

1. Background

- Sustained attention in Remote Learning Context
- Using sensors that are not commonly used in previous research to detect if learner is losing attention.
- Cheap hardware used such as a laptop web camera or simple Infrared Temperature sensor
- **“To what extent can camera-based face and infrared temperature sensing of a learners affective state in the remote learning context be used to indicate a loss of sustained attention?”**

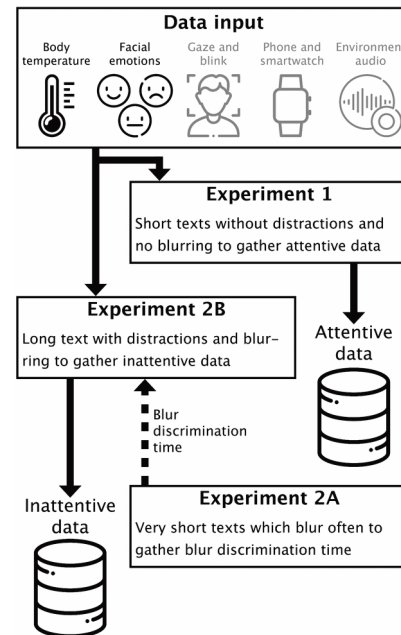


4. Conclusions & Future

- Overfitted models due to low amount of data and possible environmental change between experiment 1 and 2B.
- Nonetheless, results are promising.
- Temperature increases accuracy in combination with emotional values.
- Random Forest ML model most promising.
- Future research should investigate repeating experiments with more participants and remove possible variations between experiment 1 and 2B.

2. Methodology

- User study with 3 participants, all male 20-24
- Two experiments conducted to gather attentive and inattentive data.
- Facial emotional recognition using Python package FER.
- Multiple Machine Learning models trained to select best performing model.

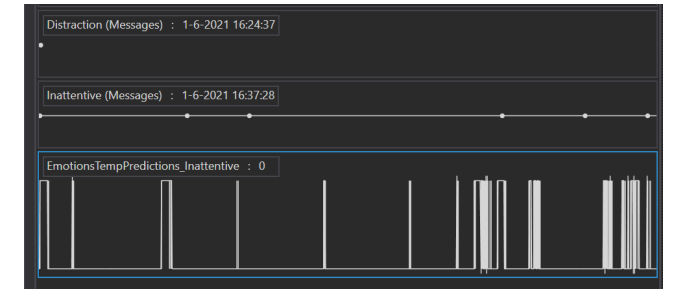
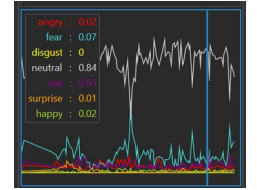


- Gradual blur to detect loss of sustained attention as described by Huang et al. (2019)
- Time windows of 10, 20 and 30s, labeled attentive or inattentive
- Statistical features
- 10-fold cross validation



3. Results

- 27 datasets
- 18 different model variations
- High Matthews Correlation Score in synthetic validation
- When applied in practice, the models were very spiky and mislabeled many of the frames
- Assumed overfitting due to low amount of data and low variety in participants



5. Acknowledgements &

- I would like to thank Jeffrey Pronk, Giuseppe Deininger and Sven van der Voort for their contribution to the experiment platform and the project.
- I would also like to thank Y. Lee and M. Specht for their feedback and support.
- Huang, M. X., Li, J., Ngai, G., Leong, H. V., & Bulling, A. (2019). Moment-to-moment detection of internal thought from eye vergence behaviour.
- Bartlett, M. S., Littlewort, G., Frank, M., Lainscsek, C., Fasel, I., & Movellan, J. (2005). Recognizing Facial Expression: Machine Learning and Application to Spontaneous Behavior. 2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'05), 2, 568–573. <https://doi.org/10.1109/CVPR.2005.297>
- Zeng, Z., Pantic, M., Roisman, G. I., & Huang, T. S. (2009). A Survey of Affect Recognition Methods: Audio, Visual, and Spontaneous Expressions. IEEE Transactions on Pattern Analysis and Machine Intelligence, 31(1), 39–58. <https://doi.org/10.1109/TPAMI.2008.52>