

FIRING EVENT DETECTION & CLASSIFICATION ON DROSOPHILA SENSILLUM RECORDING DATA

Haoyang Rong

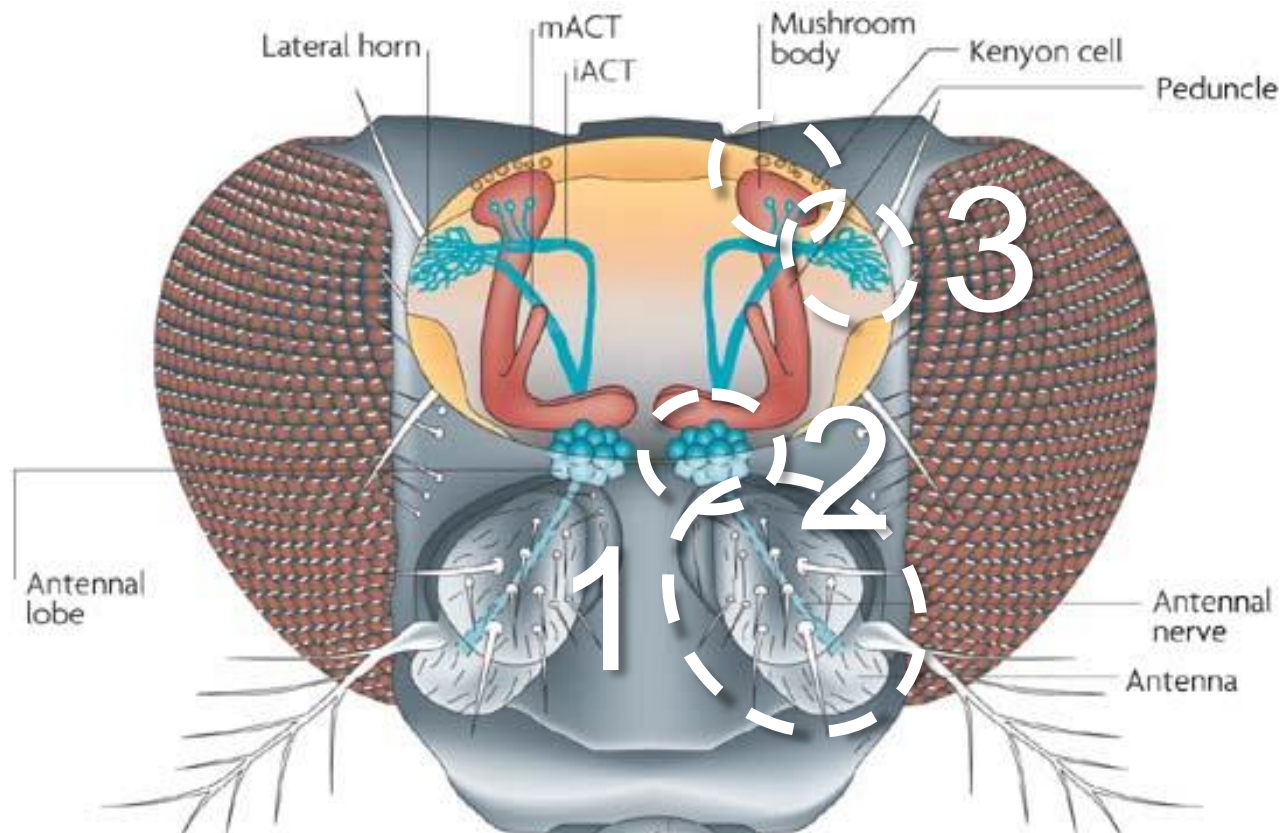
Significance of odor detection



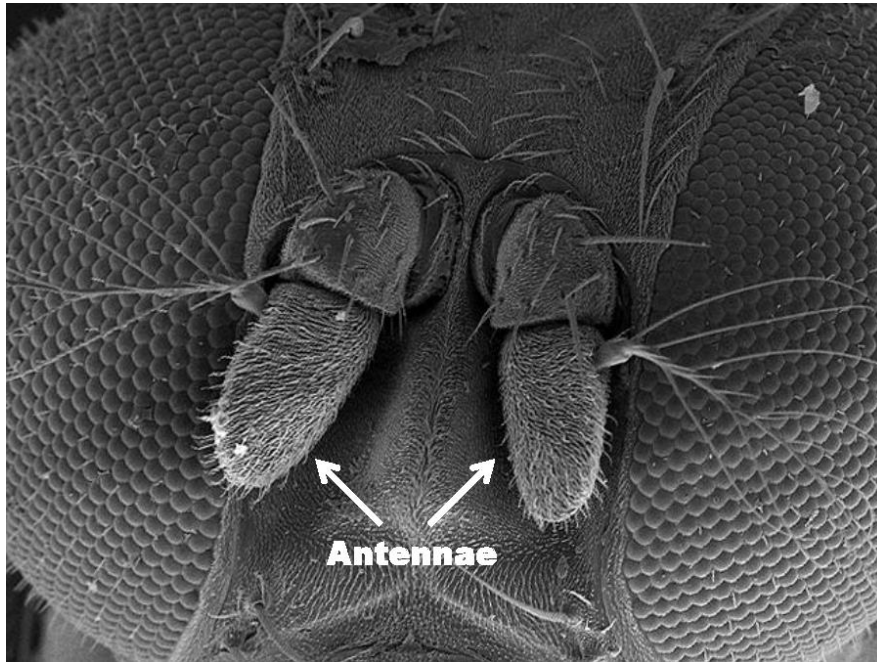
Marcus C. Stensmyr, et al., "A Conserved Dedicated Olfactory Circuit for Detecting Harmful Microbes in *Drosophila*", *Cell* 151 (6), 1345–1357 (2012).

