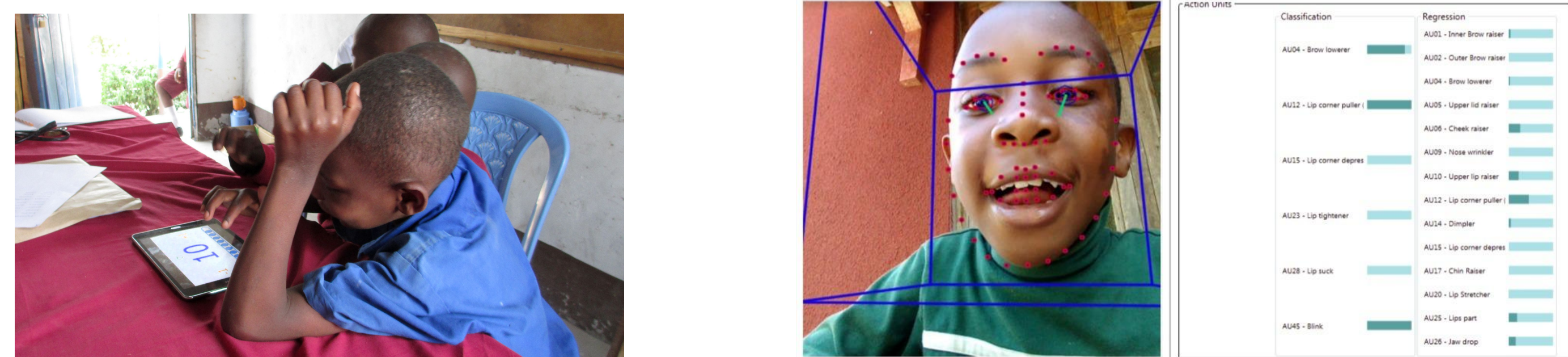


Goal: To study if there are any interesting links between student behavior and their affective states in an intelligent tutor system? Can these affective states be used to predict student's behavior in real-time?

