Slide 1

Francisco

This is a characteristic circuit of the primary visual cortex. It's made up of neurons VIP-SST-PV and pyramidal neurons. During visual processing tasks, neurons in the primary visual cortex of mice constantly modulate their activity depending on the task and the context in which visual stimulus processing occurs. Among these, populations of VIP and SST neurons are key regulators of pyramidal neuron activity. The dynamics of these neural network in V1 cortex are not fully understood, but there is evidence that these neurons markedly modify their activity during novel vs familiar image processing, which has been investigated by measuring calcium activity in mice performing familiar vs novel image discrimination tasks

Slide 2

Ale

In order to explore the behavior of VIP and SST neurons, we worked with the Allen SDK dataset, which consists of data from the experiment performed with the help of 13 mice. Its basically a task that shows familiar and novel images while recording their calcium activity in 10666 cells of the cre line VIP and SST with a two-focal microscope. We took the traces at the stimulus presentation until 0.750 seconds later.

Slide 3

Nicole

Given the previous we want to know if given the calcium activity of VIP and SST neurons the type of image can be predicted. So we organized in a feature matrix the calcium activity at the chosen timestamp, according to the mouse, its cre line and the stimulus presented. And a vector of experiments conformed by the stimulus shown or the behavior we want to classify.

For this we hypothesize that the fluorescence values of the VIP, SST neuronal populations are NON linearly related to the type of novel or familiar image presented. And a binary logistic regression is an excellent model to Classify the outcome of our dependent variable, the type of image by means of calcium activity data.

Slide 4

Bruno

We used cross-validation to calculate the accuracy of the models and compute the probabilities of obtaining this accuracy in a random distribution, so as to determine how trusted they are. For the VIP Model the accuracy is 79.42, for the SST Model, the accuracy is 78.29 percent, both with a probability of less than 0.001 of it being by chance.

Regularization was not necessary because the accuracy test and train were similar.

Both models are good at classifying the type of stimulus maybe we could obtain better results if we fit the model with more data.

Slide 5

Seba-> We then proceeded to visualize the “importance” assigned by our model to each temporal feature. Thus we plotted the weight values against the features. According to this, the model mainly uses time features close to the stimulus window for both VIP and SST populations, highlighting the temporality of visual processing. It also appears that the VIP and SST weights tend to be inverted with respect to each other. This makes a lot of sense considering the network, that is, VIP neurons tend to fire in favor of new stimulus whereas SST fires in response to “older” stimulus. It is also interesting to note that after the stimulus, the weights of both populations tend to progressively decrease, and even change signs. Hence, the initial perturbation seems to have repercussions well beyond its time frame.

Slide 6

Diego

Now… just to give a more global perspective of the data we worked with, and as a way to visualize the behavior of the linear part of the model, and have an idea on how this part classifies the two different stimuli before applying the logistic regression, the nonlinear part.

Here you can see on the right, for the VIP and SST populations when a novel (in yellow) and a familiar (in purple) stimulus were presented, the cumulative sum of the mean signals, multiplied by the model parameters associated with each time, as a function of the time interval considered….

These plots are interesting, because it can be observed that, as the time interval increases, the curves separate from each other ***more for the SST than the VIP neurons…*** or in other words, the averages of the cumulative sums for the novel and familiar signals fall outside the standard deviation estimated from the data of the other image type presented.

So…as a future perspective, it would be interesting to study how the accuracy of the model behaves as the time interval increases (more stimuli are presented), as well as when we take only the time intervals where the stimuli were shown.

Now… just to give a more global perspective of the data we worked with, on the left are plots for the mean fluorescence signal versus time, along with their standard deviations, for the VIP and SST populations when a novel (in yellow) and a familiar (in purple) stimulus were presented.

diferencia entre las vip y las sst

Given the activity of neurons can we predict the type of image?

**DISCUTIR SOBRE LA FORMULA DEL MODELO, AGREGAR UNA MINI ECUACIÓN DE LA SUMA ACUMULADA**

Slide 7

Conclusions