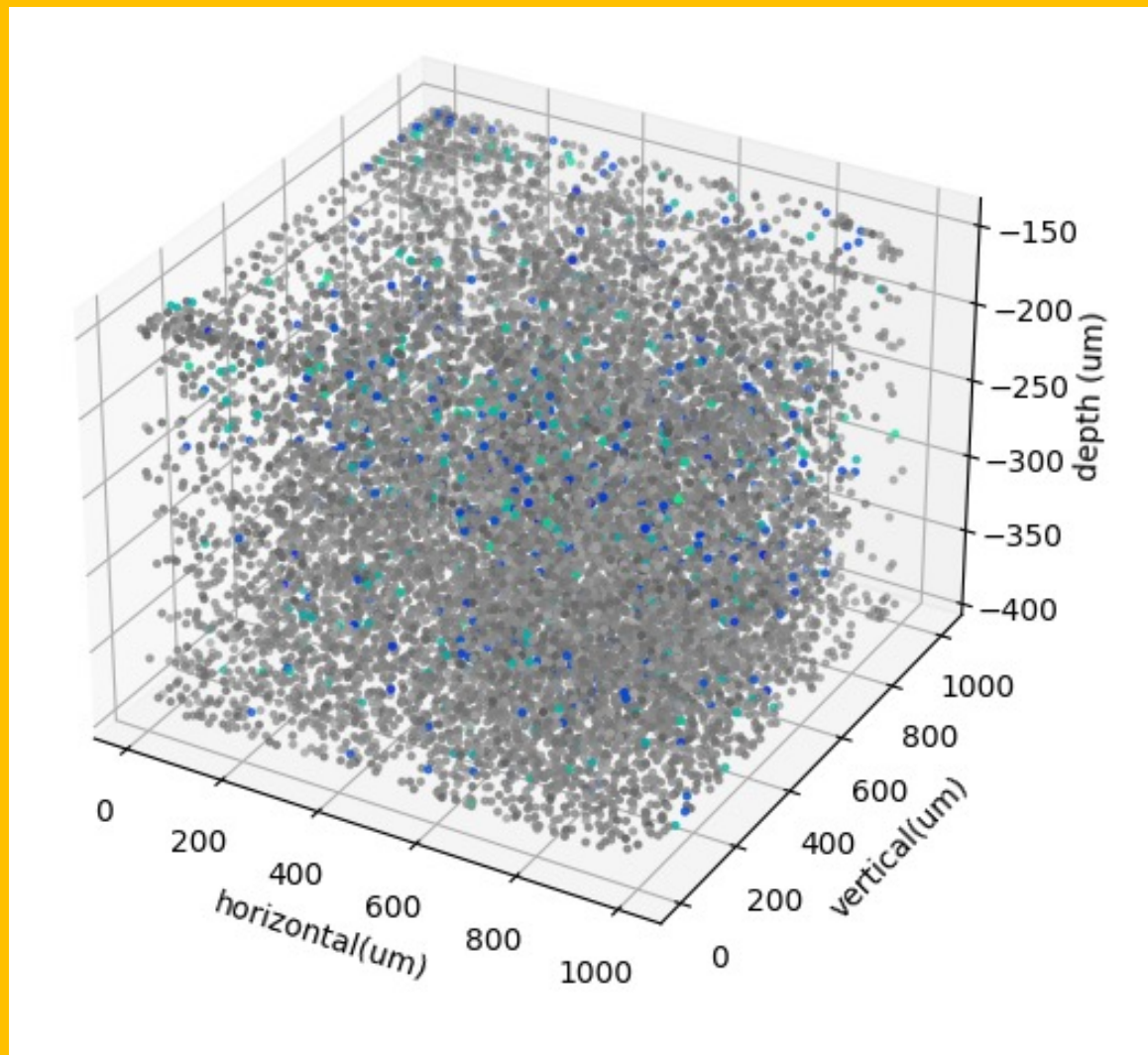
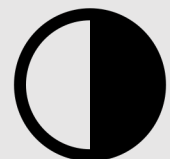
Regularization

