

MOTIVATION

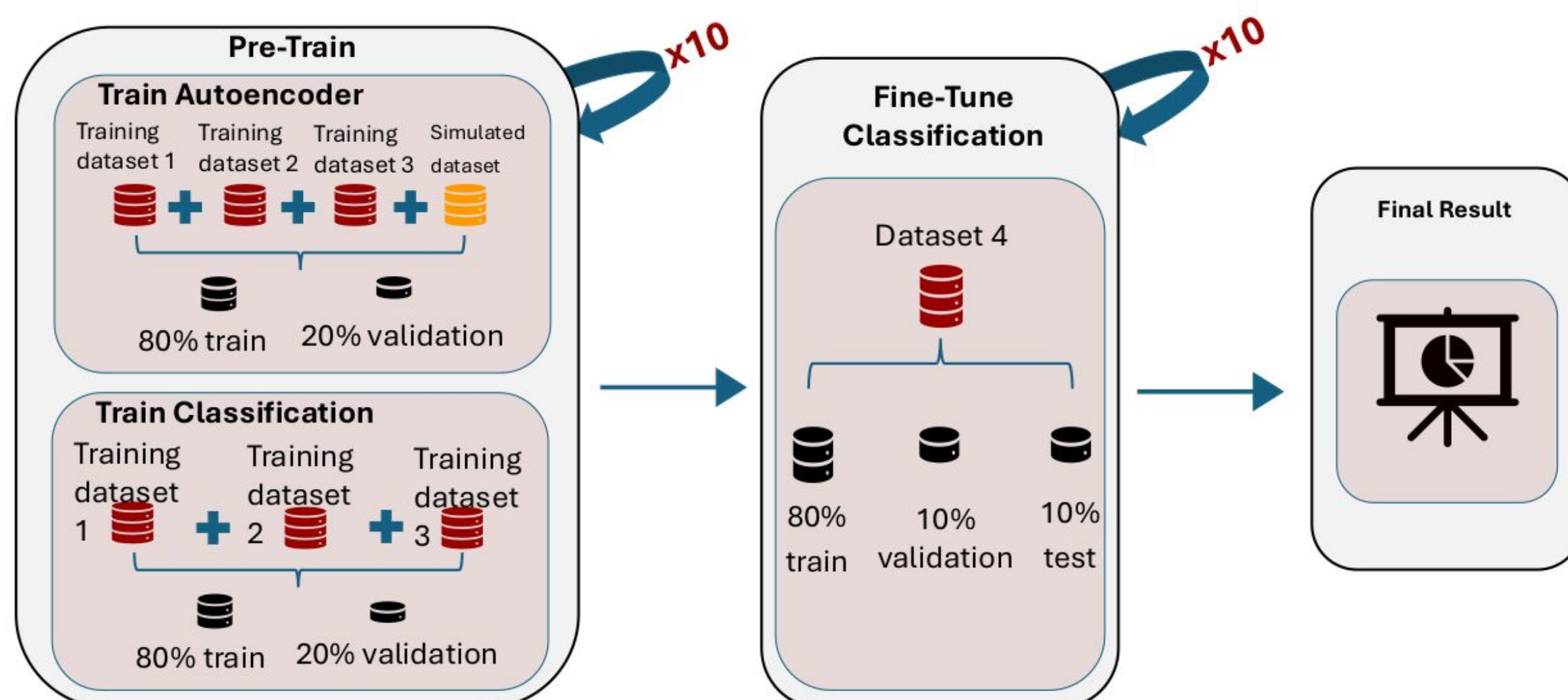
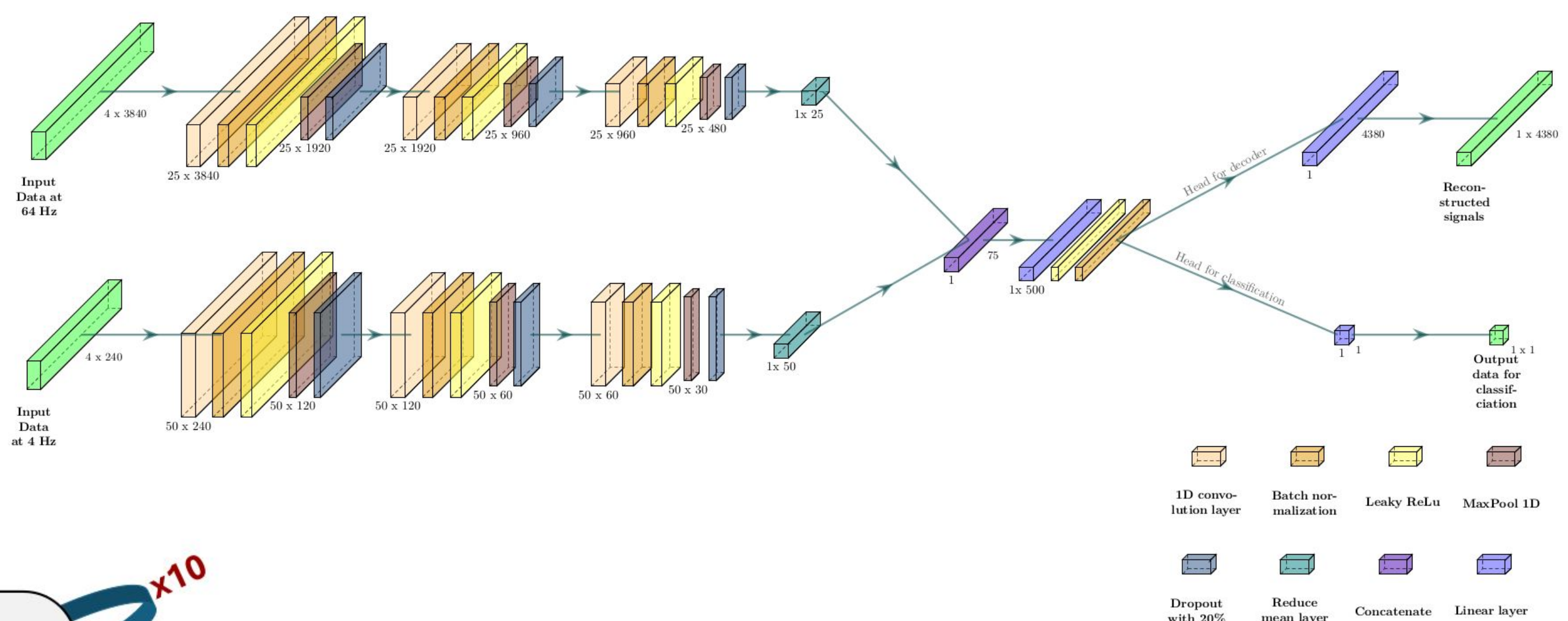
- Physiological time-series signals obtained from wearable sensors can help characterise various physio-neurological conditions.
- Lack of open-source datasets hampers the development of prediction models for new applications.
- Previous studies have shown promise in using transfer learning and simulated data augmentation in other domains.

