Control of Neurons

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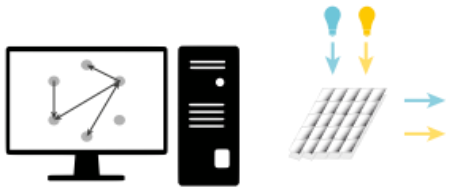
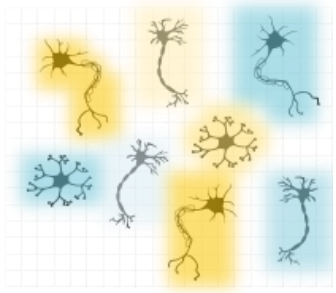
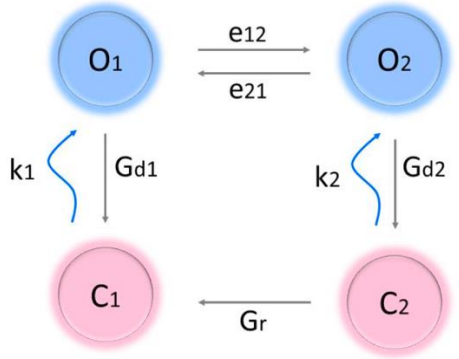
Goal: controlling a network of neurons → First step: controlling a single neuron → Learning the parameters



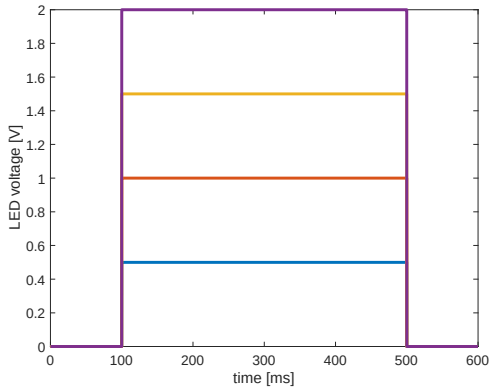
compute photocurrents for each cell using mathematical model

