Evaluating Methods for Predicting Neuronal Connections in Drosophila Brain

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A Drosophila brain encompasses more than 100000 neurons. To delineate the connections between these neurons in a fluorescent-image-based database is a crucial but challenging task. Previous studies have developed several approaches to estimate neuronal connections based on the distance and contact point criteria. The distance criterion indicates the shortest distance between two neurons that can be considered as making a contact while the contact point criterion sets the minimum value of the contact points between two neurons that are determined to form synaptic connections. Moreover, the distance can be calculated based on the distance between terminal points or branch segments. The goal of this project is to determine the best method and the optimal criteria by performing statistical analyses based on the ground truth data, which were compiled based on previously published papers on the central complex. We found that the highest accuracy was yield from the method based on the segment node-to-segment node at distance is 12um and the best contact point criteria was 1.5 percent. We further discovered that the best criteria were neurons-size dependent and by adopting variable criteria, we increased the accuracy by 15 percent. We will apply our method on the FlyCircuit database to generate a highly accurate connectome of the fruit fly brain

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