THE UNIVERSITY OF ARIZONA
COLLEGE OF ENGINEERING
Biomedical Engineering

DEPARTMENT OF BIOMEDICAL ENGINEERING SEMINAR SERIES

PRESENTS

Gianna Jordan

MS Student
Biomedical Engineering
PI: Dr. Stephen Cowen
Cowen Lab

"Automated Behavior Quantification of Rats in the String Pulling Task"

ABSTRACT: Accurate and detailed assessment of motor function is critical for the investigation of movement disorders such as Parkinson's disease. Many behaviors are currently available for evaluating motor performance in rodent models of disease; however, most of these behaviors have limitations. Simple behaviors like the rotarod test are easy to implement but only provide a single measure of behavior (e.g., time to fall off of the rotarod). Others, like the center-out task, skilled reaching task, and vermicelli handling test are complex and often require manual segmentation of movement to identify motor patterns. The string-pulling task is a novel behavior that has many advantages over existing tasks as it affords detailed assessment of arm-reaching and grasping. We have developed a system capable of 1) automatically quantifying behavior and tracking limb position in the string-pulling task, 2) automatically reinforcing behavior with food pellets, and 3) syncing behavioral measurement to neural data recorded concurrently. Open-source tools were used to construct the system, including a neural network (DeepLabCut), a high-frame-rate camera, a rotary encoder, an Arduino MEGA, a food-pellet dispenser, and simple circuits. We were able to automatically segment upward and downward pulls from each paw and correlate pulling behavior with the activities of neurons in the primary motor cortex and striatum. This system has applications for the study of the motor system and motor disorders, and it can be used to streamline the training and analysis of movement in rodents.

AND

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Angela MacIsaac

MS Student
Biomedical Engineering
PI: Dr. Erika Eggers
Eggers Laboratory of Retinal Neurophysiology

"Electrophysiological Signal Modeling for Spatial Distribution of OFF Bipolar Cells in the Retina and Electroretinogram Construction"

ABSTRACT: Diabetic retinopathy is one of the leading causes of blindness in the United States and is caused by damaged blood vessels within the retina of the eye. Understanding the pathways and mechanisms of this disorder and its effects on the retina is essential for determining how the damage can be prevented in early phases of the disease. Many of these intracellular pathways can be studied using single cell electrophysiology techniques or an electroretinogram (ERG). An ERG is a device which measures electrical responses of various cells in the retina as they respond to different stimuli. These recorded electrical potentials show if the retina is sending signals properly. Using previously recorded electrophysiology data from single cells of OFF bipolar cells under light- and dark-adapted conditions, I developed a code to model how the total activity recorded from these cells over a certain time period vary as the distance of the stimulus to the cell differs. The system was used to compare the light- and dark-adapted recordings from both glycinergic and GABAergic inhibitory inputs to the cells. Along with this system, I am currently working on the construction of a new ERG which will be tested to ensure the recordings from this device are accurate and precise.

Please join us on

Monday, November 23rd, 2020

12:00-12:50 pm, https://arizona.zoom.us/j/94765815841

Hosts: Dr. DK Kang and Dr. Russ Witte
dkkang@arizona.edu and rwitte@arizona.edu

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