

# STATISTICAL, SPECTRAL AND GRAPH REPRESENTATIONS FOR VIDEO BASED FACIAL EXPRESSION RECOGNITION IN CHILDREN

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\*Equal contribution



Link to the paper

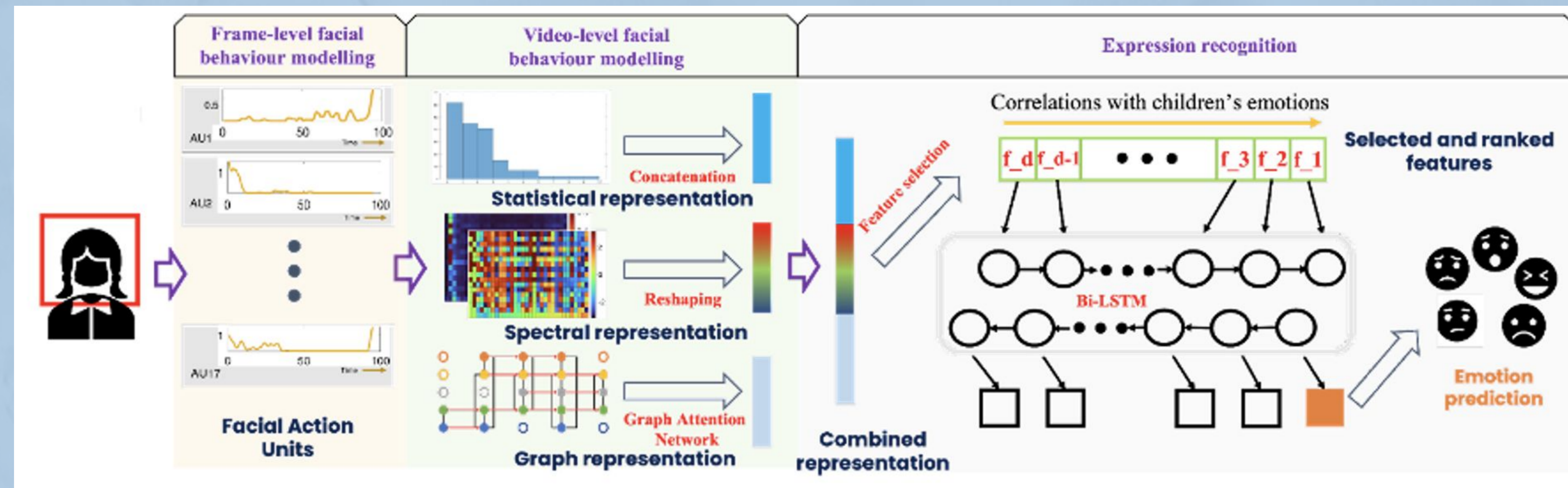
## Why construct child-specific facial expression frameworks?

- Models trained on **adult** expression datasets do **not generalize** well on **child** facial expression recognition tasks [1].
- Facial expressions of **children** are often exaggerated, **incomplete** and **unique** as compared with their adult counterparts [2].

## Novelty of our Proposed Approach

- First approach that constructs **video-level heterogeneous graph representation** for facial expression recognition in children.
- First approach that predicts **children's facial expressions** using the automatically detected Action Units (**AUs**).

## Proposed Methodology



The proposed pipeline for child facial expression recognition.

