Figures Sept 2, 2020

Notes from previous meeting:

-Apply Synaptic weight % even if there is no stimulation, baseline effects always exist

-Make sure connections aren't happening twice

-Create distributions for total FR Change/synaptic weight depending on population (Excitatory,Motion,Excitatory (Inhibitory effects).

-Review optogenetics equation – Equation is correct & in accordance with paper

Figures 1-4 include the individual & summated synaptic weight contributions by % of of firing rate at no microstimulation.







Optimization Function update:  
  
Using the properties we have discussed so far, I have not been able to achieve the desired results in neuronal activation performance (Non-Motion/Motion), the average results are listed below:

|  |  |  |  |
| --- | --- | --- | --- |
| MS only | Opto Only | MS + Opto (+) | MS + Opto (-) |
| 4.65 | 0.87 | 4.32 | 4.58 |

I would expect for type 3 and type 4 combinations to achieve as good a result as type 2, however this is not the case. I hypothesized this may be due to the large number of variables in the solution space so I lowered the number of electrodes to 24 from 100. The results from this change indicated worse performance compared to the 100 electrode array, thus this hypothesis does not seem to be accurate.

I then attempted to apply microstimulation alone, followed by optogenetics in a follow-up optimization run. This also resulted in disappointing results from all modes except type 2 (optogenetics only).

I reviewed previous work and concluded that the issue must be occurring due to the change in F-I curves previously made. I reverted the F-I curve change for microstimulation, opting instead to have one curve represent both inhibitory and excitatory neurons. The following plot is created from the resultant optimization performance.



The performance of all solutions were greatly enhanced. In particular, type 4 calculations arrived at near-optogenetic levels of performance much easier than any other type. We can hypothesize that Microstimulation + Optogenetics combination has three distinct advantages

1. Enhanced performance compared to either of the two stimulation modalities alone
2. Faster determination of optimal stimulation patterns, shown by the figure
3. Lower amplitudes of stimulus intensity used from each modality