

Master's thesis topic: Estimation of neural models from spikes

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A fundamental question in neuroscience is how to link observed neural activity to the unobserved biophysical mechanisms that generate this activity. Therefore, there is a critical need for methods to incorporate the partial and noisy data that we observe with detailed, mechanistic models of neural activity.

In this project, we will explore how to estimate the parameters and the hidden variables of neuronal models from neuronal spike train responses. In particular, we will compare modern simulation-based inference methods [1] to more traditional methods like particle filters [2, 3]. Depending on the progress, we will also investigate how to actively collect new data in closed-loop experiments to improve the inference.

Keywords: simulation-based inference, particle filters, neural activity, neural mechanisms.

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