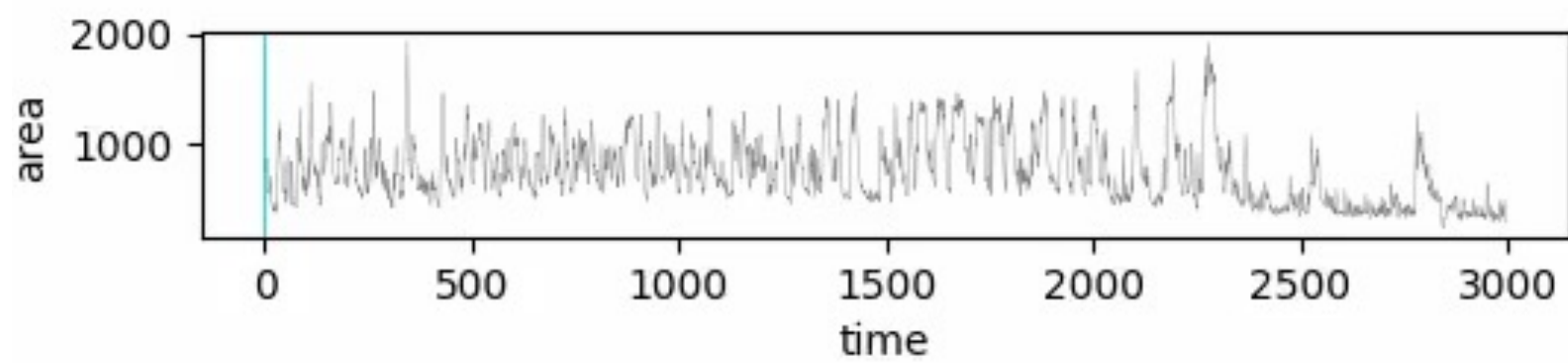
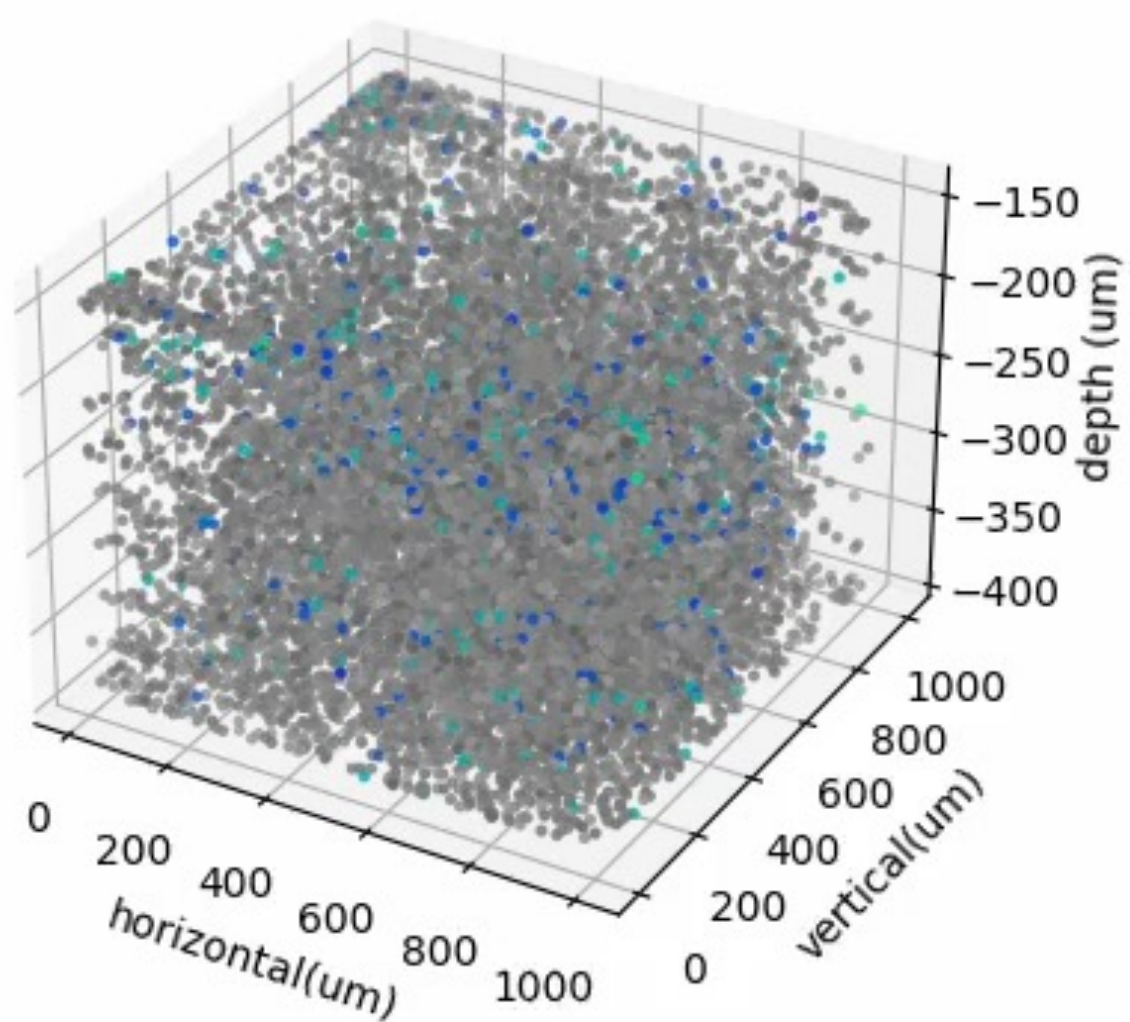


Time Windows



Partitions





motivation

methods + results



future direction

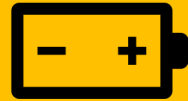
Analysis

Implementation

Quantitative
Analysis



Unexplored
Data

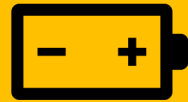


Implementation

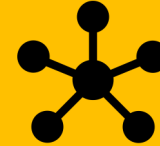
Quantitative
Analysis



Unexplored
Data



Clustering
Neur. & Behav.



