



中科院计算所



Automatic Engagement Prediction with GAP Feature

ICMI 2018

EmotiW2018

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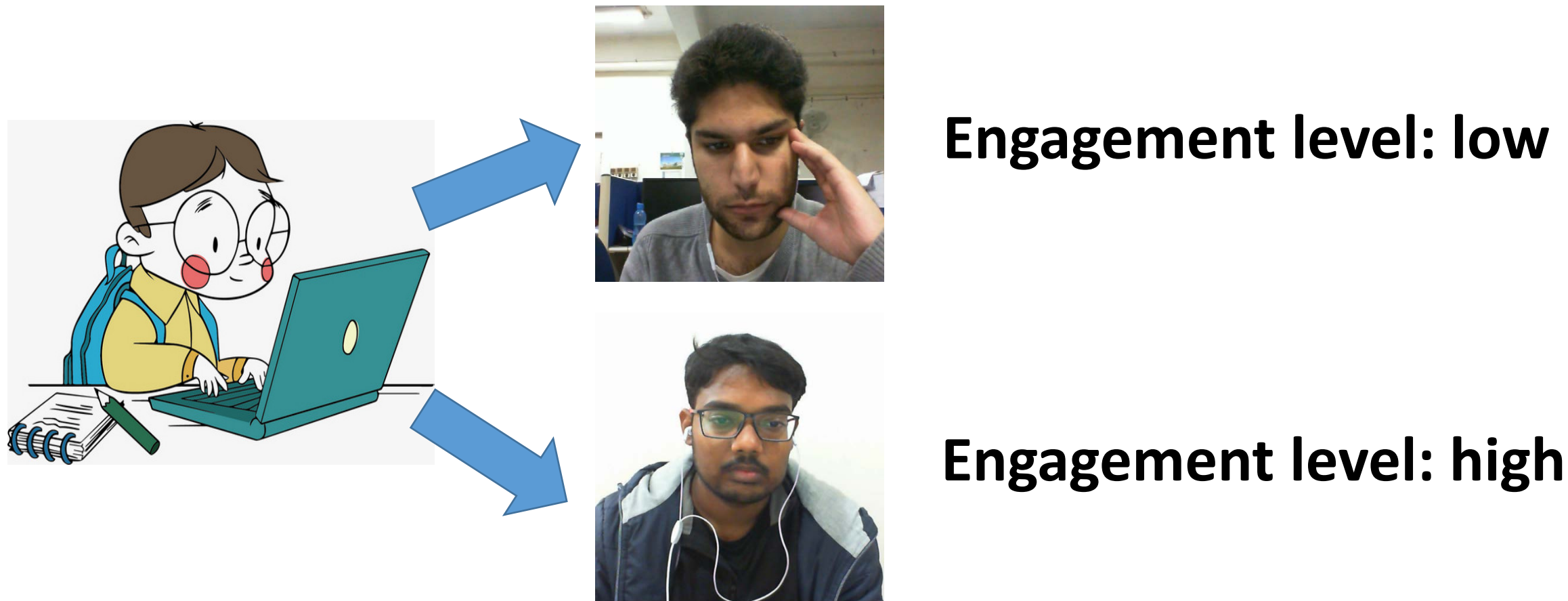
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Problem

