INTRODUCTION

Causal State Models are minimal and predictively sufficient representations of the data. They are built from a set of rules that specify the transition probabilities between states. The structure can be summarized by the complexity of the model.

CAUSAL STATE MODELS QUANTITY STRUCTURE

Causal State Models (CSMs) are minimal, optimal, predictive Hidden Markov models (HMMs) that represent the structural information in the data. They are built by finding the most compact representation that includes all the information that is necessary to predict future events.

SIMULATED DATA

All CSMs were constructed by applying the CSSR algorithm and bootstrapping to 200 seconds of simulated data with 1 millisecond time steps (M=1000). The assumptions in this model were:

- Random spiking 10 Hz Bernoulli process with 40 Hz refractory period. The state of the spike generating process is updated at every time step.
- A 5 ms refractory period after each spike imposes statistical independence of spikes.

The CSMs were used to generate CSMs for both spontaneous and evoked activity.

RAT BARREL CORTEX DATA

CISMs were constructed from spontaneous data recorded by tensile s-11 in spike trains of a chloralose anesthetized rat primary somatosensory SI (barrel) cortex. The states in the CSM are equivalent when they have the same internal entropy rate and residual randomness.