Roote, J., Prokop, A. (2013). How to design a genetic mating scheme: a basic training package for *Drosophila* genetics. *G3* (Bethesda) 3, 353-8

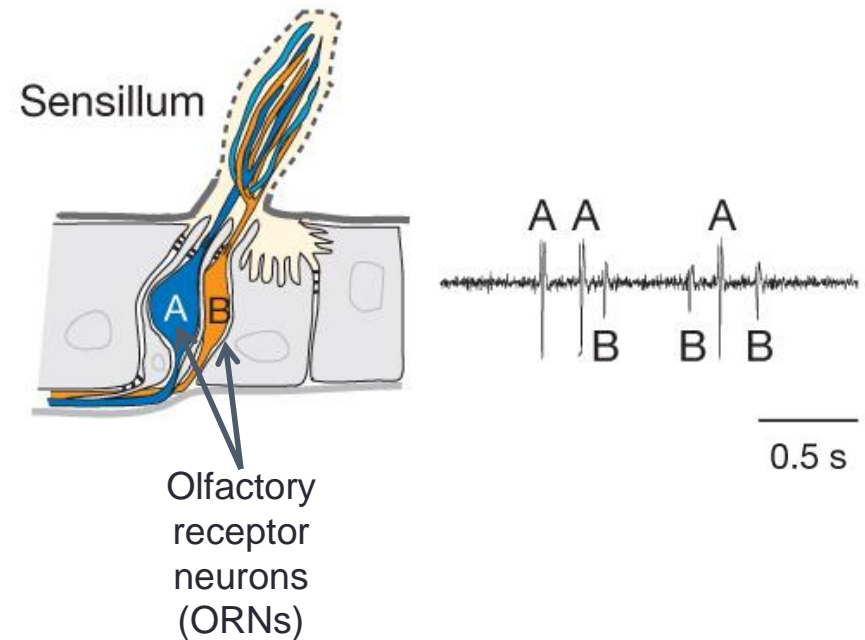
Three Stages of Olfactory System



Peripheral Olfactory Neurons

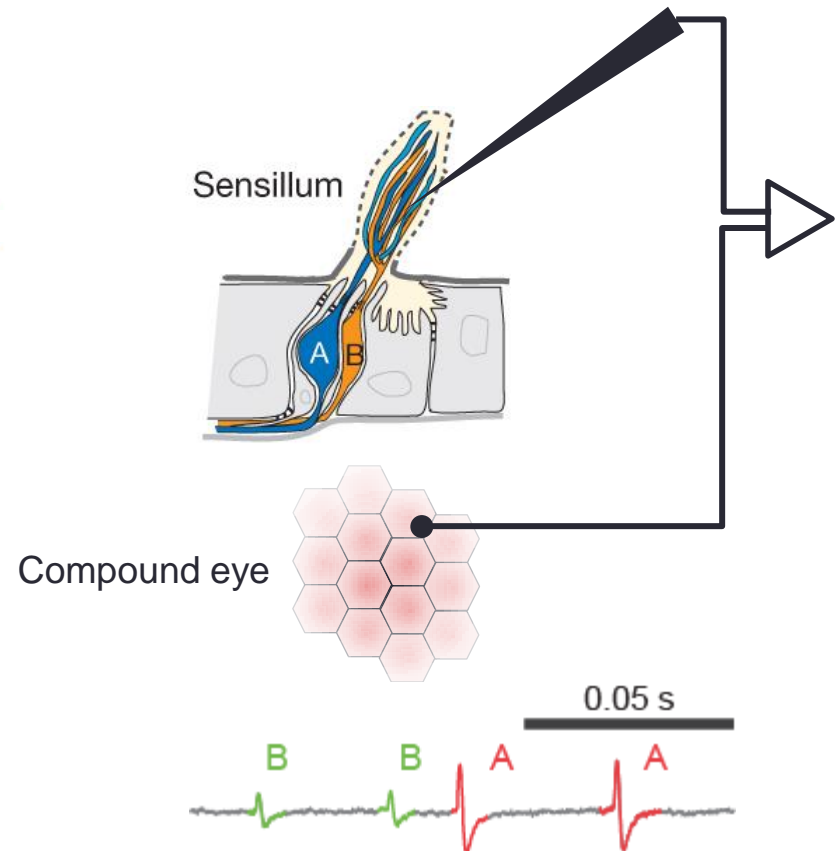
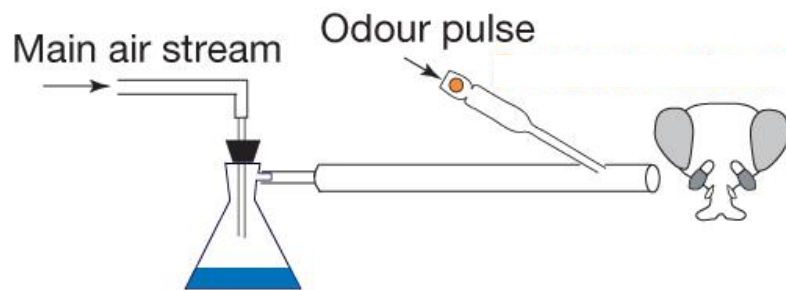