Student engagement prediction in MOOCs



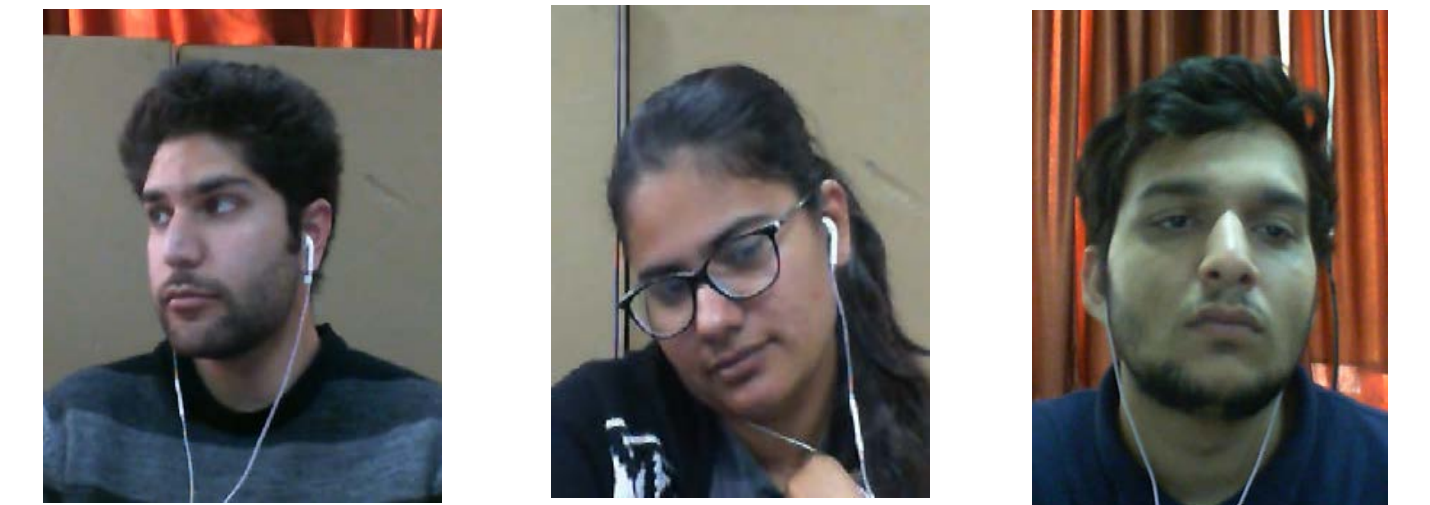
Challenges involved in engagement level prediction

- Engagement is an affective state which has various aspects such as emotional, cognitive and behavioral aspect.
- The engagement level of the subject may change constantly when watching a MOOC course.