METHODOLOGY

- Simulation strategies for physiological signals (HR, BVP, EDA, TEMP) are employed using Neurokit2 and JOS-3.
- A CNN-based model is proposed for event prediction by incorporating transfer learning and simulation techniques.
- Four open-source datasets with stress factors are utilized, collected using the Empatica E4 wristband.
- Results in tables 1 & 2 show transfer learning & two data augmentation strategies with respect to baseline.

OBJECTIVE

- The aim is to develop a predictive model for physiological time-series signals with events.
- We do a structured exploration of data augmentation and transfer learning strategies.



CONCLUSIONS

- Transfer learning and simulated data augmentation generally improve model performance.
- The fragmented simulation strategy outperforms the plain simulation method.
- Results suggest the need for further research to reduce variability and improve robustness in real-world applications.



¹ Department of Applied Mathematics and Computer Science, Technical University of Denmark

Transfer	Simulation	ADARP	EmoPairCompete	ROAD	WESAD
No	No	0.26 (0.10)	0.53 (0.05)	0.55 (0.08)	0.89 (0.04)
No	Plain	0.21 (0.06)	0.46 (0.07)	0.56 (0.09)	0.89 (0.04)
No	Fragmented	0.21 (0.07)	0.50 (0.05)	0.50 (0.17)	0.84 (0.06)
Yes	No	0.25 (0.00)	0.48 (0.07)	0.67 (0.07)	0.95 (0.01)
Yes	Plain	0.28 (0.09)	0.51 (0.07)	0.52 (0.09)	0.95 (0.01)
Yes	Fragmented	0.22 (0.06)	0.52 (0.03)	0.63 (0.03)	0.96 (0.01)

Table 1: Average F1-score of 10 runs. Standard deviation in parentheses. For 1-minute windows.

Transfer	Simulation	ADARP	EmoPairCompete	ROAD	WESAD
No	No	0.39 (0.15)	0.54 (0.13)	0.75 (0.16)	0.86 (0.10)
No	Plain	0.56 (0.13)	0.49 (0.22)	0.75 (0.08)	0.88 (0.06)
No	Fragmented	0.63 (0.10)	0.56 (0.21)	0.65 (0.18)	0.81 (0.10)
Yes	No	0.52 (0.09)	0.60 (0.04)	0.79 (0.05)	0.74 (0.15)
Yes	Plain	0.48 (0.18)	0.54 (0.07)	0.70 (0.04)	0.84 (0.04)
Yes	Fragmented	0.59 (0.17)	0.73 (0.05)	0.72 (0.06)	0.93 (0.12)

Table 2: Average F1-score of 10 runs. Standard deviation in parentheses. For 5-minute windows.