Leal Lab, UC Davis



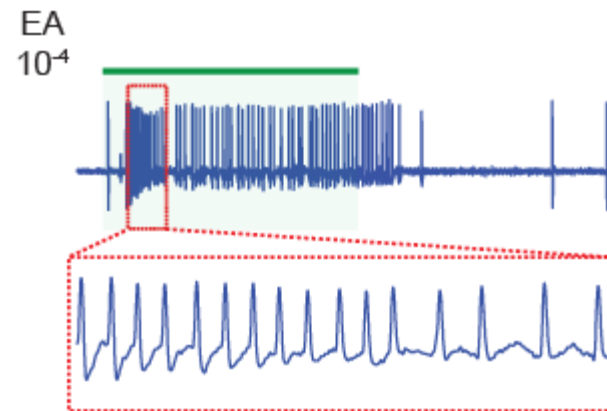
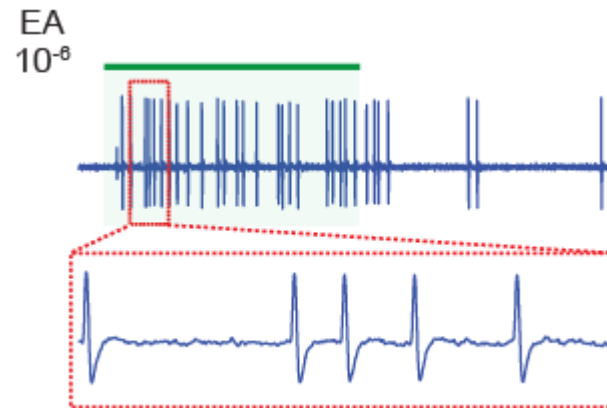
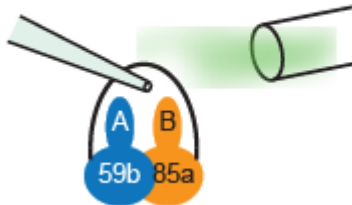
Chih-Ying Su, et al., "Non-synaptic inhibition between grouped neurons in an olfactory circuit", Nature, 2012

Sensillum Recording



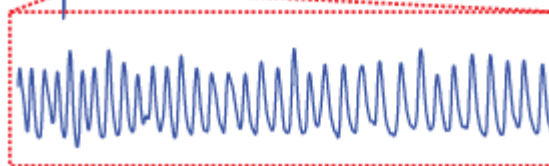
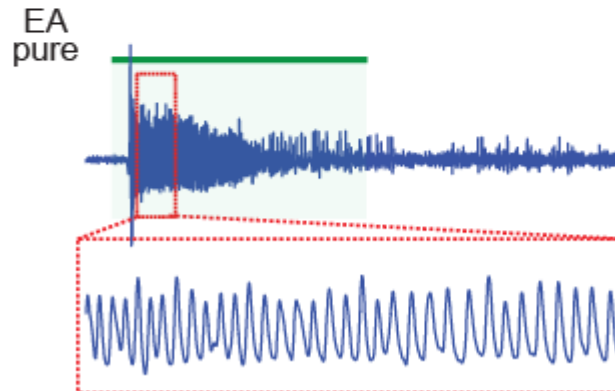
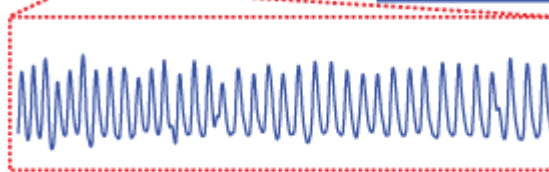
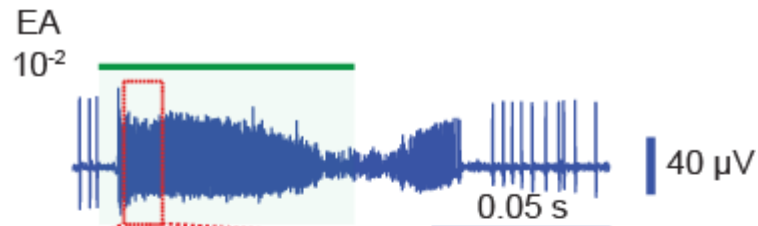
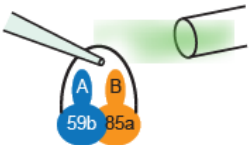
A Sensillum's Response to Ethyl Acetate

