

Predicting facial movement using electromyography and machine learning

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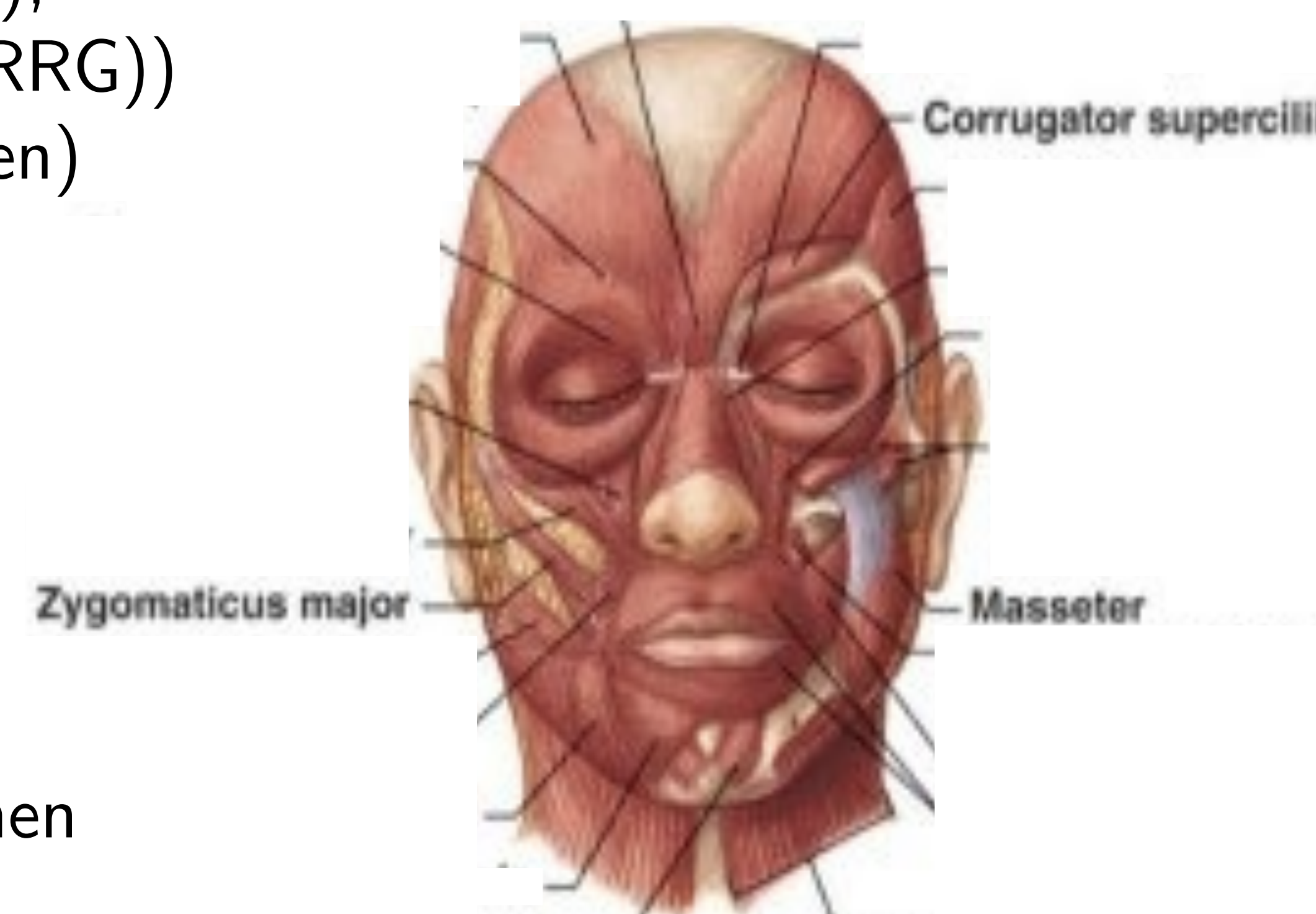


Motivation

- Behavioral coding is commonly used for psychology research.
- Behavioral coding is inherently a subjective and time-consuming process.
- In addition, there is always the chance of missing subtle expressions that are not easily visible.
- The purpose of this study is to support traditional behavioral coding methods of facial expressions by using machine learning on available electromyographic (EMG) data.