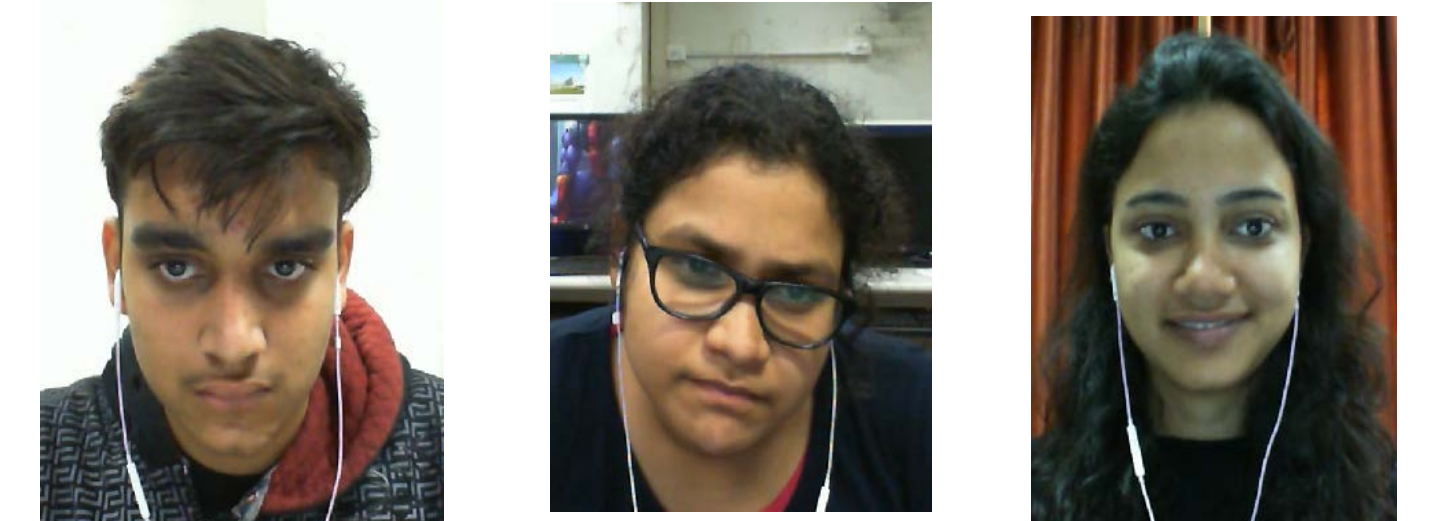
Motivation

Multiple factors can be related to engagement level, i.e., gaze, head pose, and action units, leveraging multiple cues could provide better robustness in engagement prediction.

