Abstract:

a multidimensional representation of motor state is encoded across the forebrain, and is integrated with visual input by neuronal populations in primary visual cortex
We want to model how neuronal activity affects pupil area.

Data

We have data of neuronal activity over time (sresp), with 11982 neurons binned as 1.2 seconds. This data is available in matrix form: every row represents single neuronal recording and every column represents time bins.
The external variable we are interested in decoding is pupil area and this is given as an 1D array which is also binned as 1.2 seconds. This data is recorded simultaneously while recording the neurons. So every column(of pupil area recording) of the array will correspond to the response of the 11982 neurons.

Methodology

We have performed PCA on 11982 neurons. We compute the correlation between our sresp and PC1 via a correlation matrix. We select the neurons with the highest correlation coefficients in this correlation matrix according to a threshold. Let's name the selected neurons as pupil
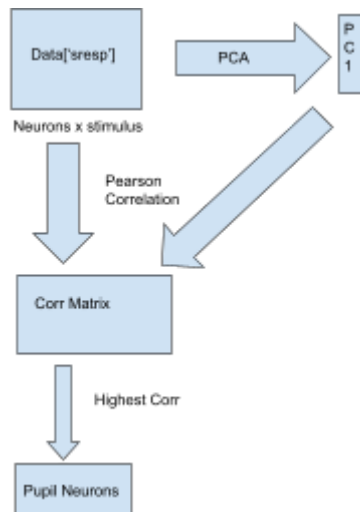
neurons.

We analyze these pupil neurons which affect the pupil area by making a Neural Network to predict pupil area given the activity of these pupil neurons.

We feed the pupil neurons recording at every time bin to the Neural Network in order to predict the pupil area of that time bin.

Hypothesis:

Sensory cortices are active in the absence of external sensory stimuli. There are Neurons which are highly correlated to the Pupil Area which gives rise to neural activity in absence of external stimuli.

What it means:

Decoders can also be used to understand the form of the mapping between neural activity and variables in the outside world . That is, if researchers aim to test whether the mapping from neural activity to behavior/stimuli (the "neural code") has a certain structure, they can develop a "hypothesis-driven decoder" with a specific form. If that decoder can predict task variables with some arbitrary accuracy level, this is sometimes held as evidence that information within neural activity indeed has the hypothesized structure.

If we can map the neural activity to behavior /stimuli we can design the decoder to predict task variables.

a multidimensional representation of Neuron is encoded across the forebrain, and is assisted with motor variables, in absence of external stimuli.

1. general background: why we care
2. 1-2 sentences of more specific background. What we already know.
3. question/hypothesis Sentences
4. what we did. Methods. 1-2 sentences
5. what we found
6. what it means

Abstract

Our perception is dictated by our sensory neurons. Finding the certain neurons which are at work is a challenge that is still being pursued today. Studies have found out that a multidimensional representation of Neuron is encoded across the forebrain, and is assisted with motor variables, in absence of external stimuli. This study seeks to address this problem by decoding neuronal activity to predict a motor area (Pupil Area in this case) which is responsible for the neural variance.. Raw neural data is naturally noisy and there are techniques such as Principal Component Analysis and Pearson Correlation Coefficient that can weed out the neurons that correspond to pupil area. Modeling the connection between neural activity and its stimulus response would be useful information for analysis that lacks the direct means to measure neural responses.