Sensillum **ab2**



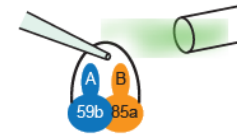
Abrupt Change of Firing Pattern

Sensillum **ab2**



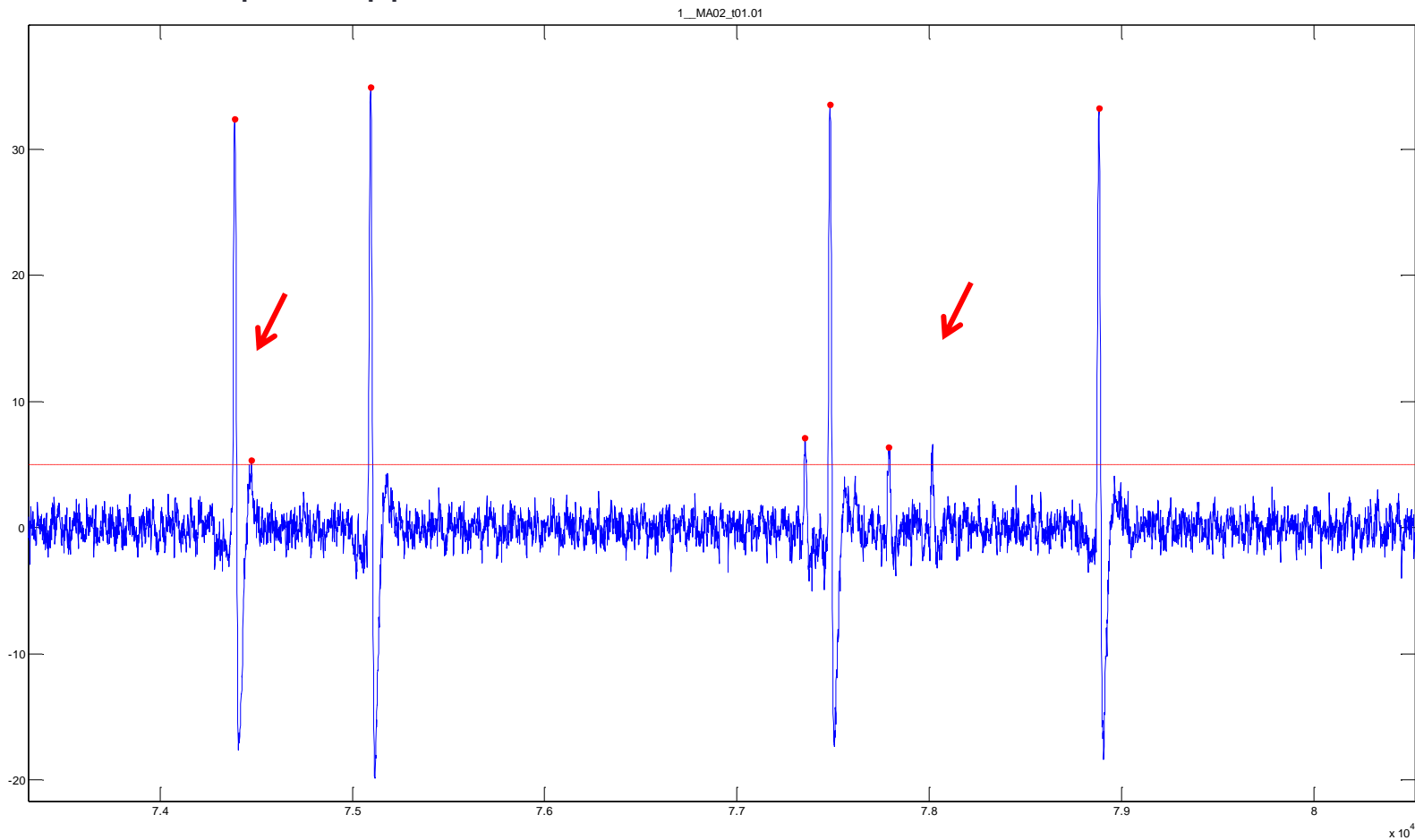
Basic Task

- How do we detect and differentiate different firing events?