Engagement level: low



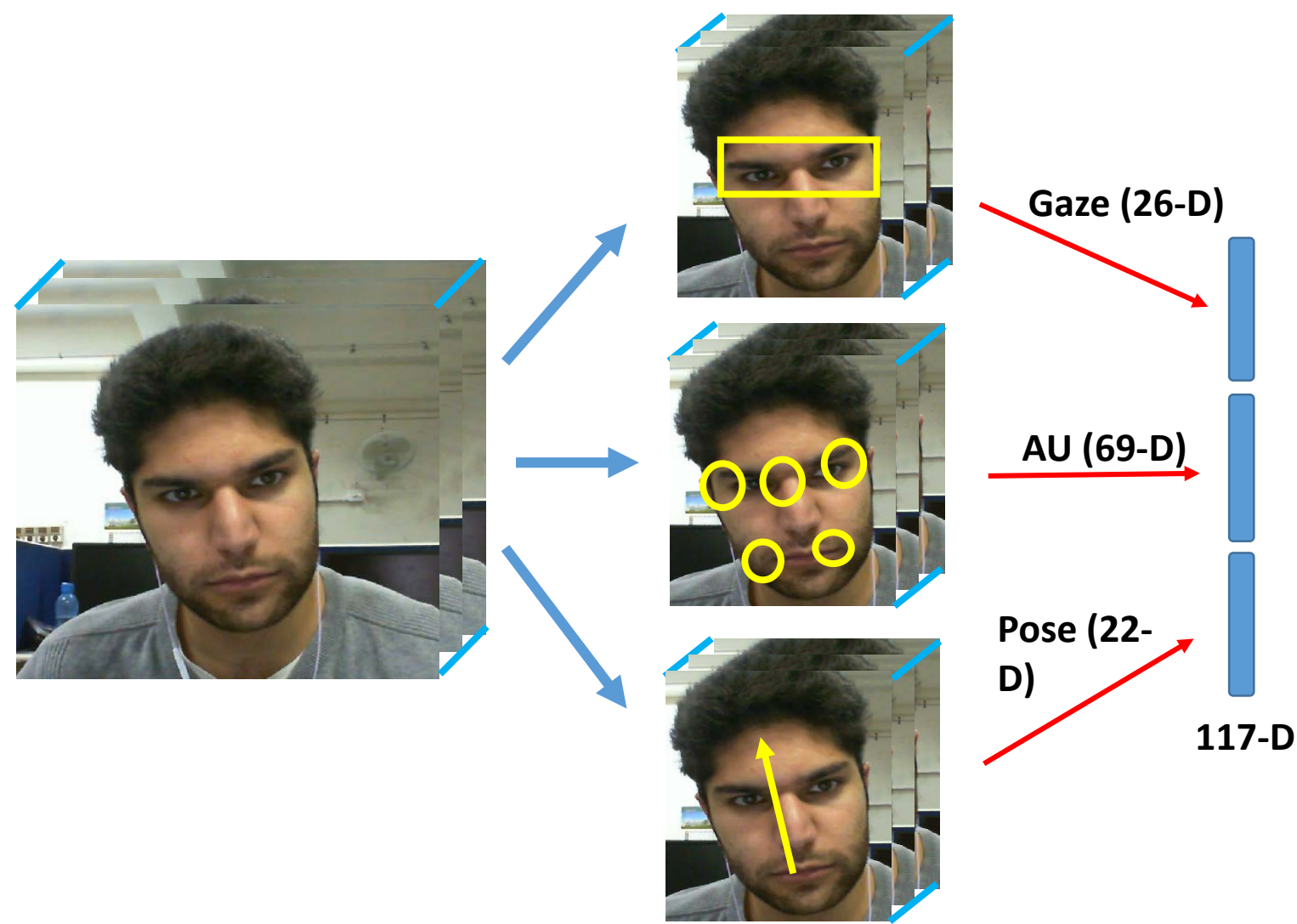
Engagement level: high



Gaze Head pose Action unit

Proposed Method

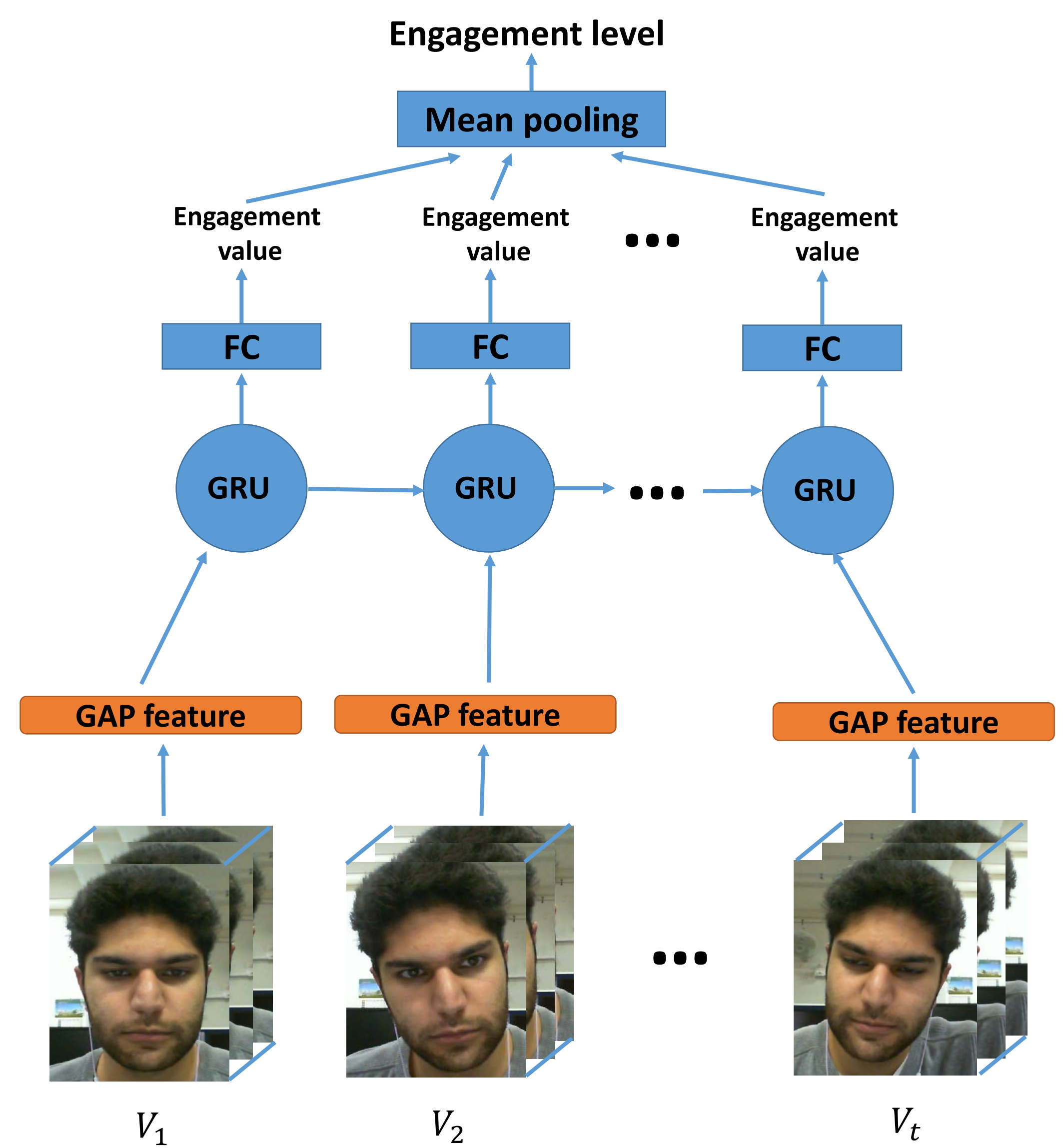
Gaze-AU-Pose (GAP) feature generation



Details of GAP feature