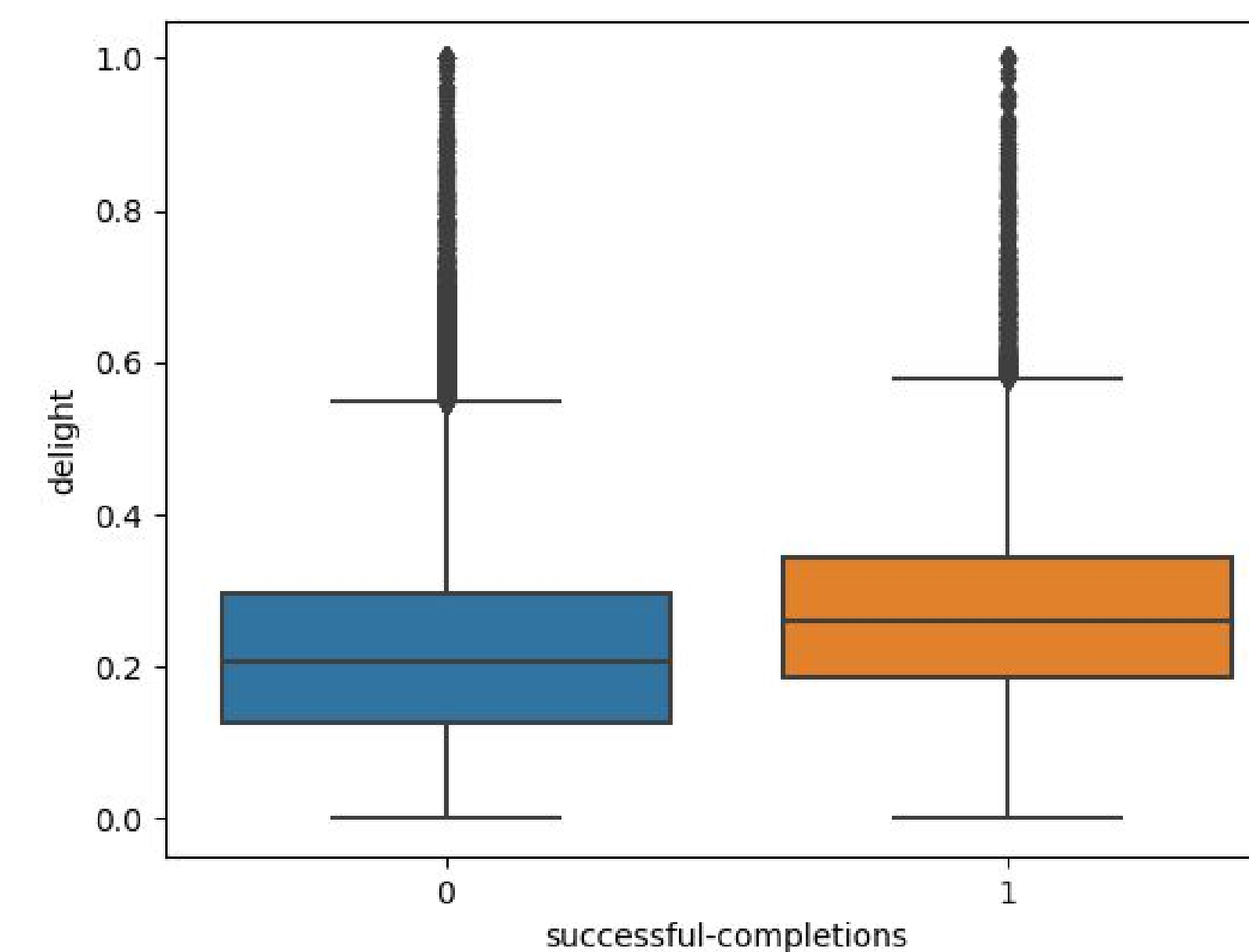


Research questions included:

- Can we apply a novel approach of affective state estimation on children belonging to different demographics using existing open source tools?
- Given the additional information of the student's affective state, what can we infer about the student, the different activities and the subject categories?
- Is it possible to predict the student's next action based on their affective states? For example, can we make a real-time system to detect when the student is about to tap the back button in-between the activity?

Results:

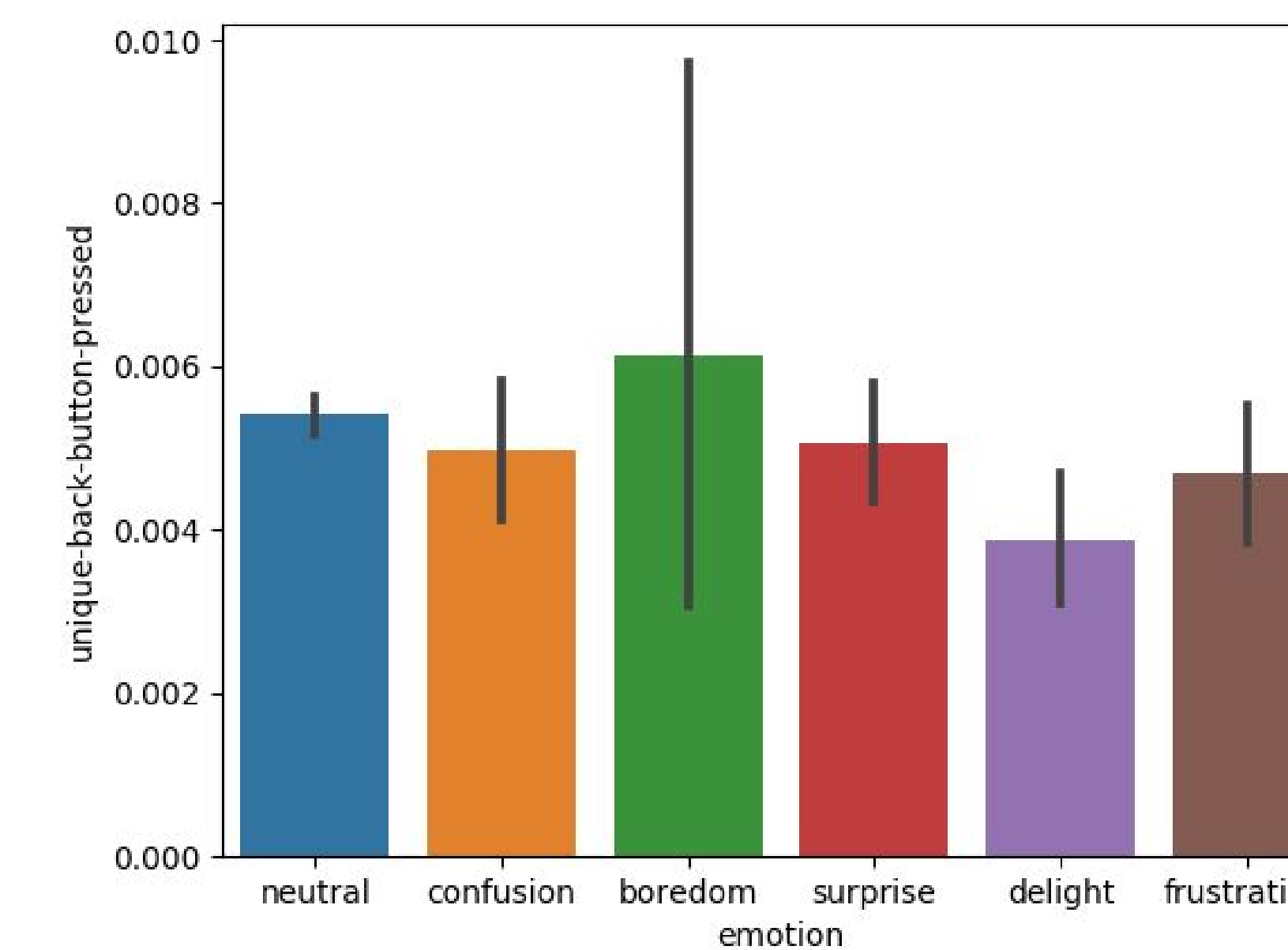
Successful completions are more likely when students are in Affective State Delight