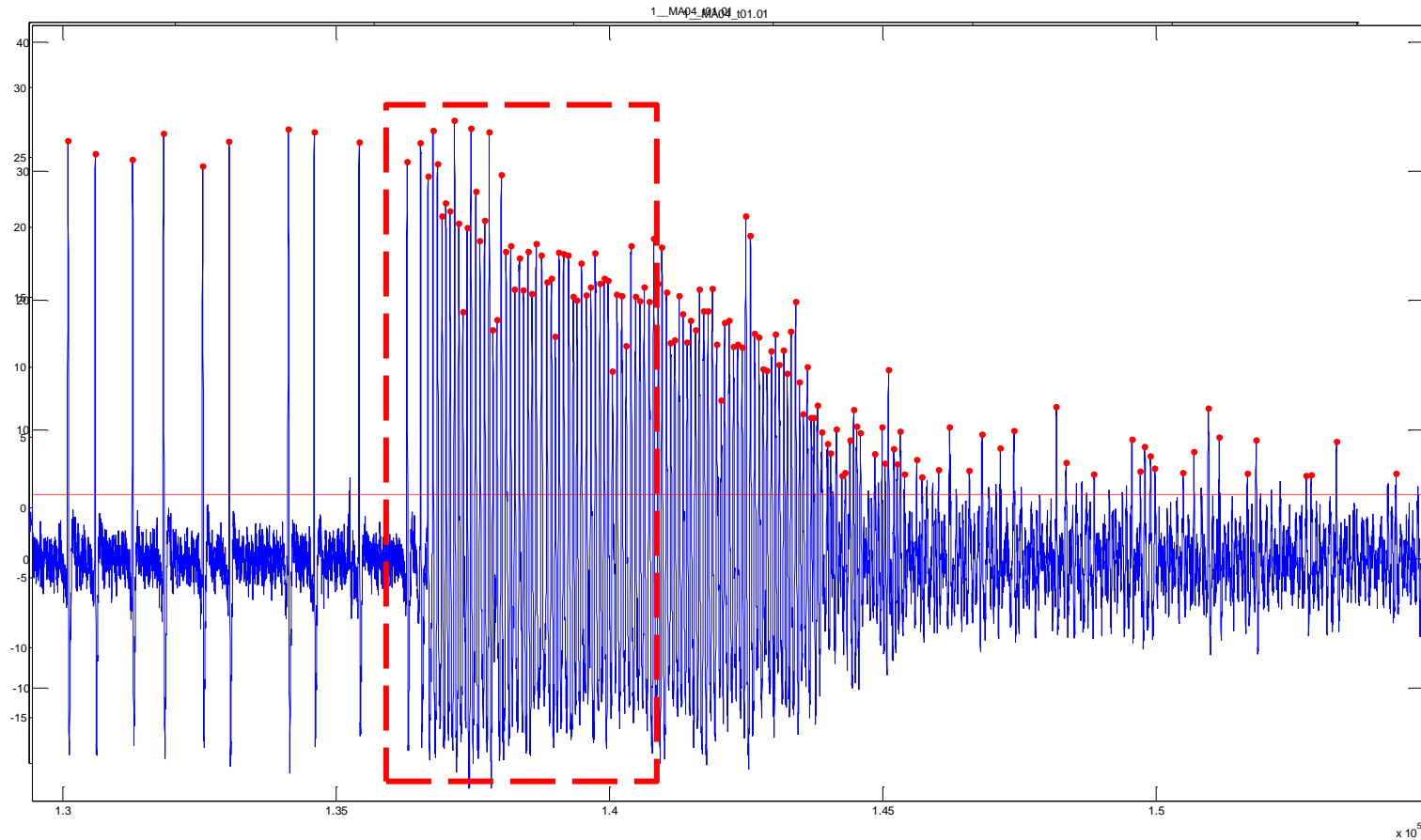
Baseline Activity

- Most dominant feature in this case: amplitude
- How a simplest approach fails

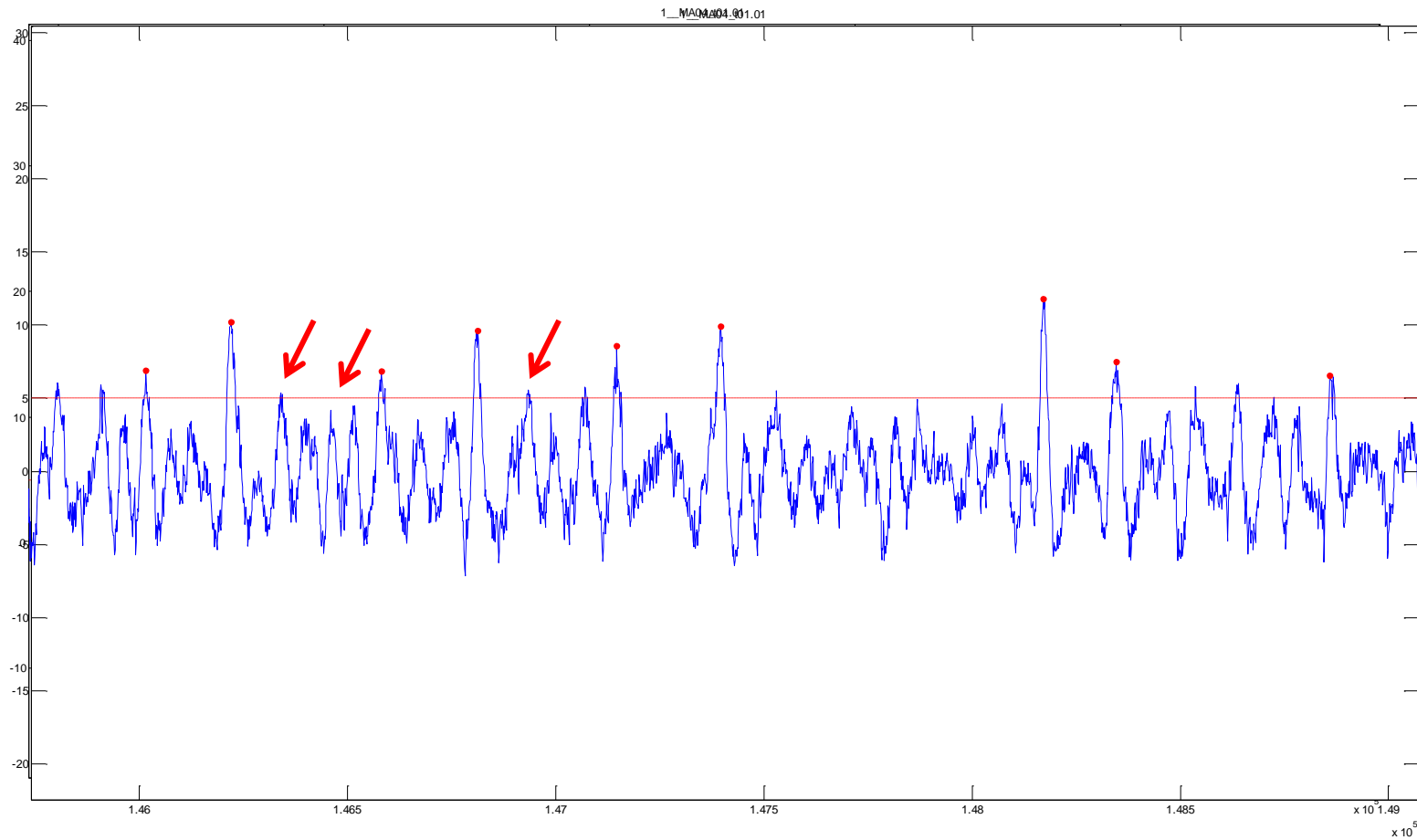


Intense response