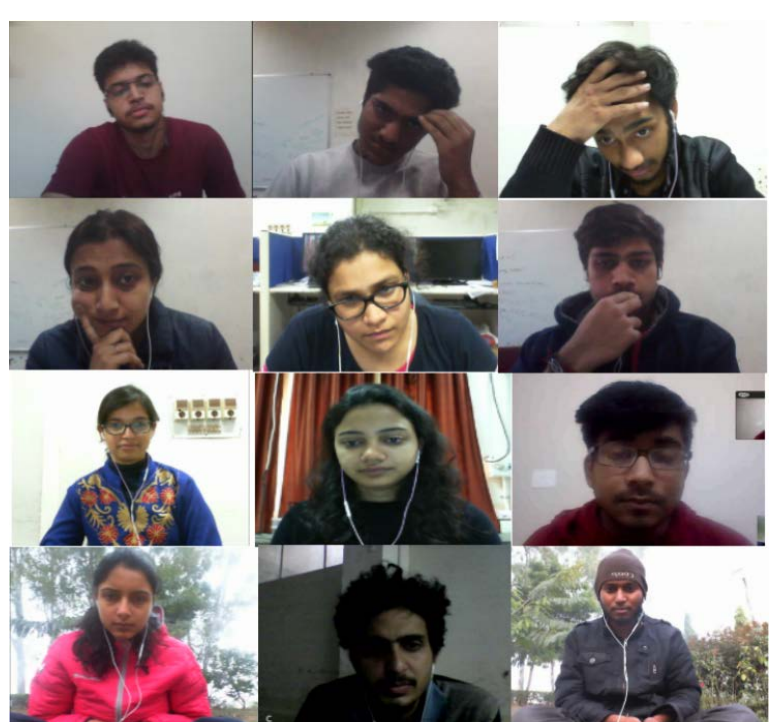
Feature	Coded Information	Dimension
Gaze	gaze direction vectors	12
	gaze direction in radians	4
	2D & 3D eye landmarks	10
AU	AU presence frequency	18
	AU intensity	51
Pose	head location	6
	head pose vector	6
	2D & 3D facial landmarks	10