Wilcoxon rank sum test (95% confidence)	W-value	p-value
	1079900000	2.20E-16

- Statistically significant positive correlation exists between the state delight and successful completions.
- Affective state delight is a possible predictor for the successful completion of activity.

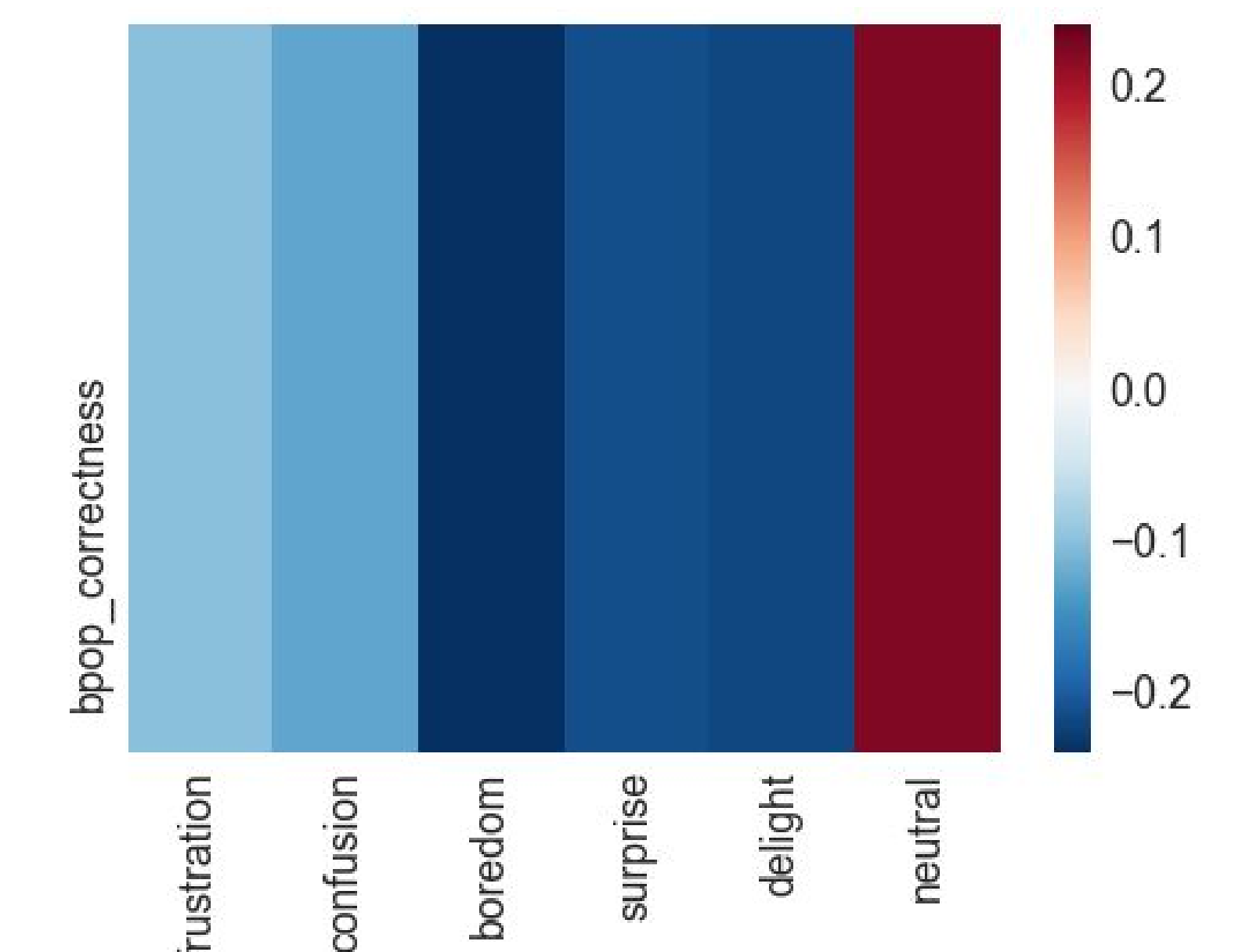
Affective State Surprise is a good indicator for a student clicking the back button during activity