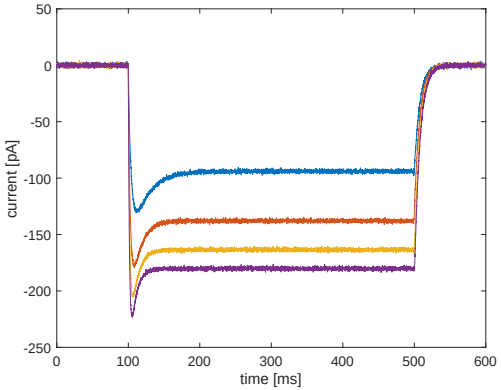


stimulate using optogenetics



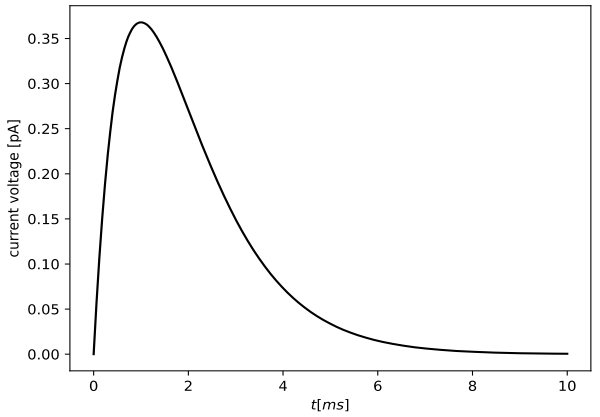
Four-state model of Channelrhodopsin

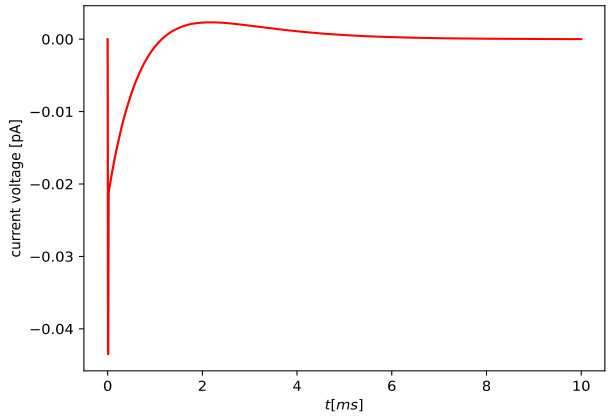


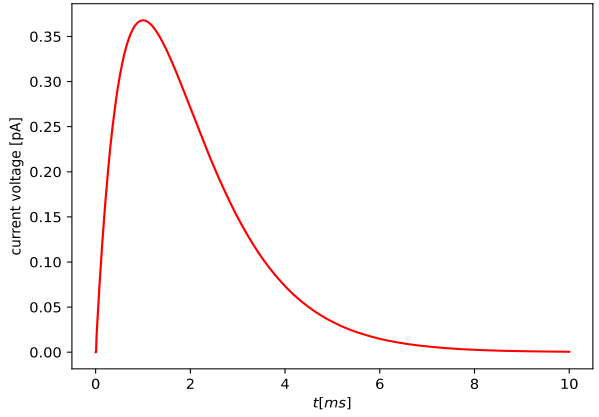


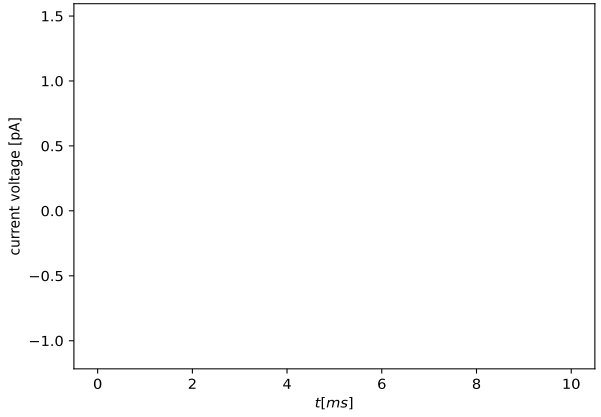
Prior?

Target current → Designed light → Current → Resampling









A way to include amplitude information from signals to ordinal pattern analysis *(submitted soon)*

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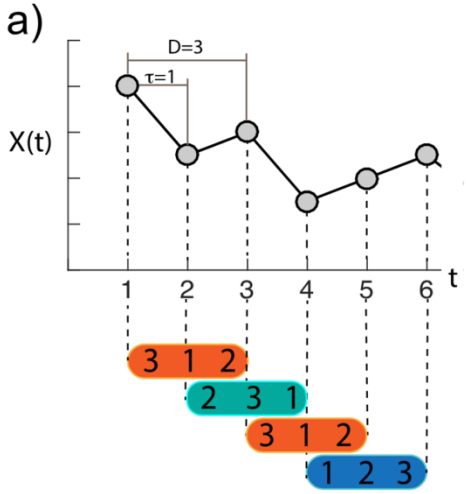
Ordinal patterns



Zanin, M., Olivares, F. (2021). *Communications Physics*, *4*(1), 190.

