Sophie Sackstein

Independent Small Group Discussion Write-up

1. What was the motivation for this study? (e.g. big picture questions motivating experiments, prior work motivating experiments, etc)

Corticogeniculate have feedback pathways to the thalamus and that feedback helps with visual response. The corticogeniculate pathway is largely unknown the connections it has are paramount to our understanding of the how it may regulate the spatiotemporal patterns in the LGN and effect excitation and inhibition response.

2. List the key methodological details (species, preparation, recording/ anatomical techniques, data analysis methods)

A gThis was performed using a virus mediated technique that used that manipulated the CG neurons in ferrets. The optogenetically enhanced neurons were then measured and images were used to discern what was effected. The stimuli were altered for gratings varying in temporal frequency, spatial frequency, and contrast sensitivity. Glycoprotein (G)-deleted rabies virus (SADΔG-ChR2-mCherry) was used to trace the direction of pathways. The neurons were verified with LED stimulation, and recording with and without it.

3. For each figure, describe the important points including how the authors interpret the findings and what the findings may actually show.

Figure 1)

This shows the virus injected CG cells.

a) this shows how SADΔG-ChR2-mCherry is taken up by axon terminals in the CG and the connection between CG and LGN.

b) This shows the virus injected in LGN

c) CG neurons expressing mCherry, this verifies that they are LED stimulated and peristimulus-time histograms show these responses

d) The y-axis is the distance to the surface, and the layers relate to that. The x-axisis time and the colors indicate current. It travels up then down the layers it seems, showing there may be feedback.

e) Population tuning curves, showing the CG neurons that are responsive to LEDs.

f) Again, shows the distinct response of LEDR neurons.

Figure 2)

They used an M sequence stimulus for the stimulation the CG neurons labeled in figure 1

a)This shows that receptive field size in the LED condition is reduced in the receptive field by way of feedback. This shows it activated with and without LED.

b) This shows differential response for the STA, this suggests CG feedback

c) This shows the reduction in spikes for the temporal STA. The latency is more apparent for the ON cells and its more spread out for OFF cells.

d) This compares physical receptive field width and LGN neuron stimulation, again shows the strong reduce in latency for ON cells.

e) The pointy LED plot shows its thinner and theres narrower distance is the visual field.

Figure 3)

This shows that with phase-reversing sinusoidal gratings

a & b) This shows the increased precision with the LED stimulation.

c &d) LGN X and Y neurons showed reduced latency.

d) There was increased spike-timing precision for both cells and corresponding. There was corresponding activity shown in figure E and F.

e) Onset response latencies also was reduced for X and Y.

Figure 4)

The increase in CG firing rate was modulated by LED stimulation.This elevated activation, that could effect the response variables of LGN.

a)This shows that the RGC to CG connection inhibition.

b) Normalizing spikes shows that is responded earlier with LED stimulation than without it.

c) This shows how they performed compared to their computational model.

Figure 5)

Contrast, spatial frequency, and temporal frequency are not effected by the CG field, they use a grating to prove this.

a) This shows normalized firing rate for Y neurons

b) normalized firing for X neurons, both a and b show no reaction for contrast

c) Spatial frequency and preferred temporal frequency was not effected by LED, both show limits in firing rate, max rate is increased for Y neurons.

d) Max firing rate was increased with LED stimulation, differences may be due to higher LED flash rates.

4. What is your assessment of the overall findings? Did the experimental data support the authors' interpretation? Why or why not?

Response latency was significantly reduced. Optic-genetic stimulation makes it more intense- time-precise. The perceptual role of that may be that it becomes sensitive to more frequency. M-sequence stimuli help manipulate this, by using two dots of light one either side of a square they showed the increased. Cells that were optigenetically labelled seemed to show response to classical not extra classical receptive.

5. Describe new insights that you gained from the small group discussion of this paper.

I learned about why the spike as a function of space was thinner so there is LED response showing the receptive field size is smaller. This is defined by deviations, as Abishek explained.

6. List all of your questions and/or points in the paper that you did not understand.

I don't understand why the m-sequence stimuli are used, I think it may be due used for habituation after discussing it with my group but i would like more info on this.