

Learning Outcome Prediction

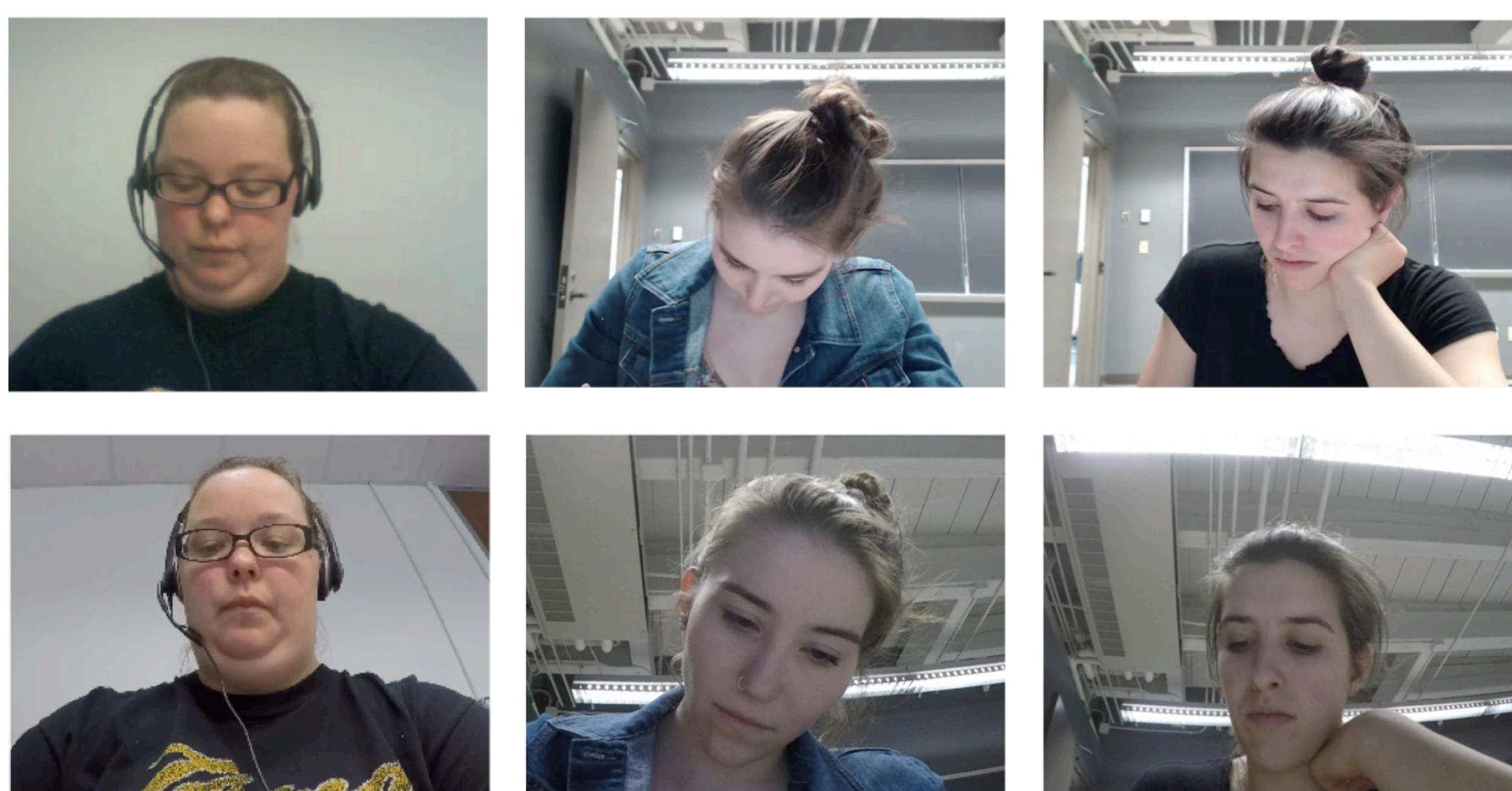


- Can we build an Intelligent Tutoring System that can forecast the problem outcome label from a video of a student interacting with it?

Overview

- We introduce a novel dataset of student interactions with MathSpring, a popular Intelligent Tutoring System.
- We provide an exploratory analysis of the different problem outcome classes using typical facial action unit activations.
- We develop baseline models to predict the problem outcome labels of solving math problems.
- We discuss how early problem outcomes can be forecasted and utilized to provide possible interventions.

