

Classification of Pyramidal Neurons and Interneurons Using Spike Width and Amplitude.

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CINPLA - Weekly Meeting

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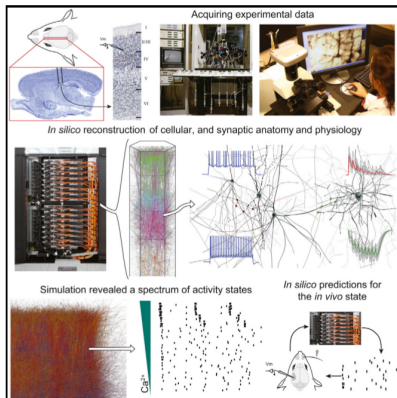
Goals

- ▶ Can spike width and amplitude be used to classify interneurons from pyramidal neurons.
- ▶ Which spike width and amplitude definition are better suited for classifying.

Cell

Reconstruction and Simulation of Neocortical Microcircuitry

Graphical Abstract



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In Brief

A digital reconstruction and simulation of the anatomy and physiology of neocortical microcircuitry reproduces an array of in vitro and in vivo experiments without parameter tuning and suggests that cellular and synaptic mechanisms can dynamically reconfigure the state of the network to support diverse information processing strategies.

Blue Brain Models

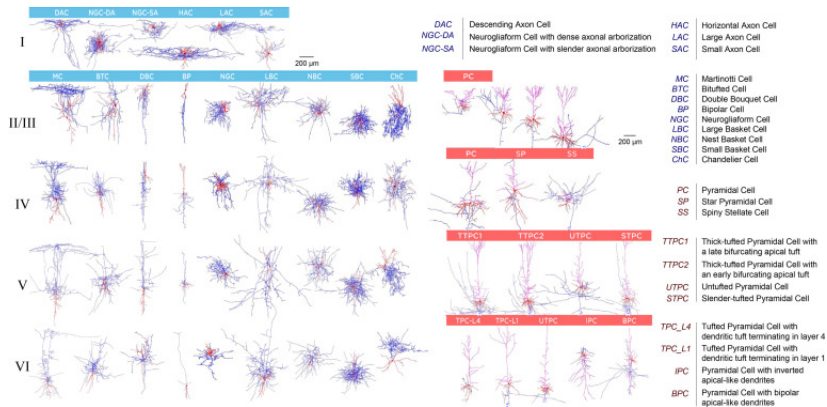


Fig. 2 in Markram et al. ("Reconstruction and simulation of neocortical microcircuitry")

Blue Brain Models

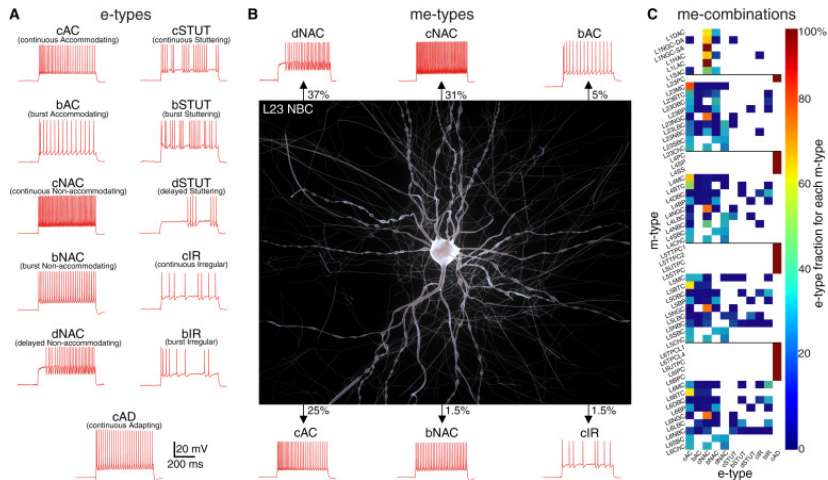
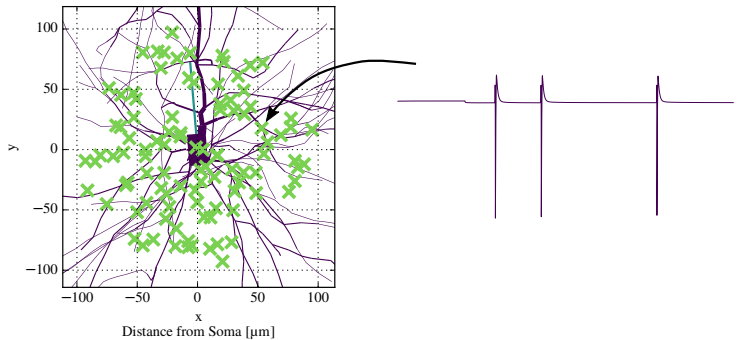


Fig. 4 in Markram et al. (“Reconstruction and simulation of neocortical microcircuitry”)

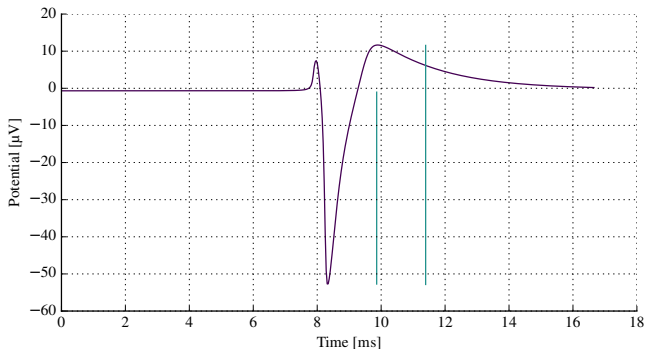
Simulation

Simulation using the SphereRand class.