Wilcoxon rank sum test (95% confidence)	W-value	p-value
	29136000	0.03796

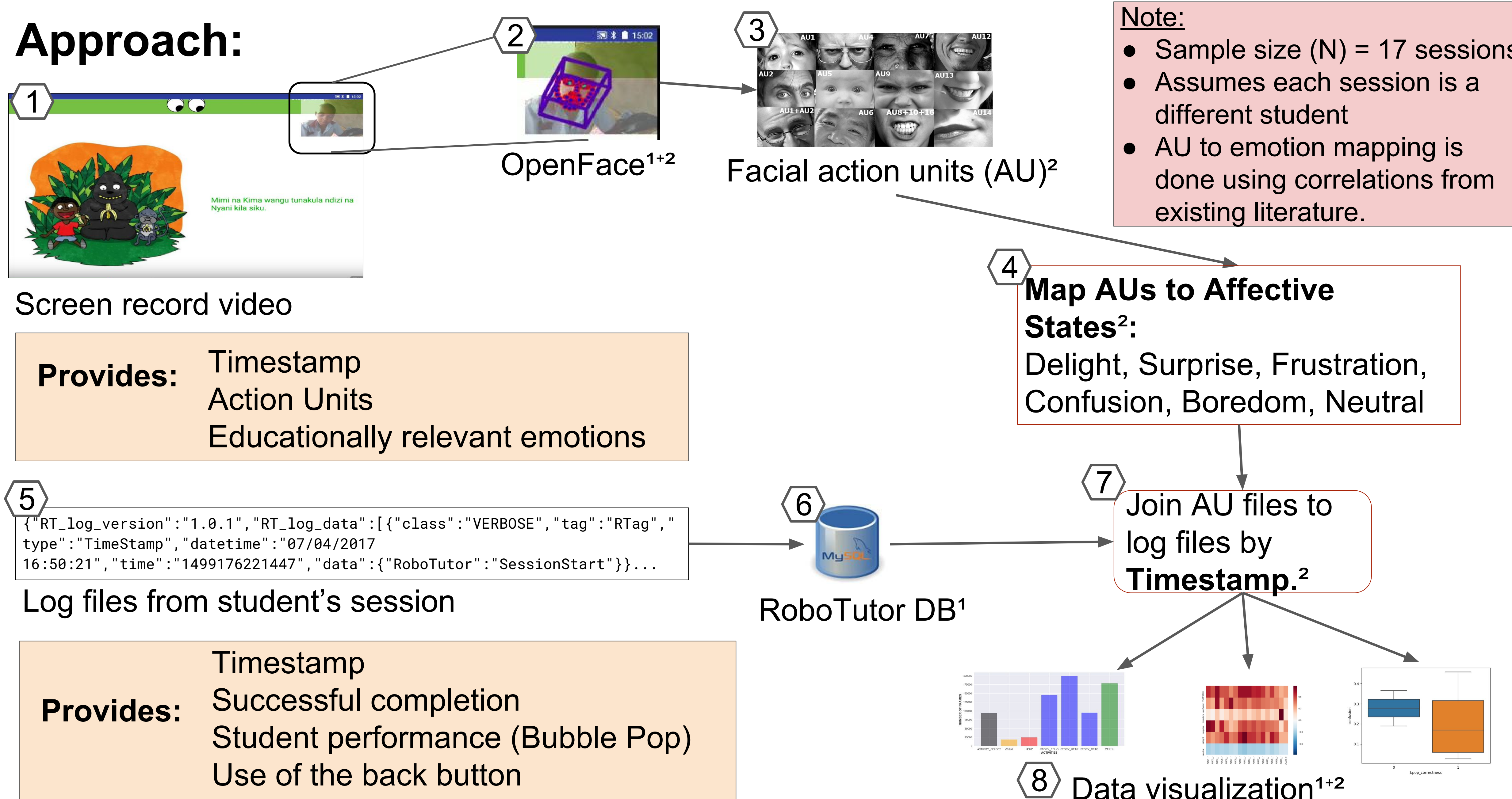
- Although boredom is more frequent, only neutral, surprise and delight were statistically significant.
- Significance values shown above are for affective state Surprise.