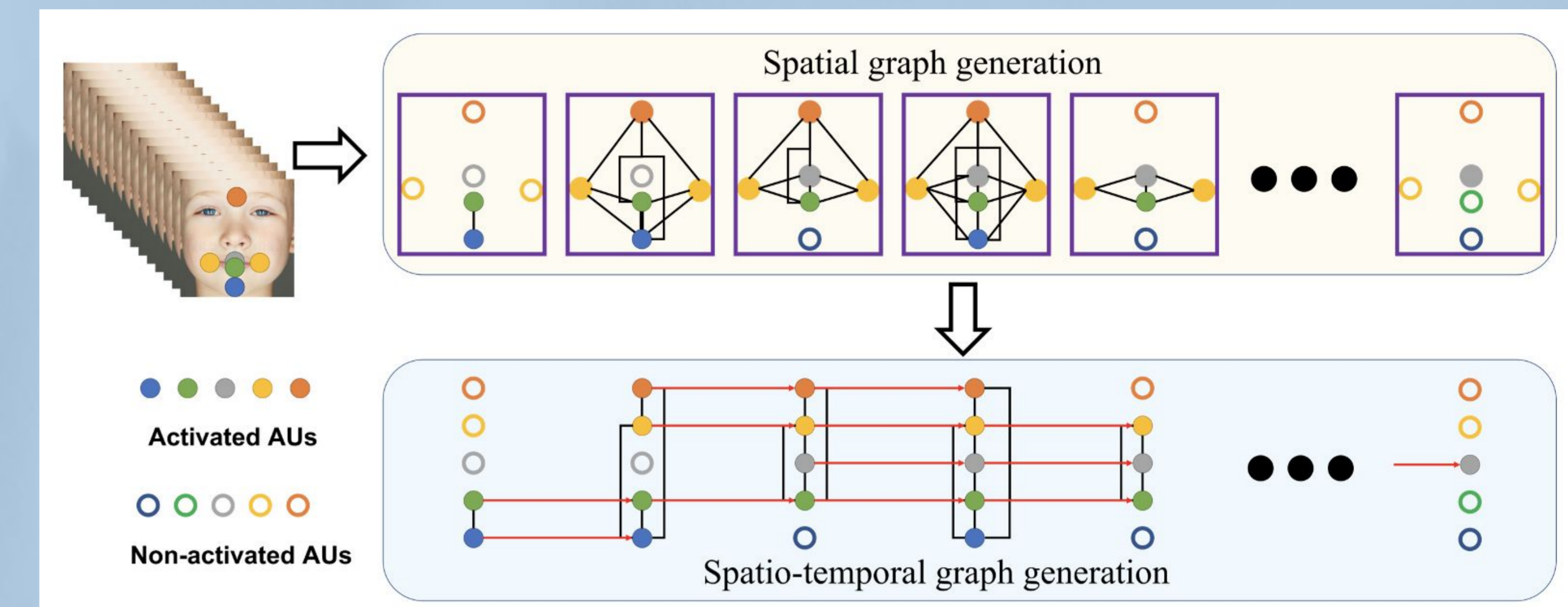


Illustration of the proposed graph representation.