Engagement level prediction

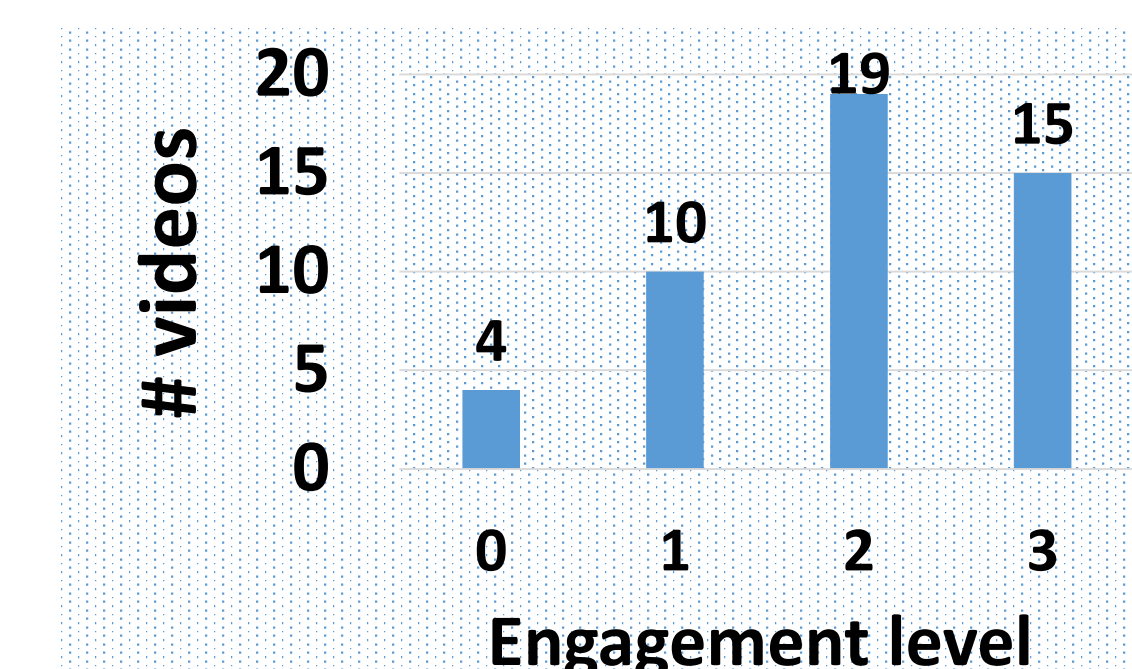
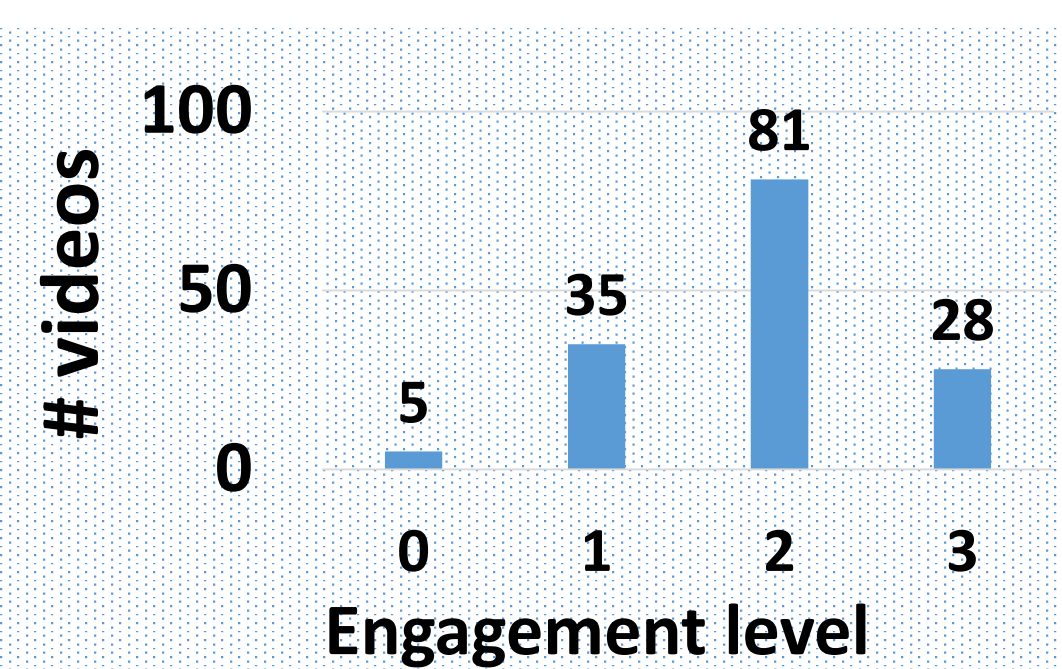


