ID: IV-7. Human Stress Detection From Body Movement Using Real-time Video Feed

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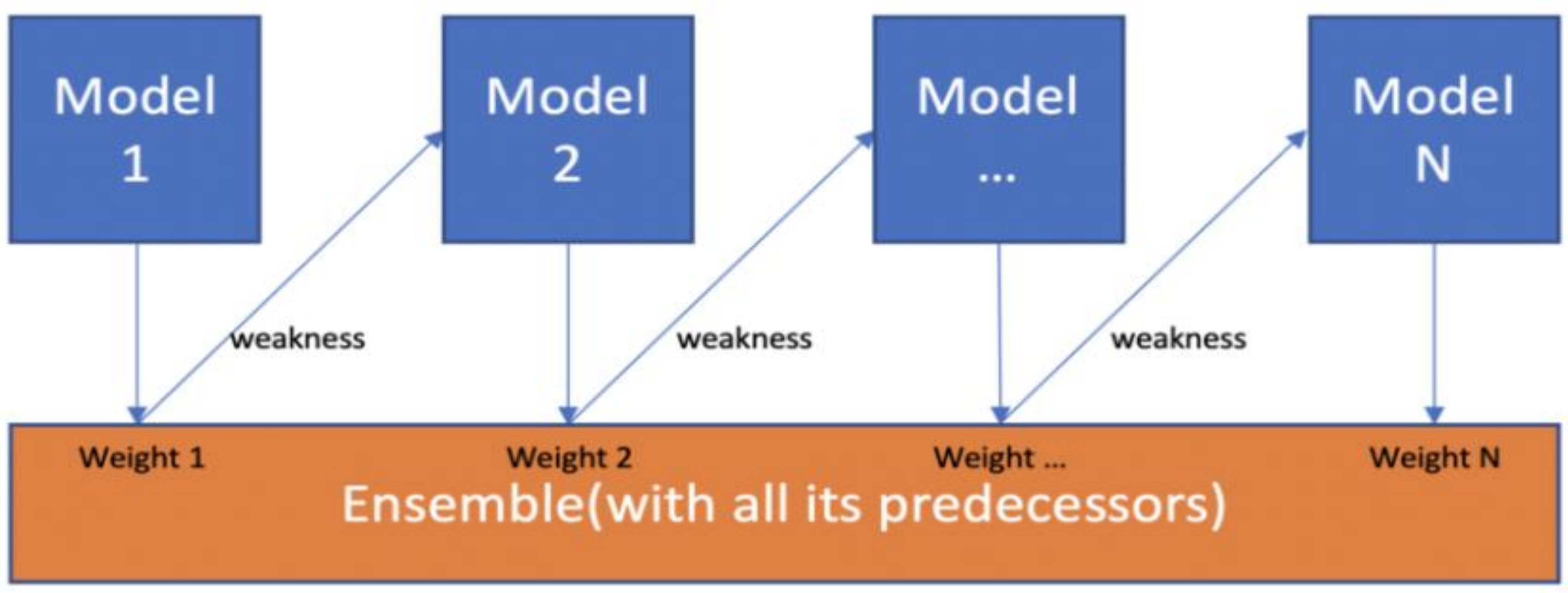
ABSTRACT

This study explores stress prediction possibilities on humans using real-time videos (web camera). Ability to accurately predict stress is a significant challenge due to the issue of limited data – the model can only do the prediction based on body movement patterns and face key points, which majorly increases the complexity because it can't see any psychological data like heart rate [1]. The aim of this study is to find whether it is possible to accurately predict stress using only video feed data.