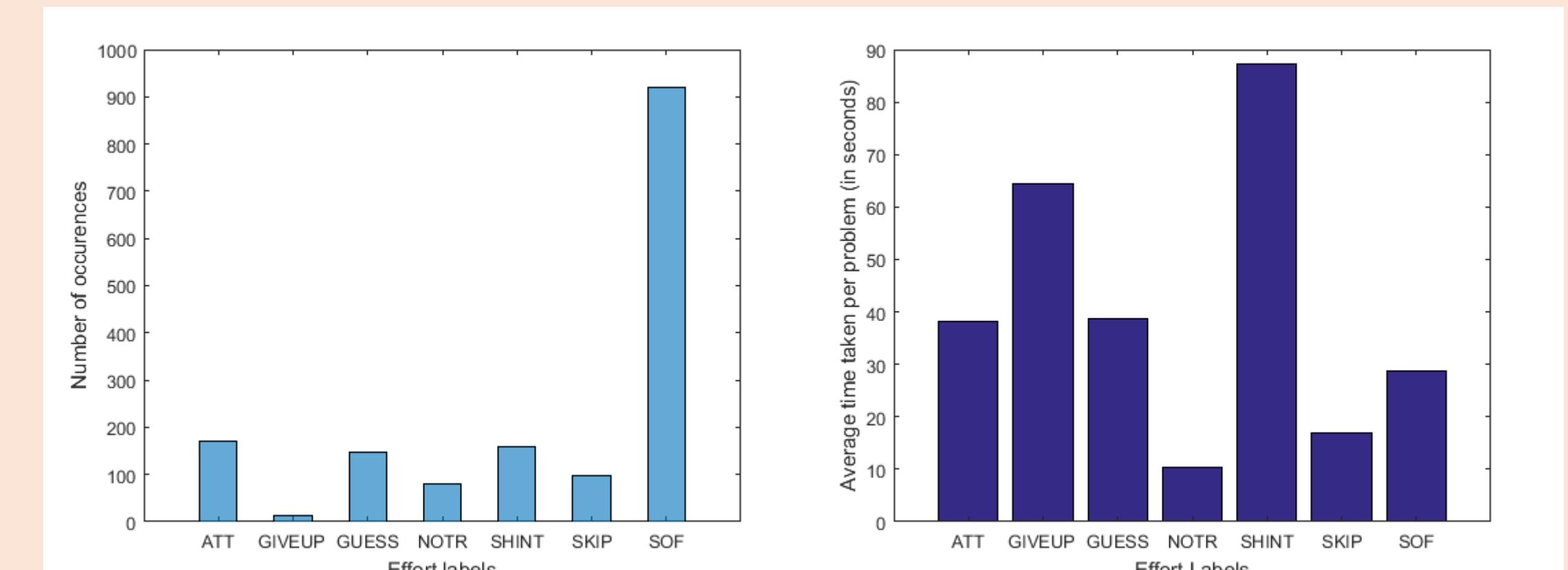
MathSpring Student-Interaction Dataset



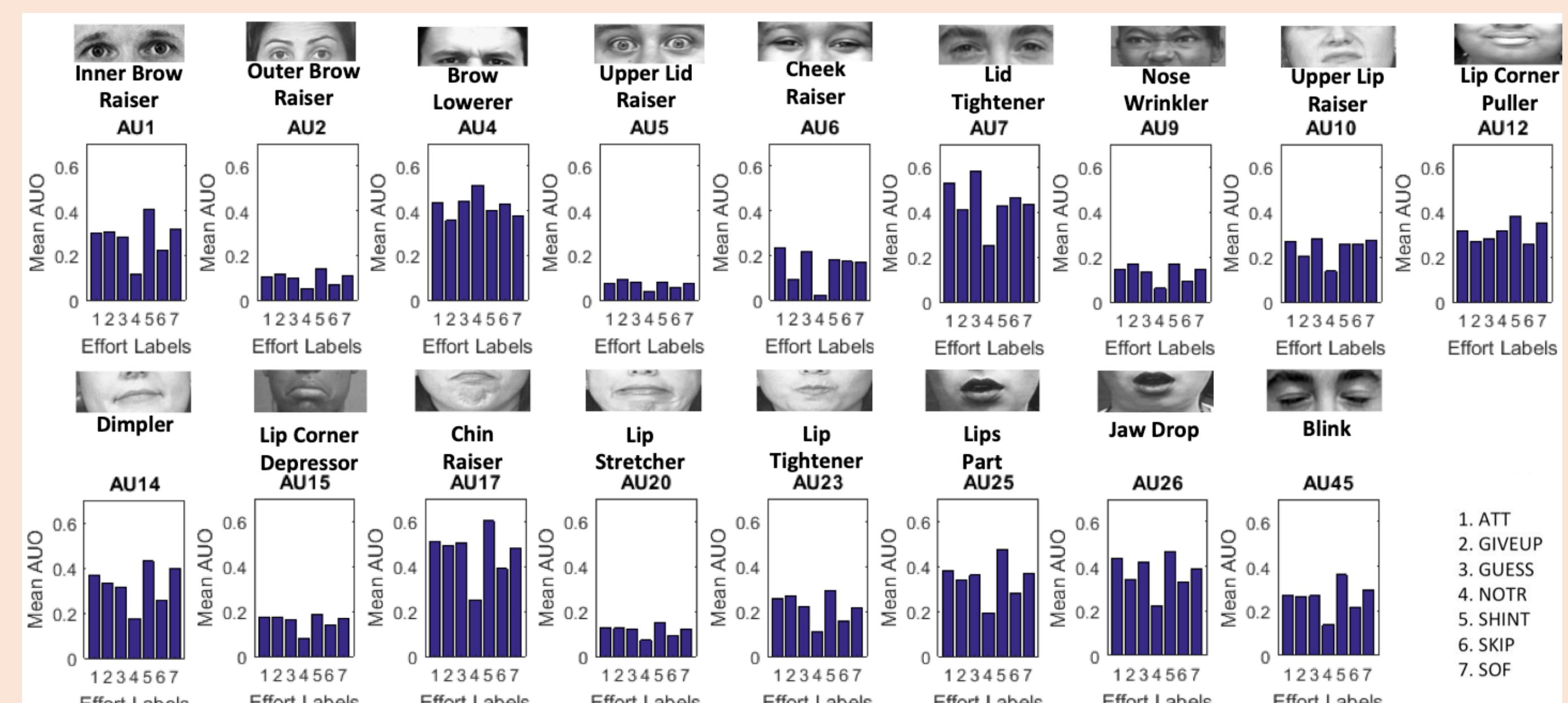
- The dataset consists of video recordings of college students participating in problem-solving sessions in MathSpring.
- The students were recorded with a webcam and a GoPro.
- A total of 30 undergraduate college students took part in the study, resulting in 38 one-hour sessions, from which 1596 problem samples were extracted.

