Computational Neuroscience: Vision

Introduction to Statistical Decision/Estimation

[Eero]

Stat. Estimation/Decision theory

Optimal extraction of quantities from data (under noisy conditions):

- Model fitting (parameter estimation)
- Population decoding
- Linking neural response to perception (signal detection theory, ideal observer theory)

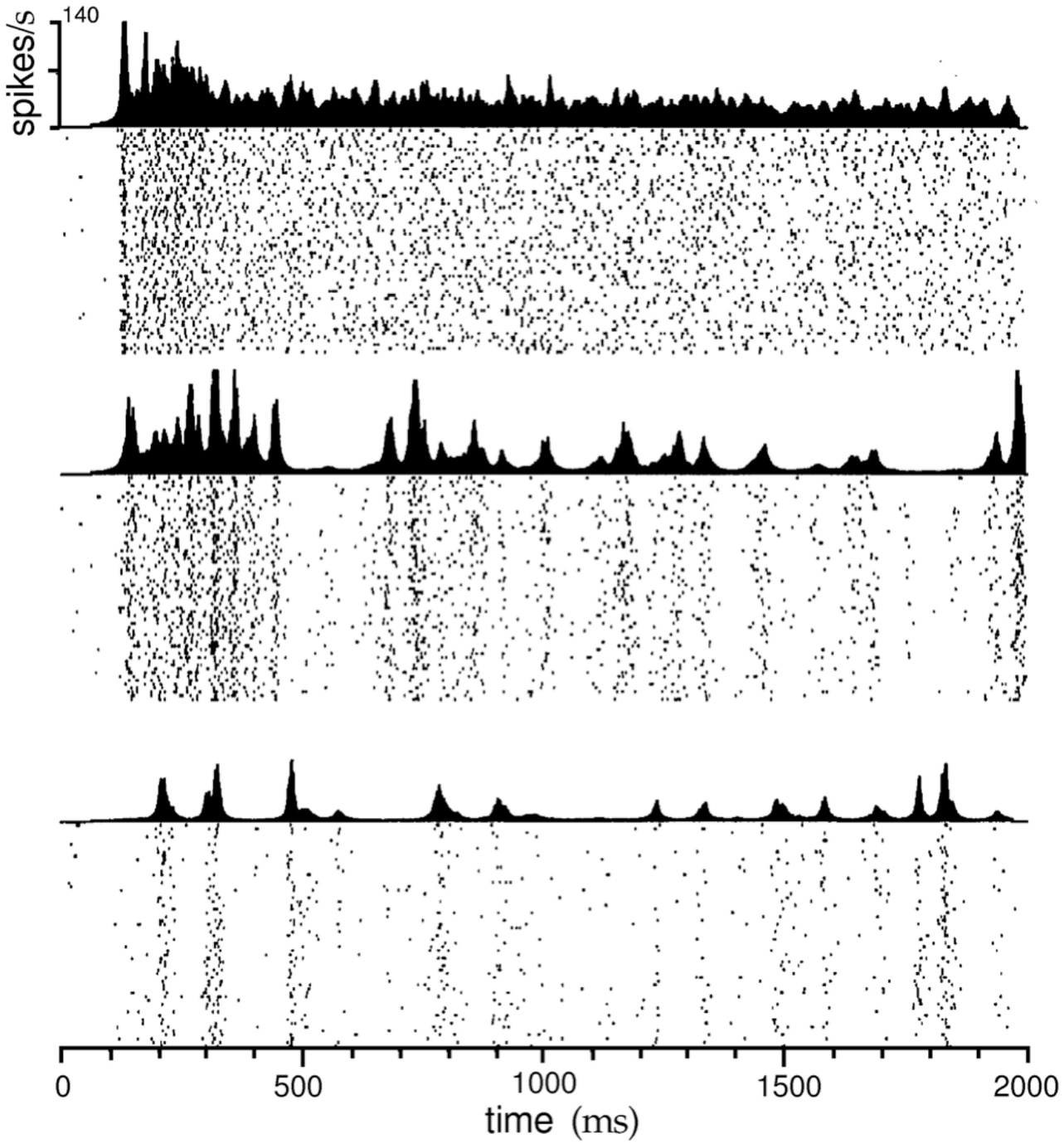
Probability basics

- Joint: P(meas & actual)
- Marginal: P(meas), P(actual)
- Conditional: P(meas | actual)
- Bayes' Rule
- Forward and inverse descriptions

(on board)

The scientist's perspective

P(spikes | stim)



The organism's perspective

P(stim | spikes)

The organism must "read" noisy responses, infer something about the stimulus, and respond (make judgements about it, remember it, or act on it).

The organism’s perspective

[the homunculus, from “Men in Black”]

- Estimation: general
- Estimation: ML, MAP, Bayes
  - Simple example: additive noise
- Decision: ML, MAP, Bayes
  - Simple example: intensity discrimination

(on board)