- A third class of firing activity

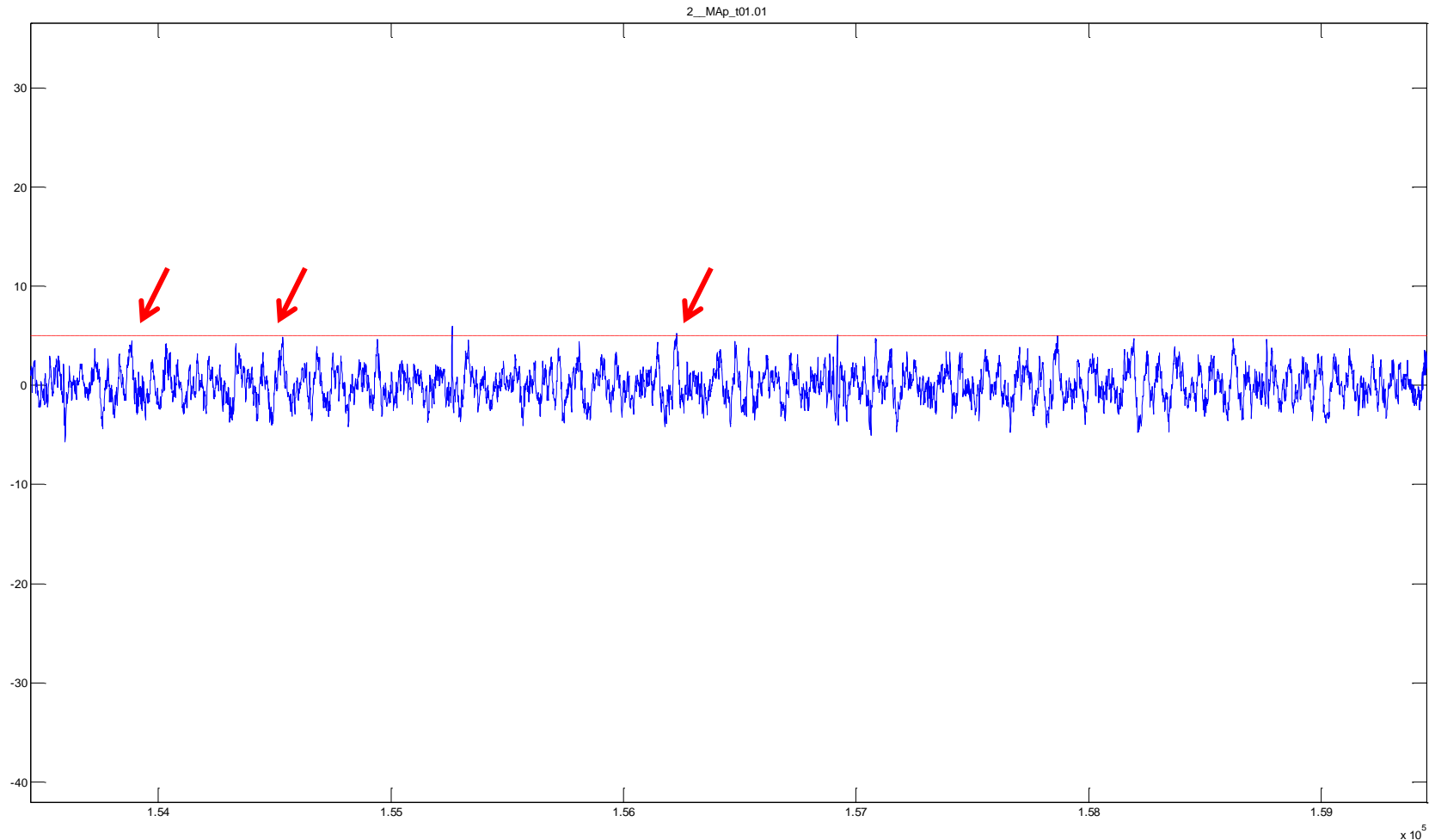


Sub-threshold “oscillations”

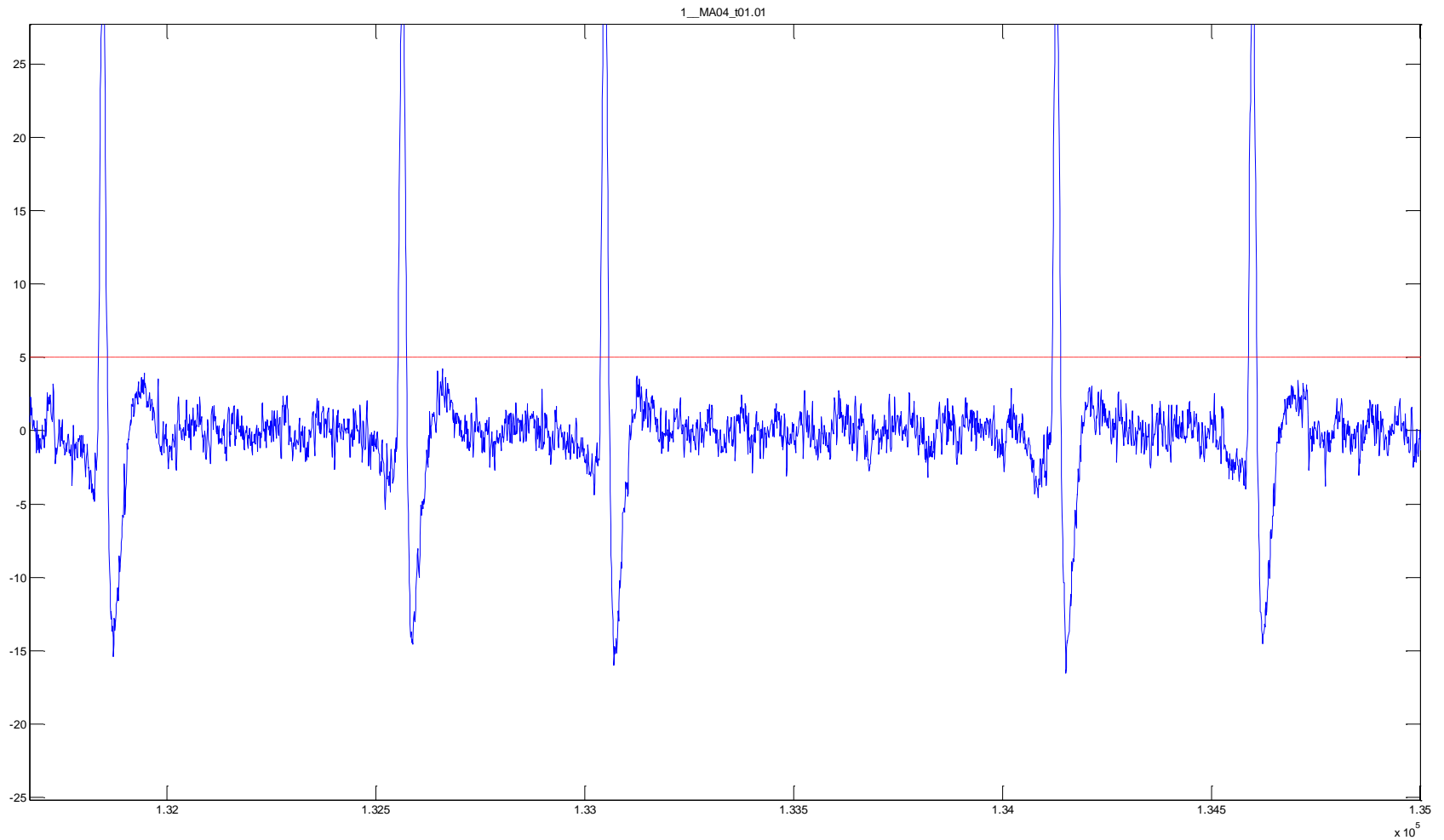


Sub-threshold “oscillations”

- Can you give an estimation about firing rate?

