Bayesian binning beats approximate alternatives: estimating peri-stimulus time histograms.

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Objective: model instantaneous firing rates from neural spike trains as a function of time.

Bayesian binning for peri-stimulus time histogram (PSTH): iterates over all possible binnings.
- Computes Bayesian expectations
- Yields error bars on predictions
- Provides complexity control via model comparison,
  - Only cubic effort for exact inference!!
  - Better predictor of real neural data than alternative approaches above.

Fixed boundary histogram approach (Shimazaki & Shinomoto, Neu. Comp., 2007)

Spike density function by smoothing spike trains with a Gaussian kernel.

Ours

The alternatives