Data Analysis

1. Number of Occurrences and average time taken to complete for each class in the dataset

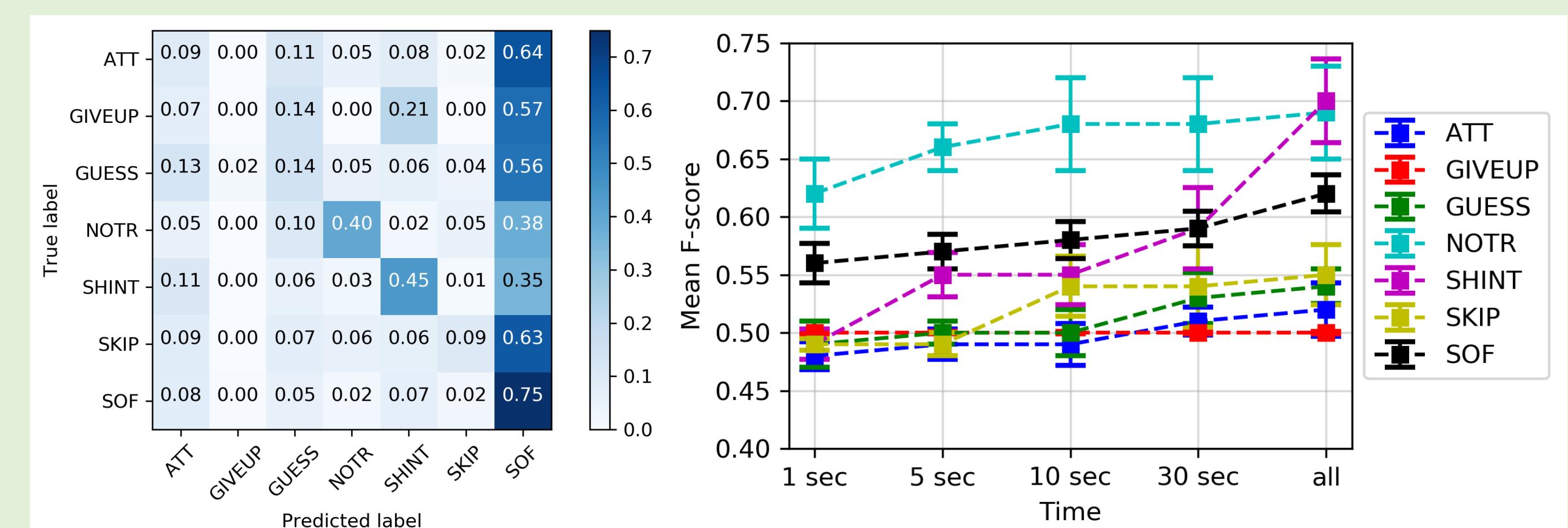


2. Average Action Unit Occurrence distributed according to student outcome prediction labels



Baseline Models

- For each video, we computed statistics (mean, std, min, max) from 18 facial activation presence and 17 facial activation intensity values as well as their derivatives.
- We trained and tested multi-layer perceptrons with 2 hidden layers, each with 100 activation nodes, on 5 random 75-25 stratified splits of the data.



Future Work

- Utilize signals from all streams of information in the dataset (GoPro videos, mouse movements/clicks).
- Train models that explicitly model the temporal dynamics of how facial dynamics evolve over the duration of the interaction.
- Utilize models to provide interventions to improve learning.