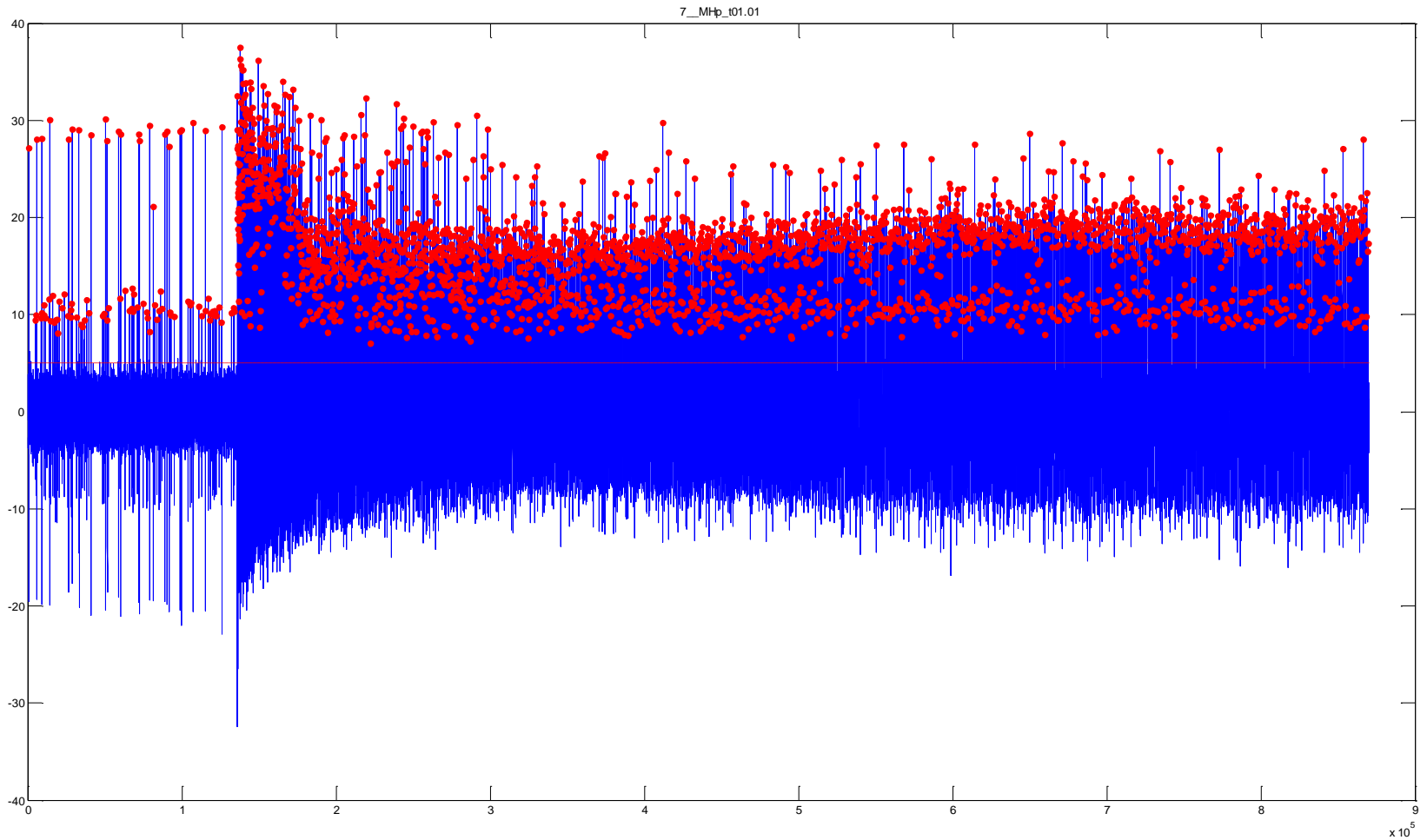


Comparing with baseline

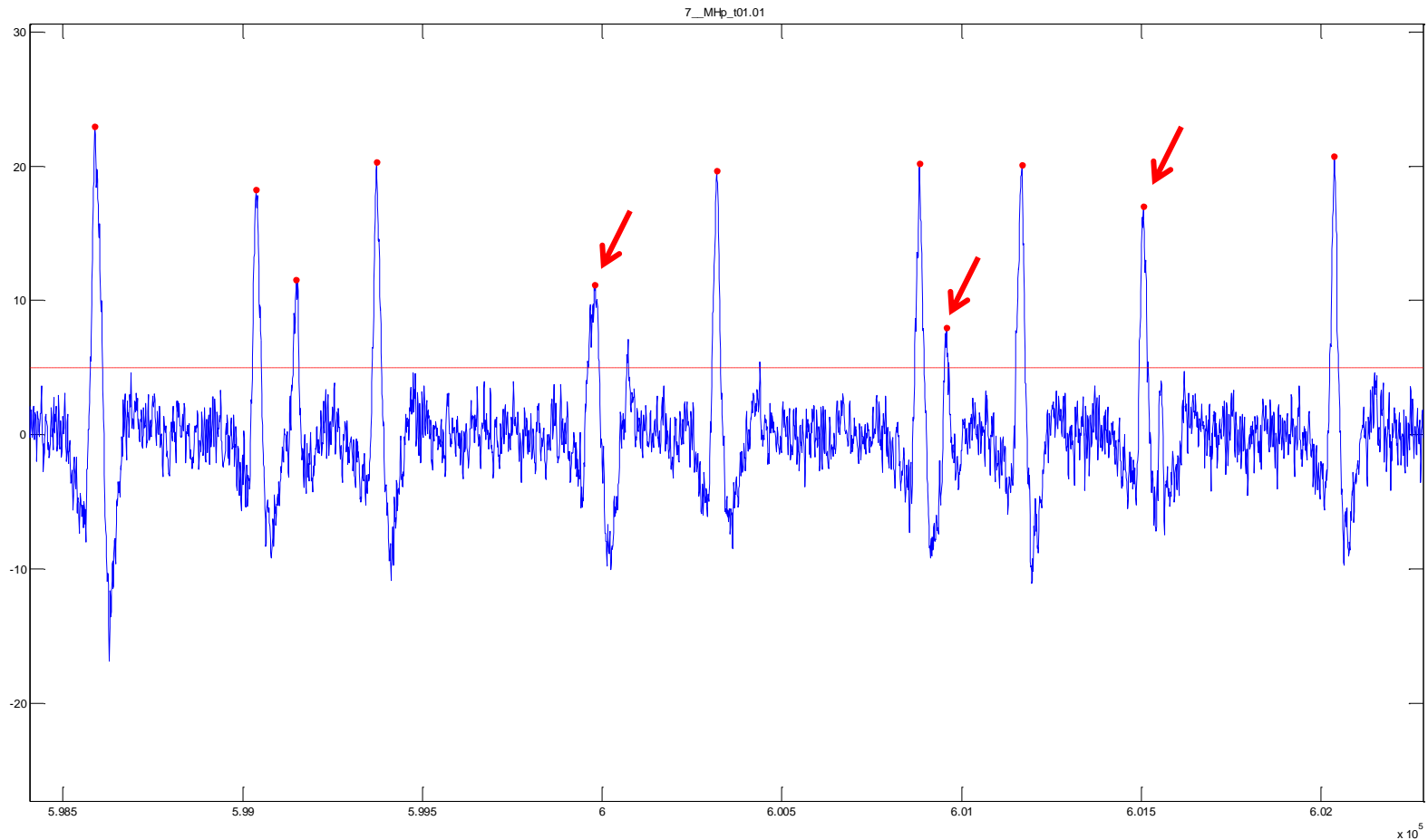


More about classification

Mixed spikes