## Results

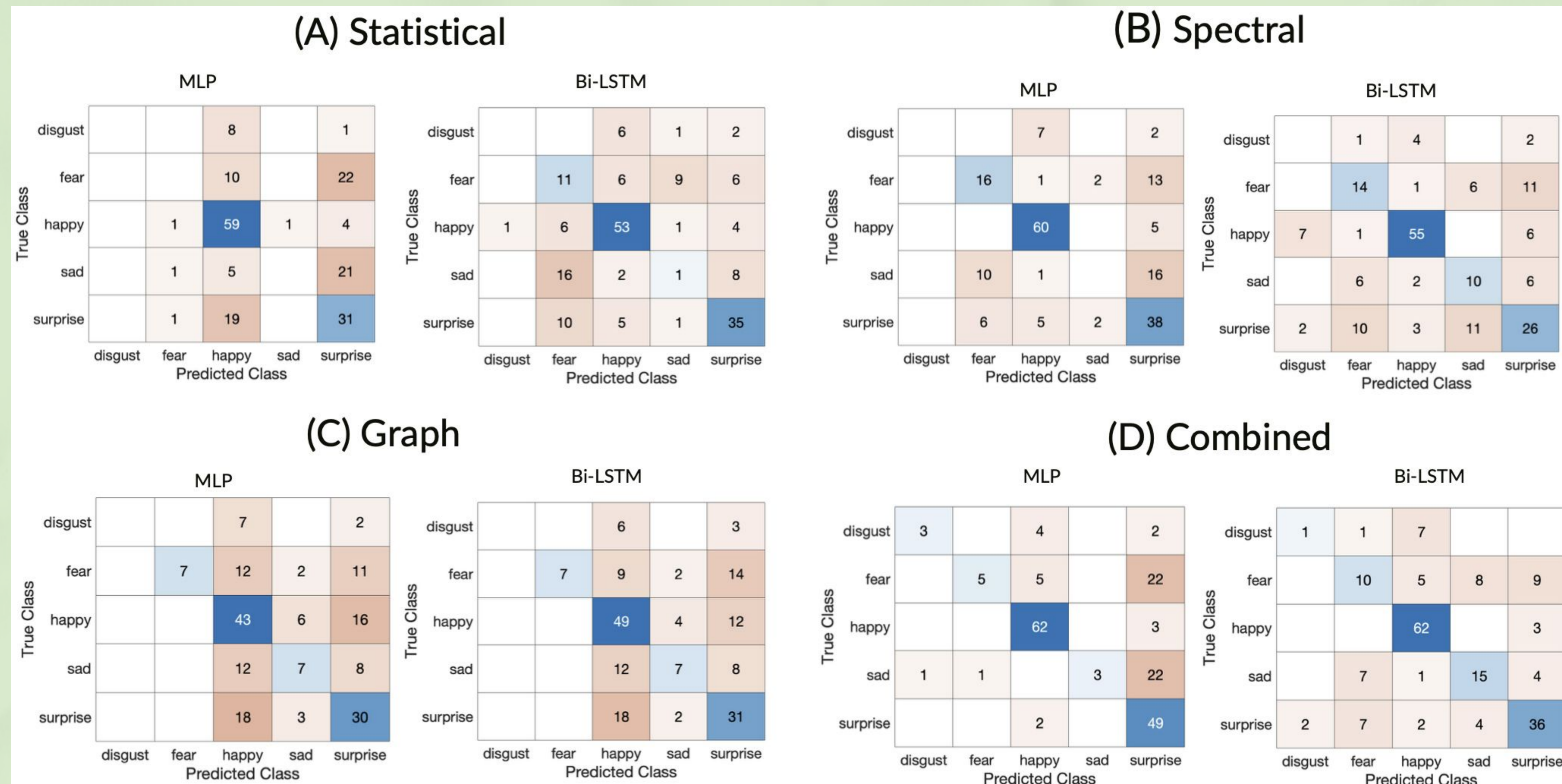
**Dataset:** LIRIS Children Spontaneous Facial Expression Video Database [3];

**Training Details:** Excluded video clips belonging to the anger class (not sufficient number of clips) and the combined categories, and the clips that have a very short duration, cross-validation: 12 fold leave one child out cross validation, loss function: cross entropy, optimiser: Adam with the learning rate of 0:001 and 0:005, respectively.

Statistical		Spectral	
MLP	Bi-LSTM	MLP	Bi-LSTM
48.9%	54.4%	62%	57.1%

Graph		Combined	
MLP	Bi-LSTM	MLP	Bi-LSTM
47.3%	51.1%	66.3%	67.4%

Classification accuracy obtained with different representations proposed



Confusion matrices for the different facial expression recognition frameworks proposed in this work

## Conclusions

- Combination of all **three representations** using the **Bi-LSTM** model provides the **highest accuracy** for child facial expression recognition.
- Models developed in this work can provide a valuable stepping stone for creating affect recognition frameworks for child-agent interaction research.

## Future Work

- In future, we aim to use more advanced deep-learning frameworks like **gated graph convolutional networks** and also compare other state-of-the-art end-to-end network architectures for improving the accuracy of the models proposed in this work.

## References

- A. Howard et al., "Addressing bias in machine learning algorithms: A pilot study on emotion recognition for intelligent systems," in 2017 IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO). IEEE, 2017, pp. 1-7.
- M. A. Witherow et al., "Transfer learning approach to multiclass classification of child facial expressions," in Applications of Machine Learning. International Society for Optics and Photonics, 2019, vol. 11139, p. 1113911.
- R. A. Khan et al., "A novel database of children's spontaneous facial expressions (liris-cse)," Image and Vision Computing, vol. 83, pp. 61-69, 2019.