Methods

- EMG Data
 - 3 electrodes (zygomaticus major (ZM), masseter (MET), and corrugator(CORRG))
 - 108 participants (56 adults, 52 children)
 - 80% train/20% test data split
- Four machine learning algorithms
 - decision tree
 - K-nearest neighbors (KNN)
 - multilayer perceptron (MLP)
 - linear support vector classifier (SVC)



Success was measured by final accuracy when distinguishing between:

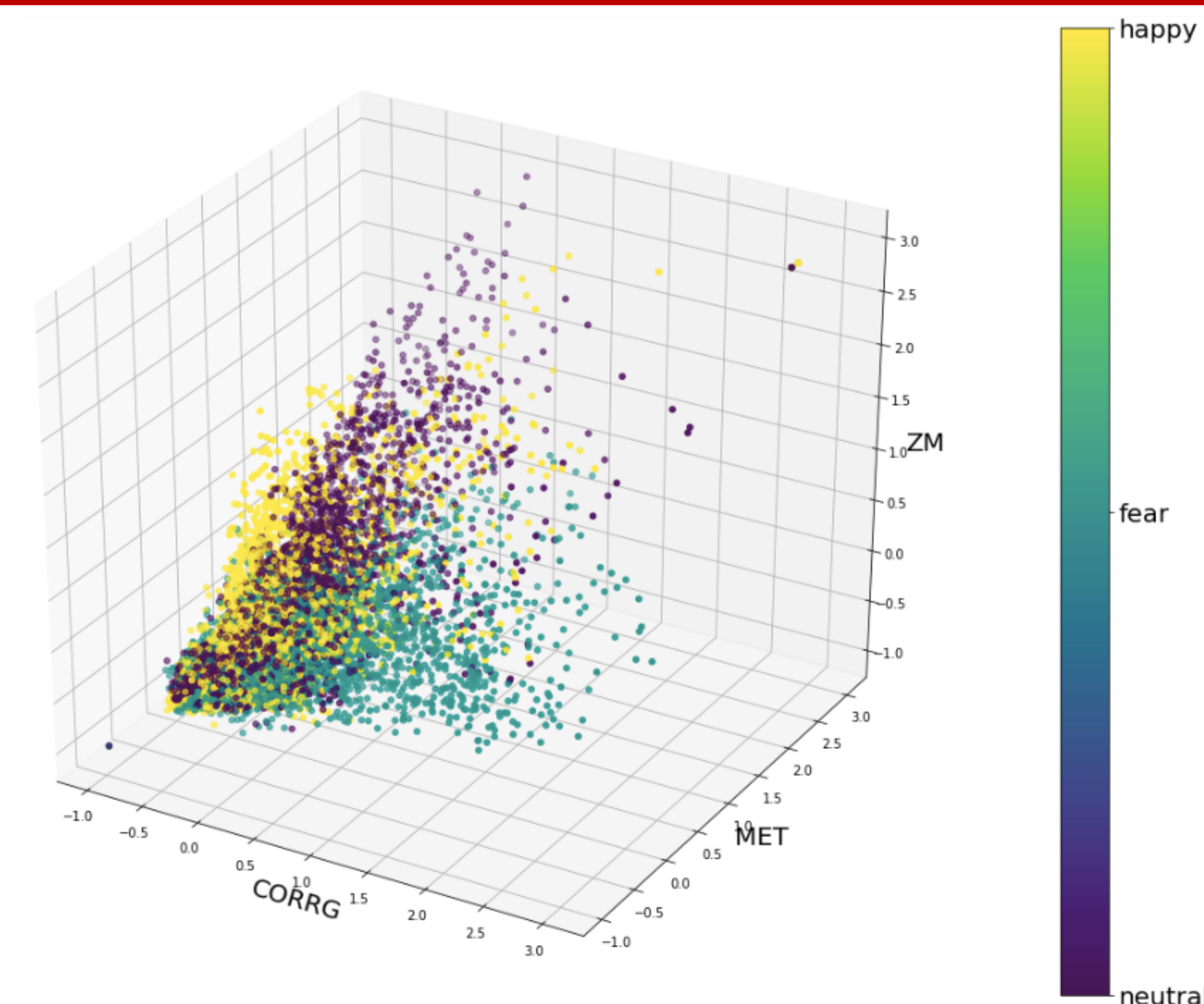
- (a) any facial activity versus no movement
- (b) different facial expressions (Fearful, Happy, Neutral).

Discussion

With further development, machine learning models could simplify the behavioral coding process.

