Lab Visit Report

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Location: Neural Interaction Laboratory, University of California San Diego, USA.

Host: Dr. Todd Coleman and Dr. Marcelo Aguilar.

Funding: ISN-CAEN category 1A - August 2014 round

Dates of visit: October 23th 2014- December 22th 2014

Overview

I arrived San Diego on October 23th. I was helped by Vanessa Hollingsworth with the processing of all the administrative formalities to start working in the lab. Also, I had access to the UCSD student card and all its benefits as a visiting scholar. Right after they introduced me to the lab and lab members, I start working under the supervision of Dr Marcelo Aguilar.

The main objective of the visit was to acquire skills in MATLAB coding, in order to analyze data from electrophysiological recordings previously performed in fear conditioned rats. To achieve this, we first worked together with Dr Aguilar in writing a code that allowed us to classify neuronal response in each trial, in one step: 1) calculate the firing rate of several neurons during each trial; 2) obtain an average firing rate for each neuron during blocks of trials; 3) normalize these data; and 4) graph these data in two differents ways (figure 1).

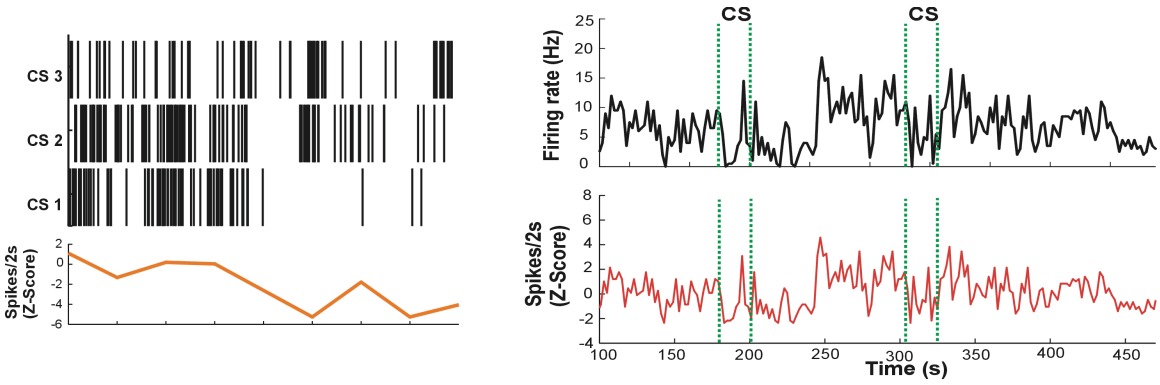


Figure 1. Raster plot before and after stimulus and corresponding raw and normalized firing rate time course.

Once the first part was complete and the code working, we were able to present these results in the Society for Neuroscience Annual meeting celebrated in Washington DC. Back in San Diego, I was able to write four codes by my own to continue analyzing our data, always under the supervision of Dr Aguilar. The first one was developed to classify neurons into putative pyramidal neurons and putative interneurons (figure 2), according to firing rate and action potential waveform. This code obtain the action potential duration (in micro seconds), by calculating the distance (in terms of time) between the peak and the valley of an average action potential waveform, for a number of neurons. It also performs a Hartigan's dip test to assess bimodality in the distribution of action potential duration.

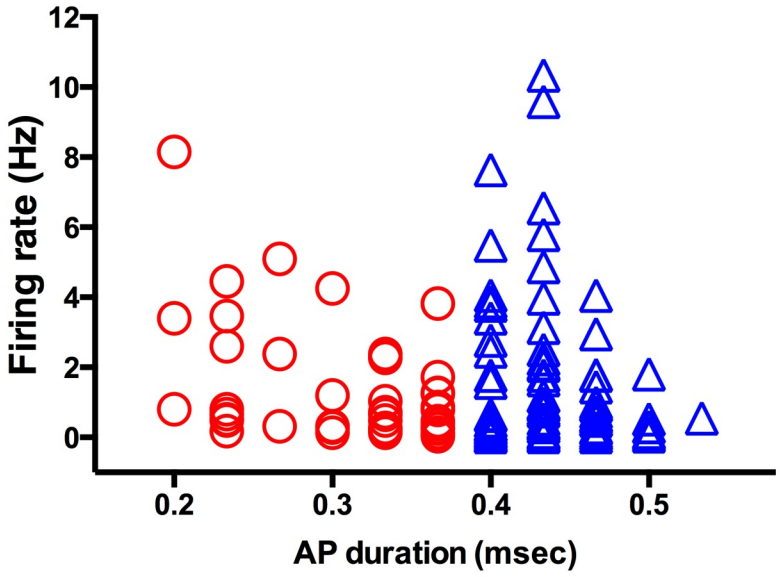


Figure 2. Distribution of action potential duration and corresponding firing rate for all recorded neurons.

The second code was aimed to perform cross-correlation between pairs of neurons from the same animal, in order to look for synchronic activity during trials, and if changes in synchrony take place with subsequent trials (figure 3).