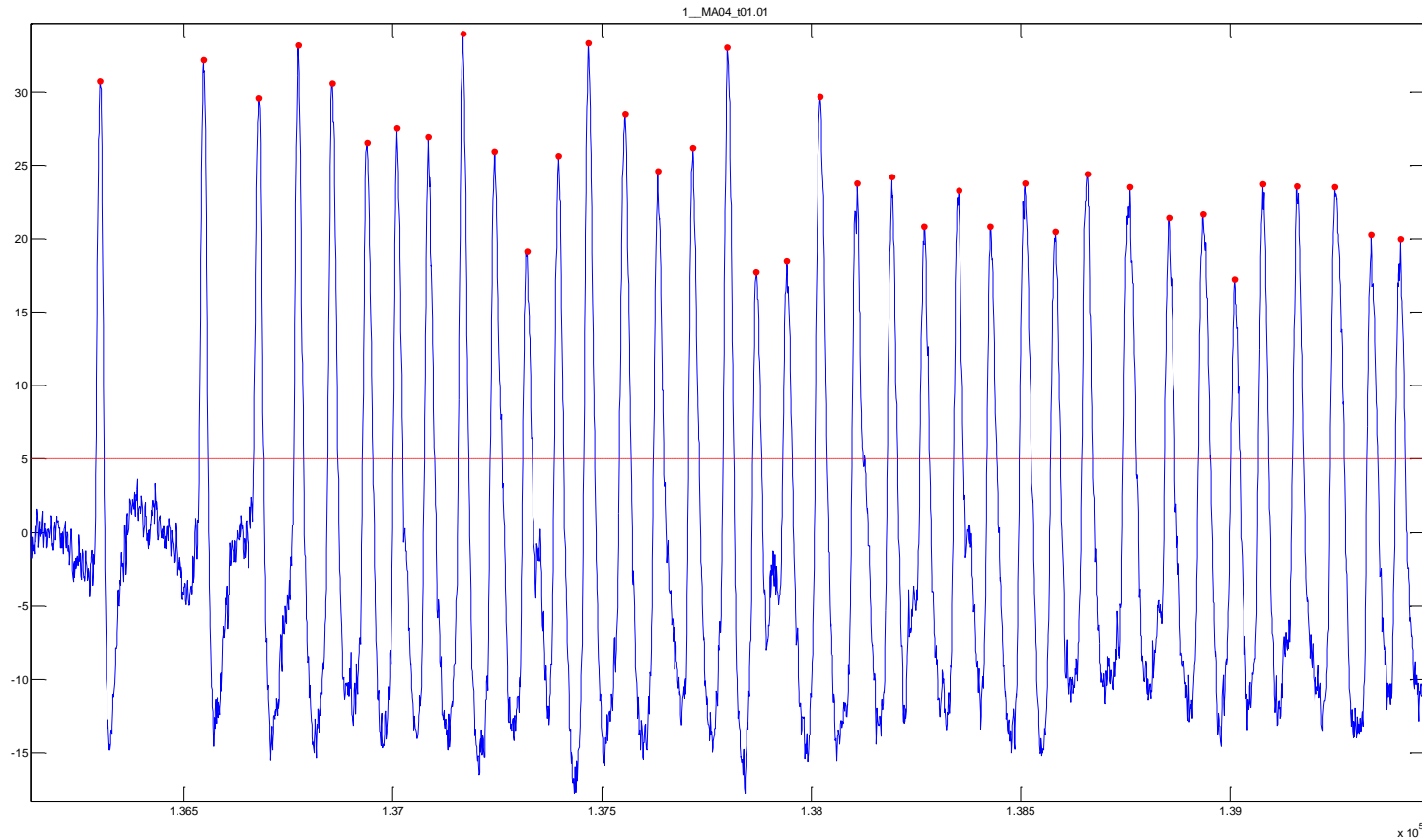
More features to consider



Modeling “Oscillations”

Modeling “Oscillations”

- Can it be a mixture of large and small neuron activity?



Summary

