

Deep CNN-LSTM Supervised model and CNN Self-supervised model for Human Activity Recognition

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Project objective

This project aims to develop a 1-D CNN **self-supervised (SSL)** network and a CNN-LSTM-ATT fully **supervised** network. The experiment result on three public HAR datasets proved the efficiency of the framework. We addressed the label scarcity problem that tends to happen in most real-world with SSL model. With only **5%** of labeled samples, SSL model was found to outperform supervised learning with full labels. We found that SSL pretext task enhanced the model's **robustness** to transformations that can occur to test data and can be robust against the **data imbalance** problem. From the hardware sensory perspective, the **smartphones and accelerometer** sensors can produce more accurate classification.

Real world issue



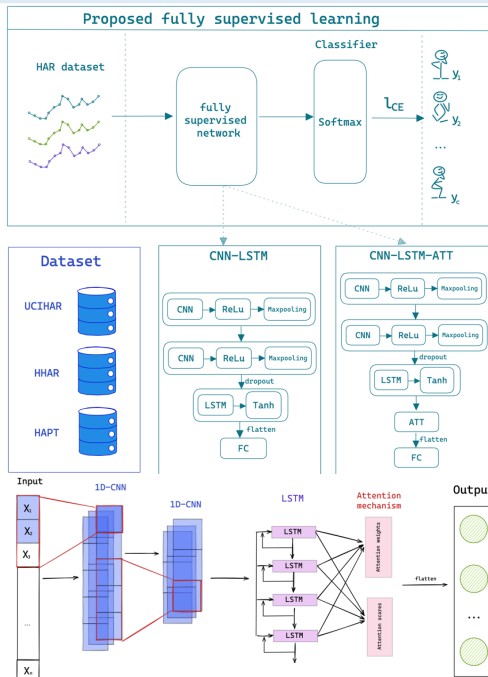
- Manual extraction
- Data label shortage
- Data imbalanced

Contribution

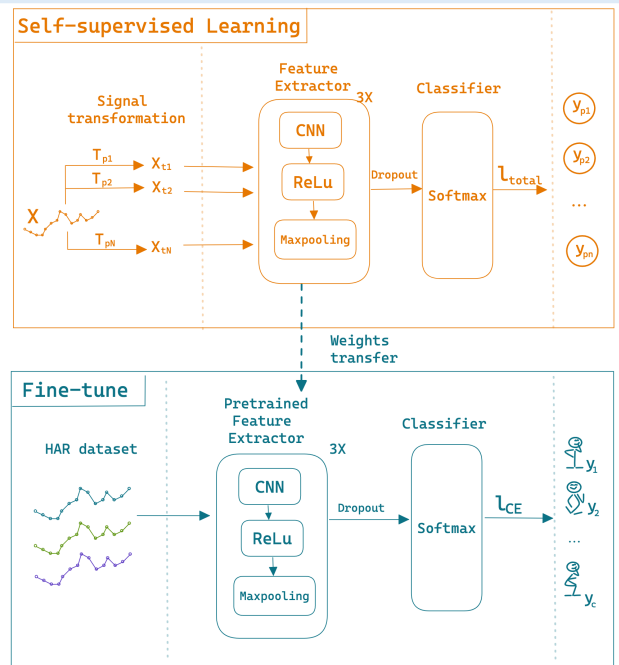


- Attention layer effect
- SSL robustness
- Hardware sensor effect

CNN-LSTM-ATT supervised network



CNN self-supervised network



Experiment result

Mean F1 Score%	✓ CNN-LSTM Sup.	CNN-LSTM-ATT Sup.	Baseline
UCI HAR	91.56	88.10	91.55
HHAR	92.05	66.63	86.50
HAPT_replication	83.81	80.37	-

Mean F1 Score%	✓ 5% FT.	10% FT.	100% Sup.(CNN-LSTM)
UCI HAR	91.73	93.02	91.50
HHAR	-	96.38	92.40
HAPT_raw	85.16	86.38	84.79