Multiscale modeling of the dependencies between spikes and fields
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Motivation & Introduction

- Recent advances in technology has allowed us to access multiple spatiotemporal scales of brain activity at the same time.

- Multiscale model

  Conditionally independent assumption

Data Analysis

- Add LFP to spikes
- Add spikes to LFP

Learning the dependencies

\[ \lambda_c(t|x_t) = \exp(\beta_c + \alpha_c^T x_t) \]

Incorporate the dependencies

\[ \lambda_c(t|x_t, y_t) = \exp[\beta_c + \alpha_c^T x_t + \sum_{j=1}^{F} \zeta_{c,j} y_{t,j}^j] \]

Decrease model complexity

\[ \lambda_c(t|x_t, y_t) = \exp[\beta_c + \alpha_c^T x_t + \sum_{j=1}^{F} f(\text{dis}(c, j)) y_{t,j}^j] \]

Kernel smoothing method

EM algorithm

Future Work

- Apply this method on real data to better understand the dependencies between spike and fields