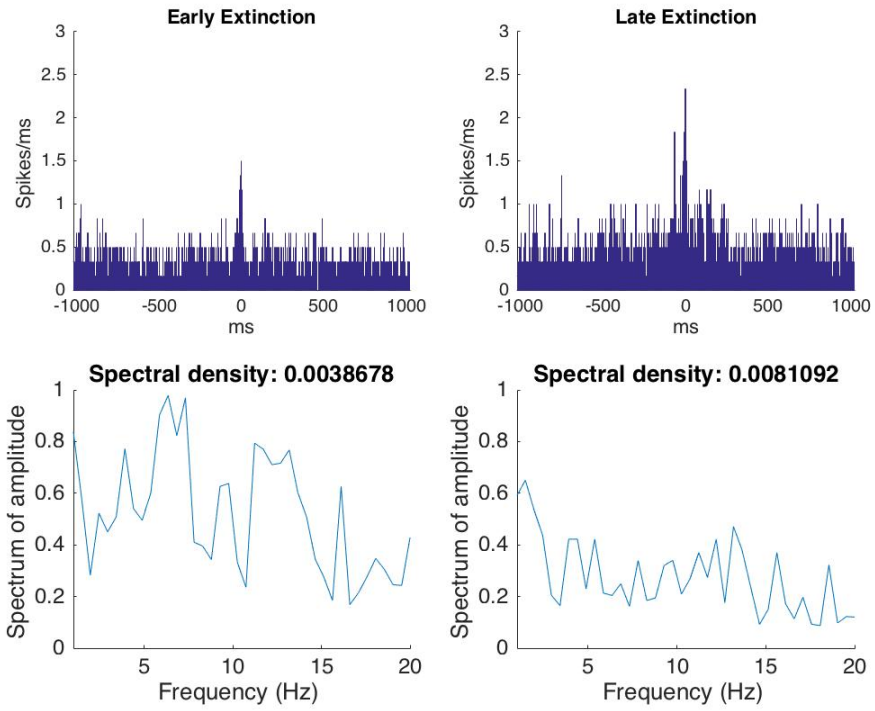


Figure 3. Cross correlogram and corresponding fourier analysis.

The third code I wrote was a very simple one and was aimed to find significant correlations between neural activity and behavioral outcome, in this particular case, with conditioned freezing time course.

Finally, the fourth code was about ploting in the same graph blood pressure and the neural activity (as firing rate) of all recorded neurons from the same animal.

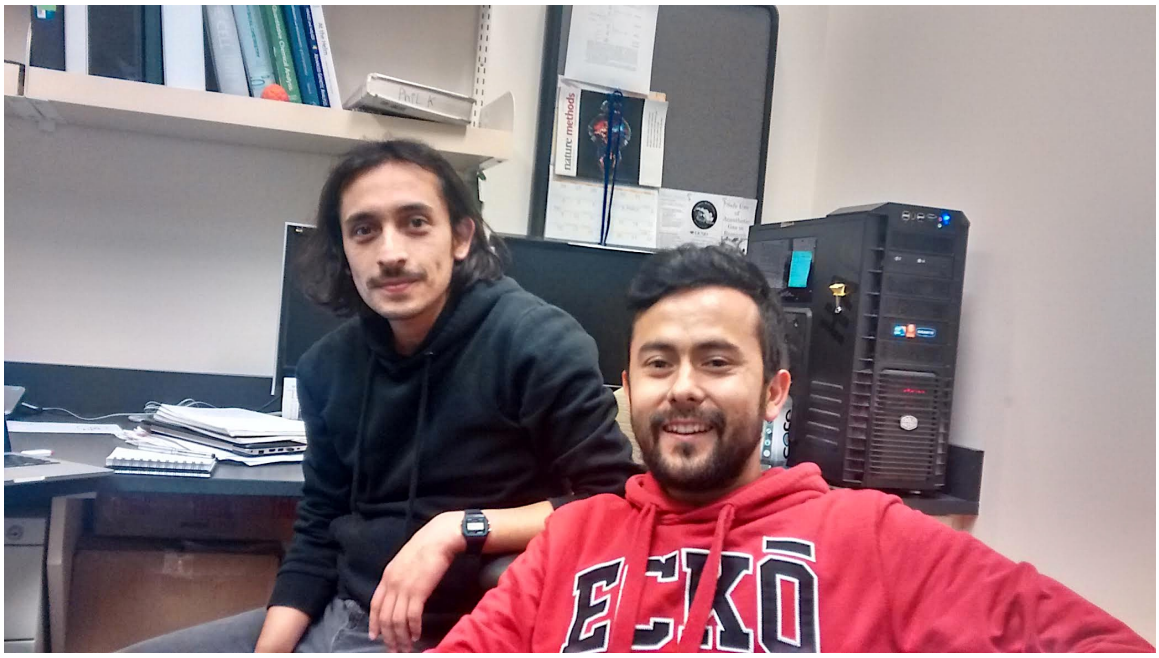
Relevance to my research

The codes we developed were useful to analyze electrophysiological data that I succesfully presented at SfN annual meeting. Furthermore, these date were an important part of my PhD thesis dissertation. Currently, these data are part of a manuscript that is about to be submitted to an ISI neuroscience journal.

Acknowledgments

I am very grateful to the ISN for giving me the opportunity to visit the Neural Interaction Lab, in which I learned a lot of things that are going to be very useful in my career as a neuroscientist. I also want to express thanks to Dr Coleman and all his team for their kind support on this visit.

José Casanova



Me (left) and Dr Aguilar (right) at the Neural Interaction Laboratory.