MODEL ARCHITECTURE

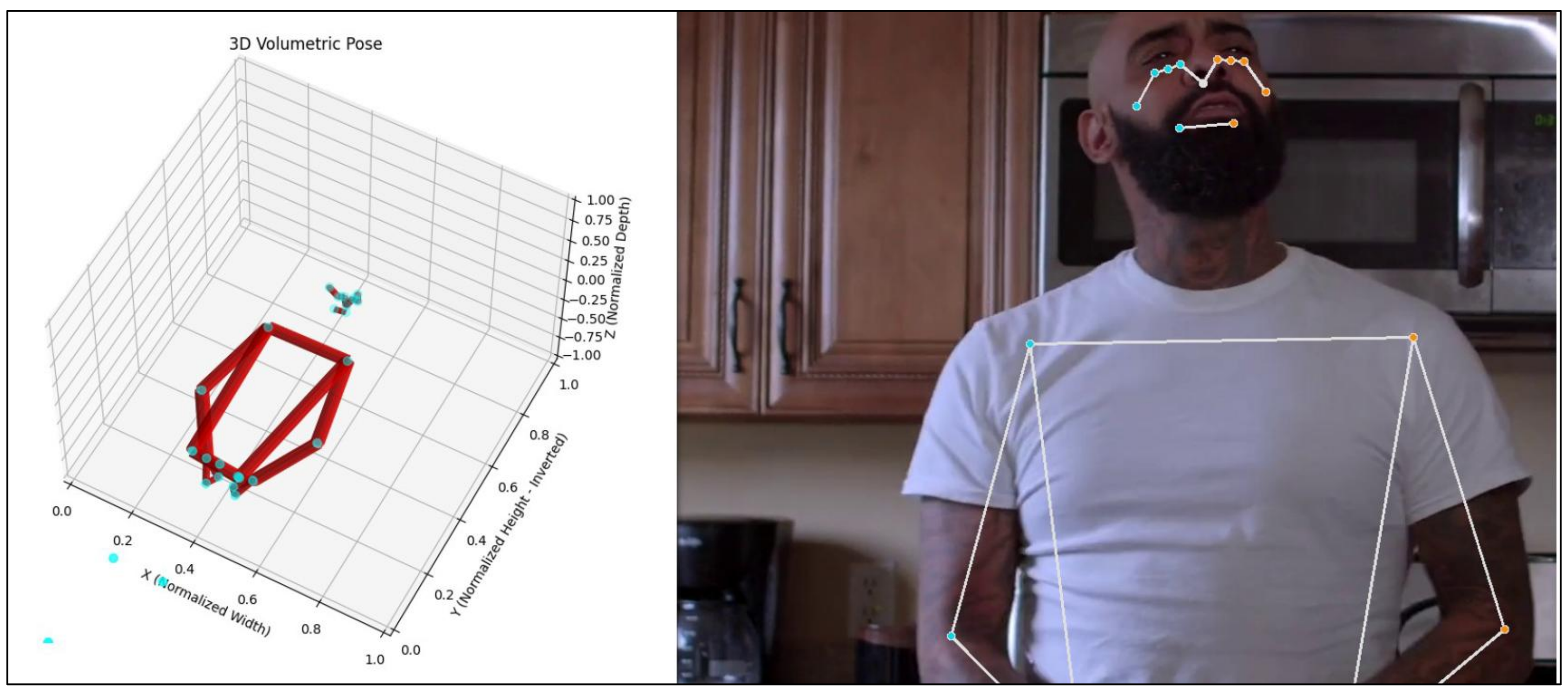
Model 1,2,..., N are individual models (e.g. decision tree)