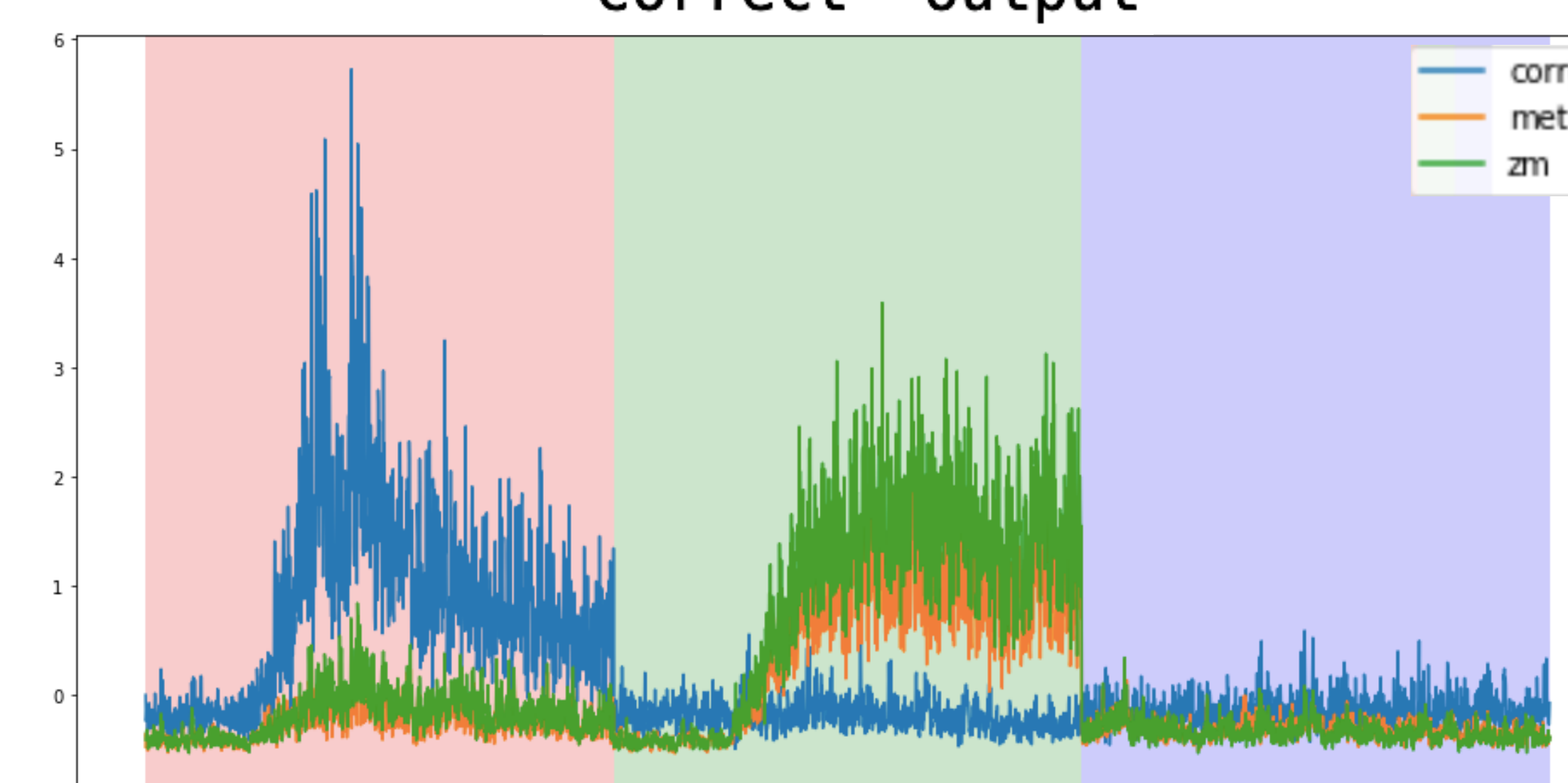
- While some models overfit and didn't generalize to novel data, other models had a consistent decision boundary and accuracy.
- The proposed use of these consistent models would be in tandem with other coding methods, such as
 - quickly verifying low-accuracy classifications via video coding
 - outputting cutoff parameters that can be used to facilitate other analyses.

Results



- For detecting facial activity, MLP and SVC algorithms achieved high accuracy.
- For classifying different facial expressions, however, all classifier accuracies were low due to discrepancies in the data.

"correct" output



model's output