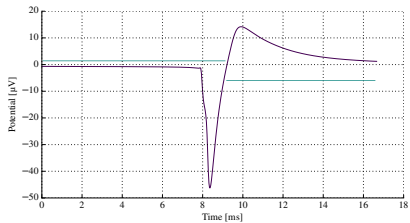
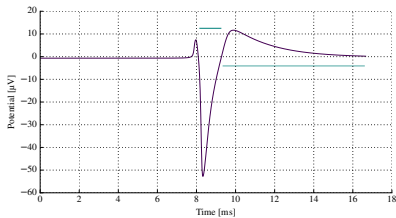
Spike Amplitude Definition

Peak-to-peak and baseline-to-peak amplitude definitions.



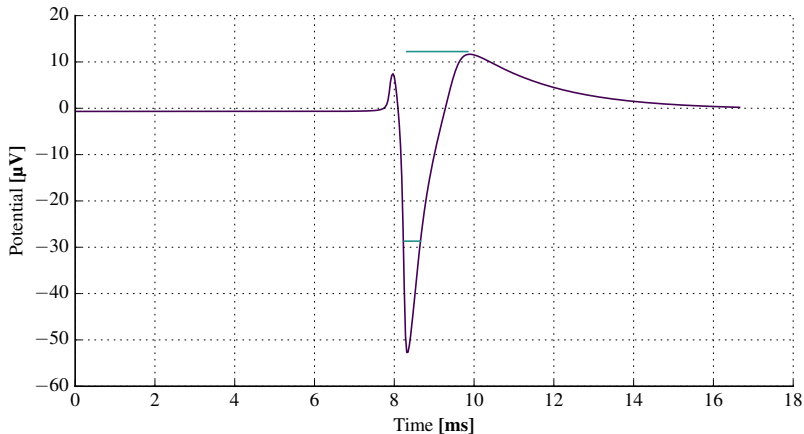
Spike Width Definition

Width at baseline.

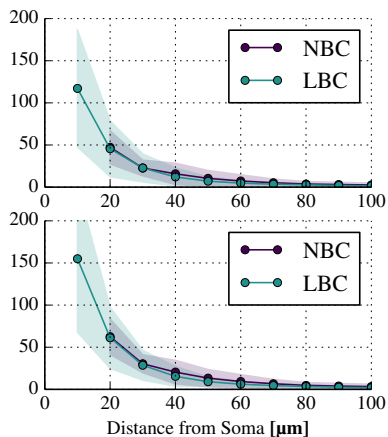
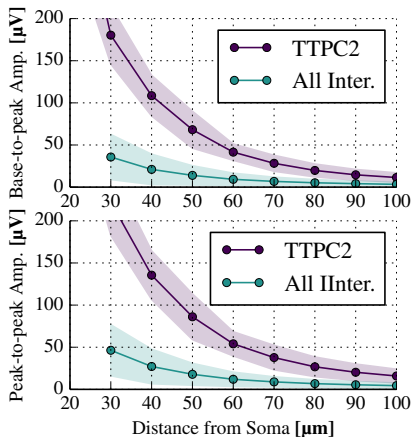


Spike Width Definition

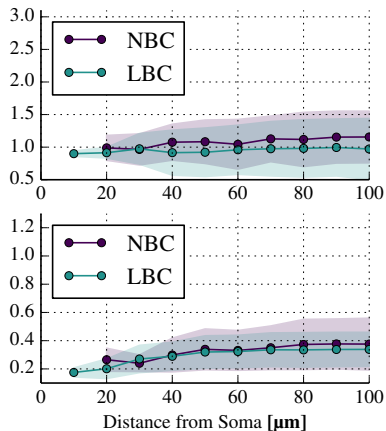
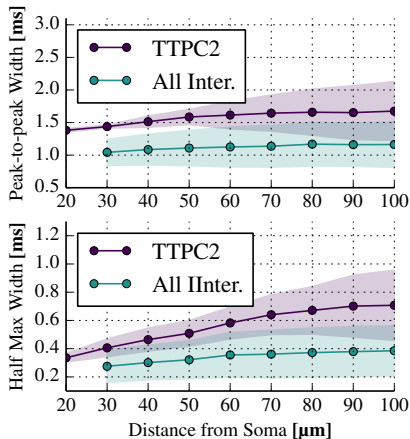
Peak-to-peak and half maximum width definitions.