One is weak, together is strong, learning from past is the best

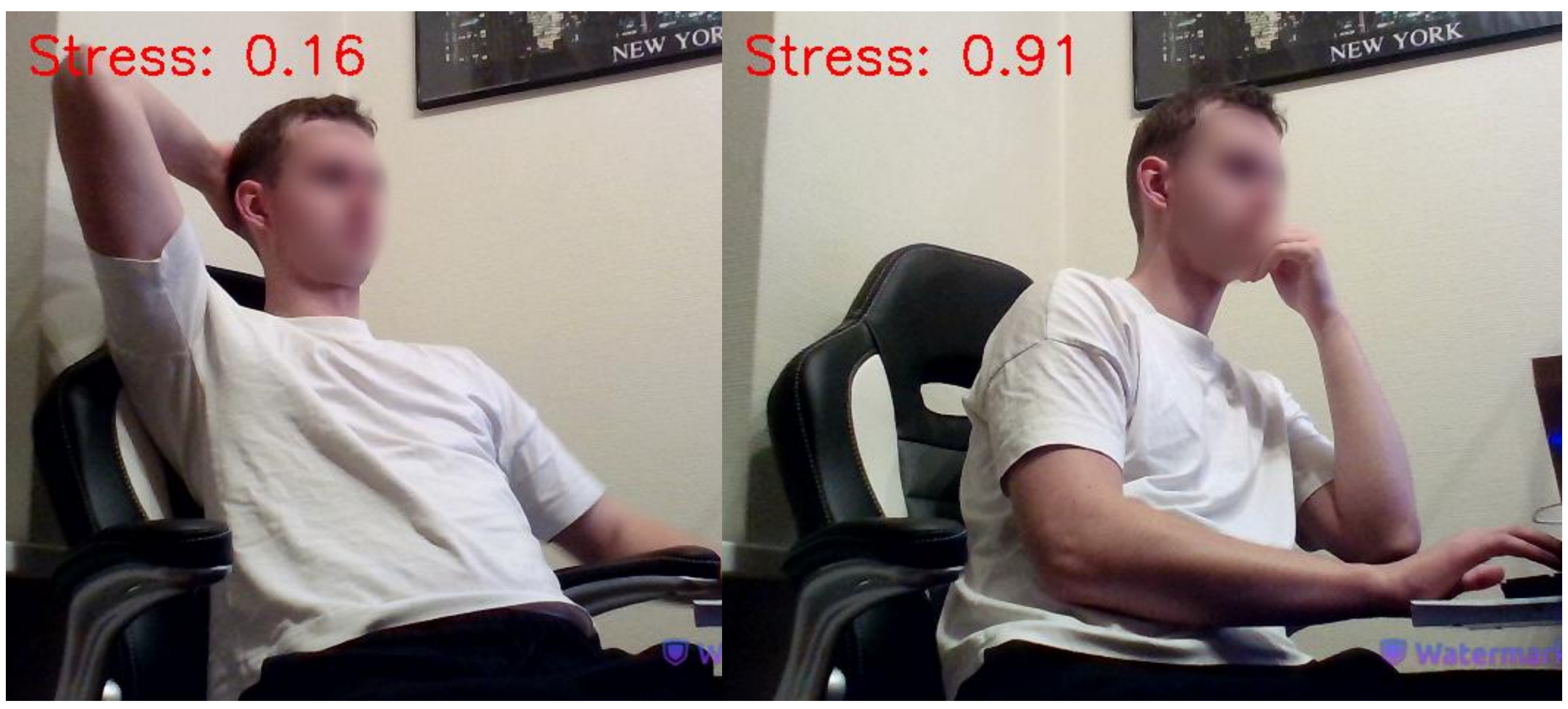
DATA

SWELL-KW dataset was used, which provides features of computer interactions, facial expressions, body postures and physiology [3]. It contains data from 25 participants, for working under 3 conditions: neutral, interruptions and time pressure.



RESULTS

Currently, with leave-one-out cross validation, the model reached about 57% balanced accuracy and 61% ROC-AUC, which basically sums up how well the model separates stress vs. non-stress across all possible probability thresholds.



Relaxed body position *Tense body position*

METHODOLOGY

The project uses scikit-learn's HistGradientBoostingClassifier, a fast and efficient gradient-boosted decision tree model designed for tabular data. It speeds up training by grouping each feature into histogram bins and then builds an ensemble of shallow trees, each correcting the errors of the previous ones using a learning rate to control updates [2]. The model takes minute-level inputs that include standardized body and face features (relative to each person's baseline), detection flags indicating whether data was available, and rolling statistics over the past three minutes to give short term context. Class-balanced weights ensure equal focus on stress and non-stress moments, and performance is tested by leaving one participant out to check how well it generalizes. The final output is a stress probability derived from the model's tree outputs, making it fast and suitable for real-time monitoring.

CONCLUSIONS

This work delivers a practical template for stress monitoring by relying on standard webcams and on-device processing. It offers an alternative to wearable sensors for tracking workload strain, giving organizations or individual users a non-intrusive way to monitor their well-being.

REFERENCES

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[3] Koldijk, S., Sappelli, M., Verberne, S., Neerincx, M., & Kraaij, W. The SWELL Knowledge Work Dataset for Stress and User Modeling Research. 2014.