Permutation entropy

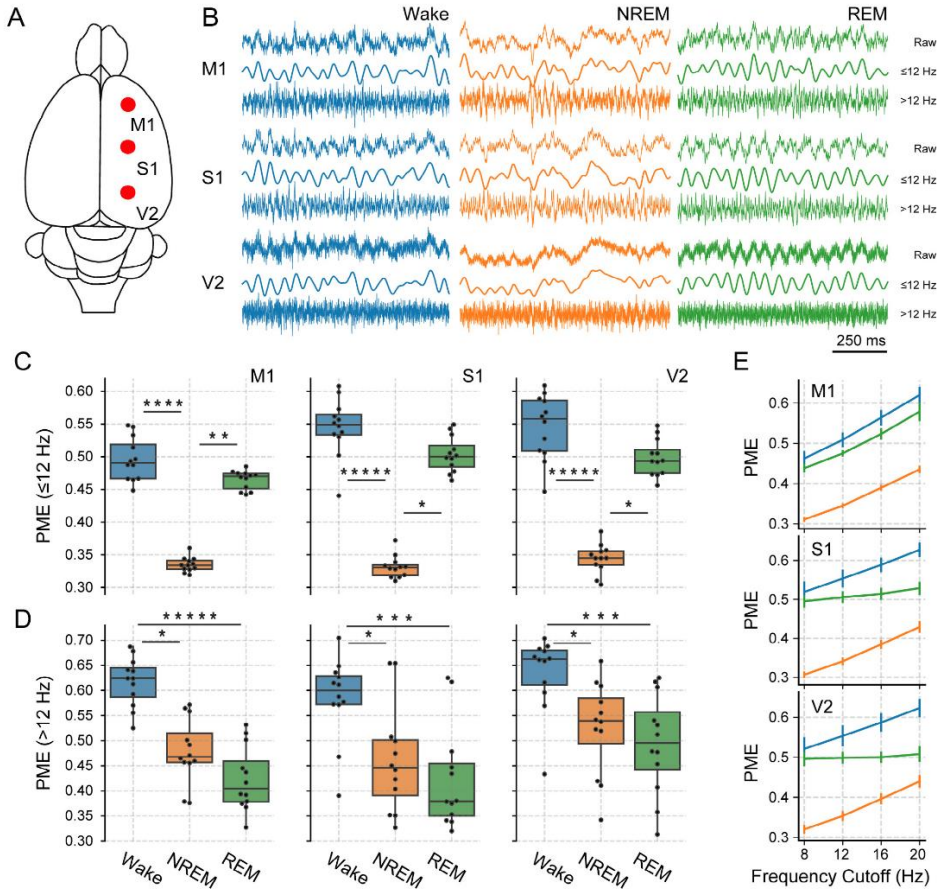
$$x = (4, 7, 9, 10, 6, 11, 3)$$

$$H(2) = -(4/6)\log(4/6) - (2/6)\log(2/6) \approx 0.918$$

$$H(n) = -\sum p(\pi)\log p(\pi)$$

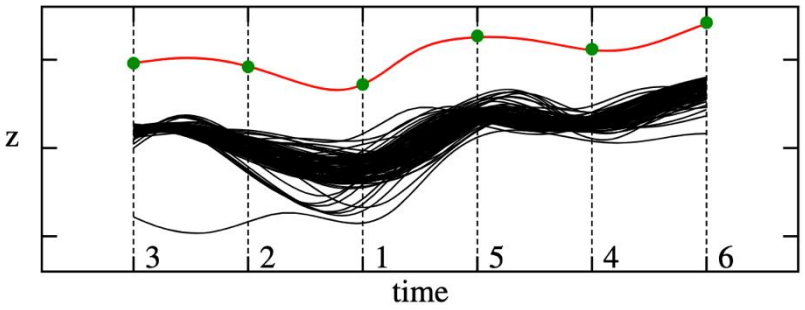
Bandt, C., & Pompe, B. (2002). *Physical review letters*, *88*(17), 174102.

Sleep/wake states



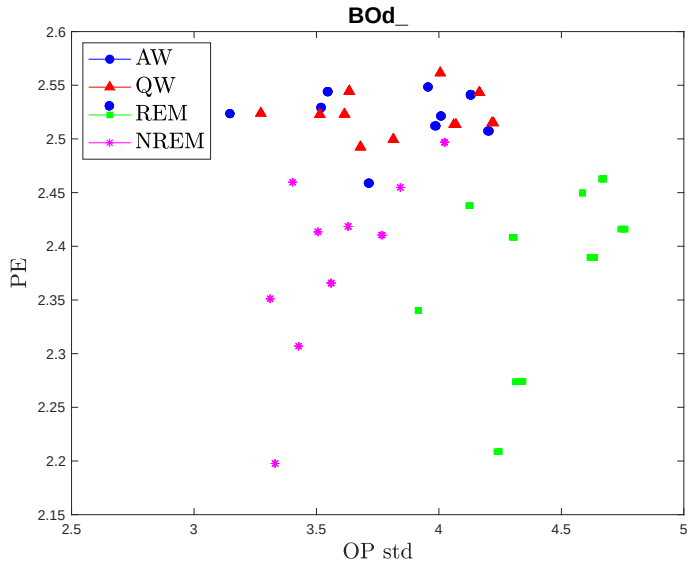
González, J., Mateos, D., Cavelli, M., Mondino, A., Pascovich, C., Torterolo, P., & Rubido, N. (2022). *Neuroscience*, *494*, 1-11.

Ordinal patterns



Politi, A. (2017. *Physical review letters*, *118*(14), 144101.

$$\langle \ln \sigma_i(j) \rangle$$



MT, Rubido, *submitted soon*

Any thoughts?

- Datasets with known states.