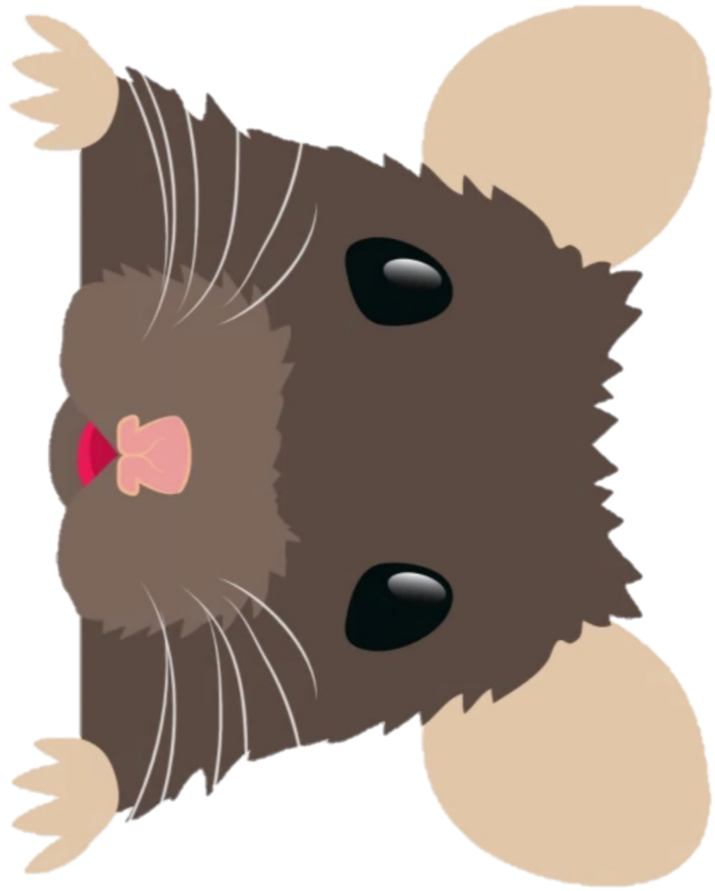
Better
Heatmaps





references

- Glaser, J. I., Benjamin, A. S., Chowdhury, R. H., Perich, M. G., Miller, L. E., and Kording, K. P. Machine learning for neural decoding. *eNeuro*, 7(4):ENEURO.0506–19.2020, August 2020.
- Liu, C., Li, M., Wang, R., Cui, X., Jung, H., Halin, K., You, H., Yang, X., and Chen, W. Online decoding system with calcium image from mice primary motor cortex. In *2021 43rd Annual International Conference of the IEEE Engineering in Medicine Biology Society (EMBC)*, pp. 6402–6405, 2021. doi: 10.1109/EMBC46164.2021.9630138.
- Montijn, J. S., Vinck, M., and Pennartz, C. M. A. Population coding in mouse visual cortex: response reliability and dissociability of stimulus tuning and noise correlation. *Frontiers in Computational Neuroscience*, 8, 2014. ISSN 1662-5188. doi: 10.3389/fncom.2014.00058. URL <https://www.frontiersin.org/articles/10.3389/fncom.2014.00058>.
- Stringer, C., Pachitariu, M., Steinmetz, N., Reddy, C. B., Carandini, M., and Harris, K. D. Spontaneous behaviors drive multidimensional, brainwide activity. *Science*, 364(6437):255, April 2019.
- Tang, J., Yuan, F., Shen, X., Wang, Z., Rao, M., Yuanyuan, H., Sun, Y., Li, X., Zhang, W., Li, Y., Gao, B., Qian, H., Bi, G., Song, S., Yang, J. J., and Wu, H. Bridging biological and artificial neural networks with emerging neuromorphic devices: Fundamentals, progress, and challenges. *Advanced Materials*, 31:1902761, 12 2019. doi: 10.1002/adma.201902761.
- van Gerven, M. A. J., Seeliger, K., Güçlü, U., and Güçlütürk, Y. *Current Advances in Neural Decoding*, pp. 379–394. Springer International Publishing, Cham, 2019. ISBN 978-3-030-28954-6. doi: 10.1007/978-3-030-28954-6_21. URL https://doi.org/10.1007/978-3-030-28954-6_21.



Thank you!