ML Documentation

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1 Machine Learning Analysis

1.1 Machine Learning Methods

Analysis was performed in Python using the Keras library from TensorFlow, decoding libraries from MNE-Python, and the sklearn library. Data was split into training sets of 500 trials for each subject with 100 trials of test trials. Trials were time-binned from 0-0.4 seconds at 0.025 second intervals to account for the 40hz MEG data. The data is split into classes based on angle. For example, if we wanted 4 classes, class 0 corresponds to gabors oriented from 0-45 degrees, class 1 from 45-90, class 2 from 90-135, class 3 from 135-180. An issue is immediately apparent from these class divisions. A gabor oriented at 179 degrees is marked as class 3 despite being very similar to a gabor marked in class 1, at 1 degree for example. To account for this, we can use a few tactics: (1) using many classes to minimize the inaccuracy of any one individual class, (2) split the first class between 180 degrees and 0 degrees, or (3) develop a cost function that takes the cosine encoding into account. Models were trained for each subject to account for individual Model accuracy was calculated with 5-fold cross-validation and evaluation accuracy on the test dataset. Model accuracy was then compared with the results of a permutation test, in which we shuffled around the training and test labels of the dataset to calculate a baseline accuracy for a naive model. This test essentially compares our models to a chance accuracy.

1.2 Sliding Models

1.2.1 Logistic Regression

1.2.2 Neural Network

1.3 Recurrent Models

1.4 Serial Dependence Model