

Models of the Neuron: Project 2 Proposal

Greg Kiar

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1 Introduction

Connectomics is a young field which aims to produce connectomes, complete connectivity maps, for living organisms. The *Caenorhabditis elegans* (*C. elegans*) roundworm is studied in this field because of its simple, and small nervous system consisting of only 302 neurons [2, 6]. The goal of the research conducted as a part of this paper is to understand neural network dynamics of *C. elegans* and what effect initial conditions have on motor neuron response. The research conducted will build off of work studying the effect of ablations of specific regions of interconnected neurons on forward motion [3].

2 Motivating Works - Kunert, Shlizerman and Kutz; Prinz, Bucher, Dirk and Marder

In Kunert et al., 2014 [3] a network is constructed of 279 neurons of *C. elegans* based on known connectome data [5]. Here, only 279 somatic neurons of the 302 total neurons were included in the model; those excluded were done so by the prescription of [5] and the set comprised of pharyngeal neurons as well as those who were isolates. Kunert et al. observe the relationships between motor neuron activation and the ablation of two regions of interneurons AVA and AVB much like was done experimentally in [1] to show their model's validity.

In unrelated work, Prinze et al., 2004 [4] show that disparate patterns of neural network activity can produce nearly identical neural activity. This result will be qualitatively applied to the Kunert et al. model developed above in this project.

3 Proposed Research Task

Using the network and neuron structure as implemented in [3], this work aims to assess the motor neuron response of *C. elegans* for random neuron single and pair ablation. Neurons will be selected both individually and in physiologically symmetric sets, and will be removed from the network signifying ablation. What this work aims to observe is if the AVB interneurons alone are responsible for transduction of forward moving responses to the motor neuron, or if other ablations have similar results. This work will

identify a set of interneurons that have a similar effect on motor response to the AVB neuron pair.

References

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