animal-soup: Automated animal behavioral classification using machine learning

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BACKGROUND

The Hantman Lab uses mouse models and a reach-to-grab behavioral task where a mouse has to grab a food pellet and eat it. Various perturbations can be performed, such as moving the food pellet or disrupting brain regions, to help us understand various aspects of skilled motor behavior. An imperative part of understanding the skilled movement during this task in mice is analyzing their behavior in parallel with the corresponding neural activity. However, hand-labeling components of the behavior manually can be very time intensive and often have varying results due to the subjective nature of human labelling. Thus, the use of machine learning techniques to automate this process will allow for better, more efficient analysis of skilled motor movement in the Hantman Lab that can have broader reaching impacts on the neuroscience community.

METHODS

■ Use previously collected data from the Hantman Lab to curate a large ground-truth dataset for training a series of neural networks
   ■ Develop a user-interface using *fastplotlib* to clean 1000 trials and corresponding behavioral labels
   ■ Use pre-existing Convolutional Neural Networks (CNNs) to train a model specific to the Hantman Lab task for predicting on new behavioral data

■ Develop an open-source software package for quick and accurate automated behavioral classification
   ■ Design an intuitive and elegantly-written API for organization, visualization, and analysis of behavioral data
   ■ Write a testing suite and continuous integration pipeline

RESULTS

1. Development of a large ground truth dataset for the Hantman Lab reach-to-grab classification task

2. Development of an easy-to-use, maintainable software tool for members of the Hantman Lab to organize their behavioral data, perform automated classification, and post-processing analysis