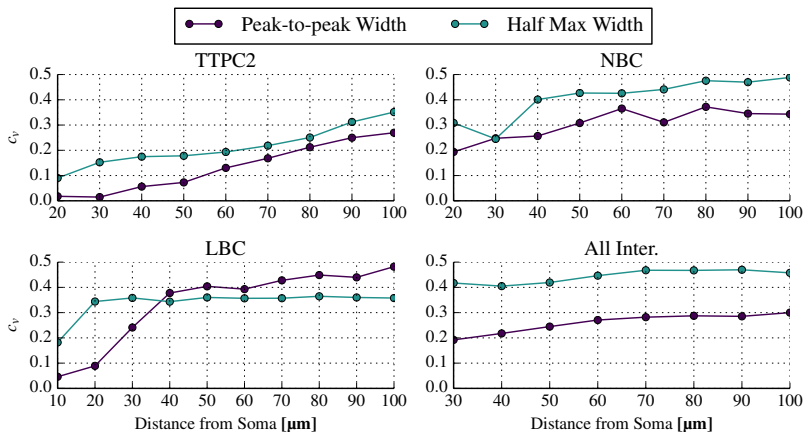
Amplitude from Soma



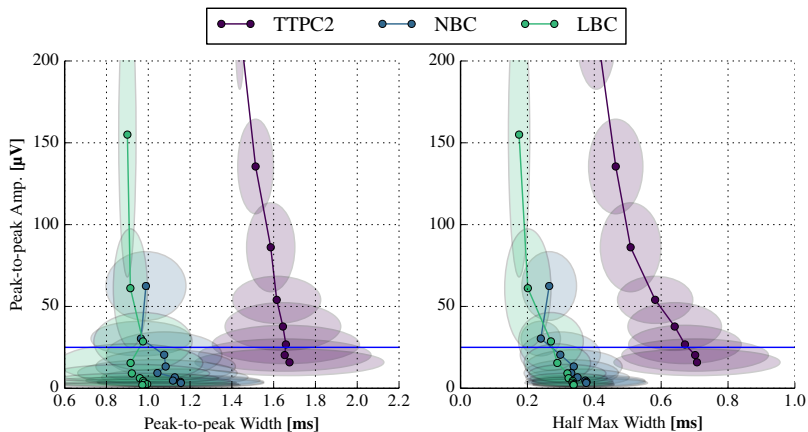
Width from Soma



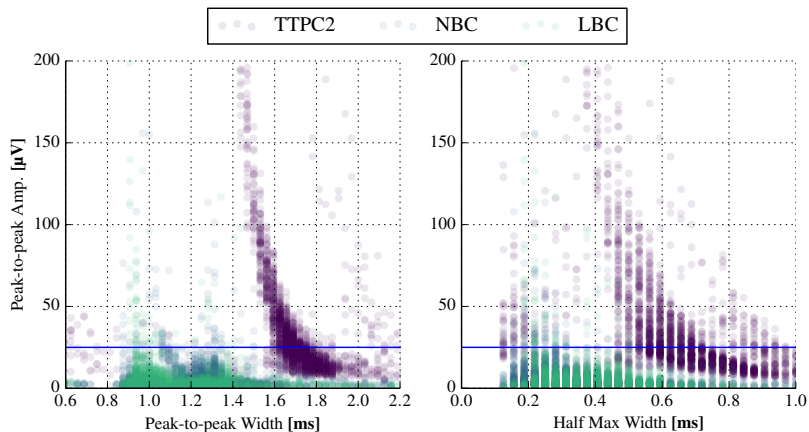
Width from Soma: Coefficient of Variation



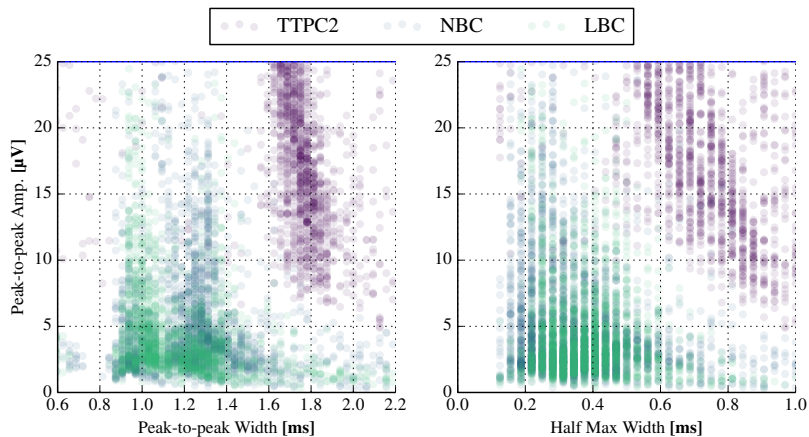
Combined Width and Amplitude



Combined Width and Amplitude



Combined Width and Amplitude Close Up



Comparing Width Definitions

Other remarks:

- ▶ Baseline is not always well defined.
- ▶ Peak-to-peak more resistant to noise.
- ▶ Half width requires high temporal resolution.
- ▶ Widths seem a bit long compared to other experimental results.

Summary:

- ▶ Amplitude should be considered when classifying based on width.
- ▶ Can use this simulation environment with new models for future research.