Correctness in Bubble Pop activity is positively correlated only with Affective State Flow



- Flow (neutral) is a good indicator of the learner being engaged while interacting with the tutor system.
- It can be considered as one of the many predictors for 'good' performance in Bubble Pop activities.

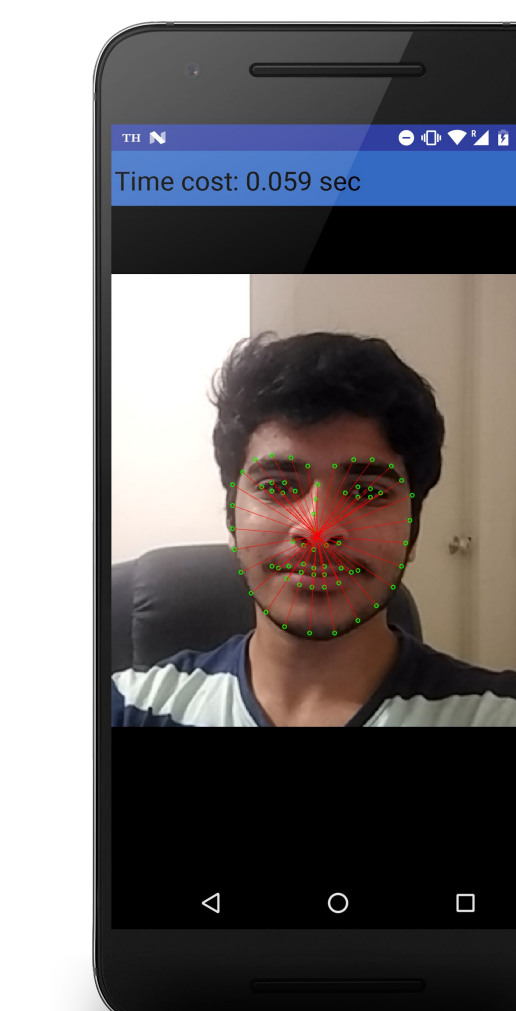
Approach:



Conclusions and Future Work:

- A correlation exists between in-app behavioral actions of the students and the affective states exhibited by them.
- Using many such correlations, we can build a prediction model for the in-app behavioral actions of the students in real-time.

Developing a background service to communicate the next possible action or behavior of the student to RoboTutor. This is currently in development.¹



Statistical Probe of Tutoring

```
{ "ID": 74, "age": 6, "gender": "female", "affect_SPOT": { "boredom": 0.0006827252, "engagement": 0.0004892586, "confusion": 0.0000475081, "delight": 0.0022222, "frustration": 0.0023153536, "surprise": 0.0012849453, "neutral": 0.00783882 } }
```

Integrate existing affective state data analysis pipeline to Statistical Probe of Tutoring system (SPOT) for continued analysis of incoming data.¹⁺²

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