Experiments

Database: EmotiW2018 Student Engagement Prediction (EngReco) Challenge

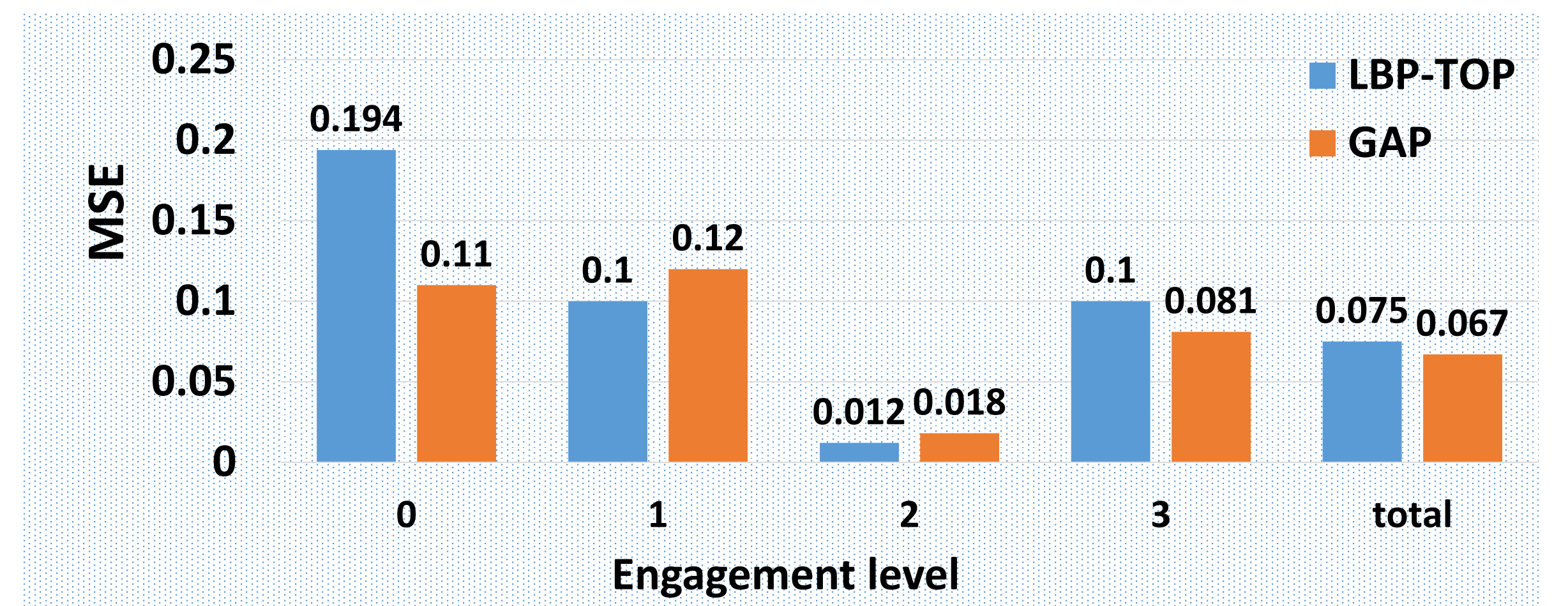


- 147 training samples, 48 validation samples and 67 testing samples
- Video average duration: 5 min
- Four engagement levels: 0-3



Data distribution of the training set Data distribution of the validation set

Results



Performance on the validation set

Fusion of GAP feature and LBP-TOP feature

$$E_{\text{fusion}} = \lambda E_{\text{GAP}} + (1 - \lambda) E_{\text{LBP-TOP}}$$

$$\lambda = 0.7$$

Dataset	LBP	GAP	Fusion
Validation	0.0741	0.0671	0.0569
Test	-	0.0724	0.1197

Final performance (MSE) on validation and test set