Human Activity Recognition (HAR)

Team 06:

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Input Pipeline – HAPT

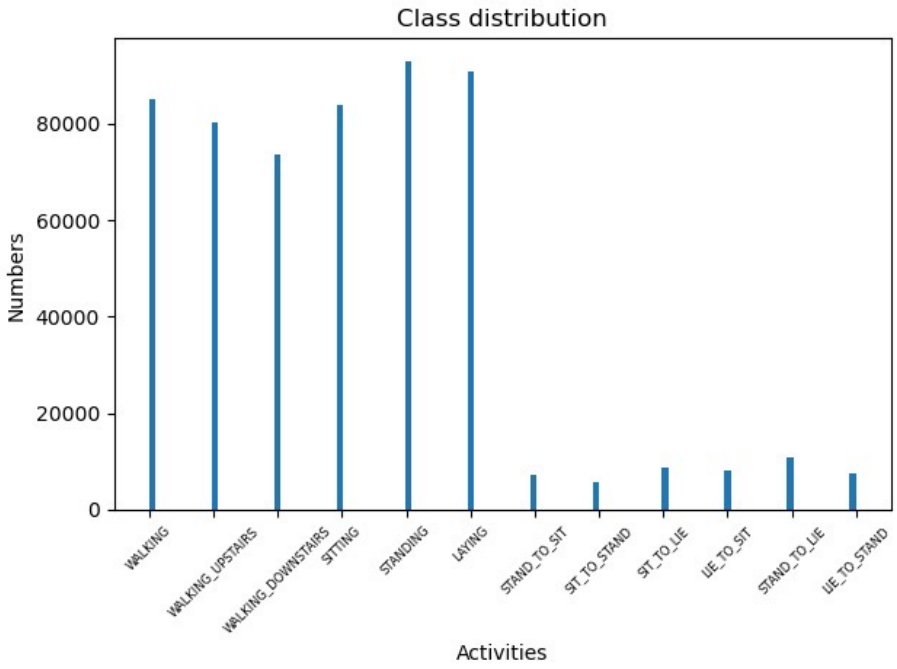
Read files from raw data

Remove unlabeled data and perform Z-Score channel-wise

Divide into windows with variable size and shift

Prepare for both sequence and label prediction (S2S and S2L)

Create TFRecord files



Input Pipeline – realworld2016

Read files from raw data

Skip the data if one sensor position is missing

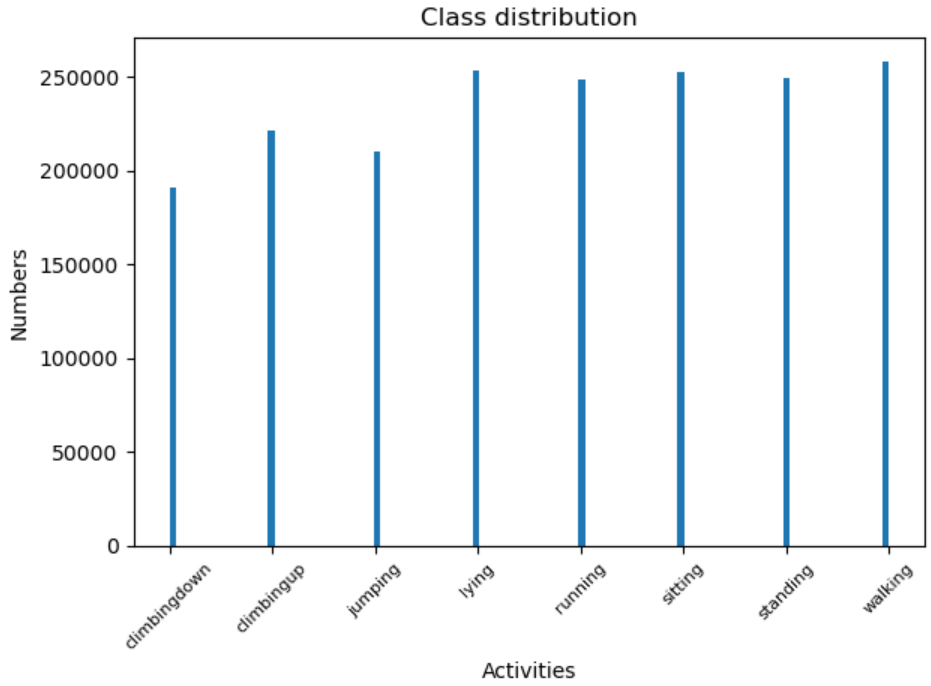
Reformulate data with consistent interval

Nearest 1D interpolation with an interval of 20ms

Ignore data from the first and last five second

Oversample the label of jumping to balance the dataset

Perform Z-Score normalization channel-wise

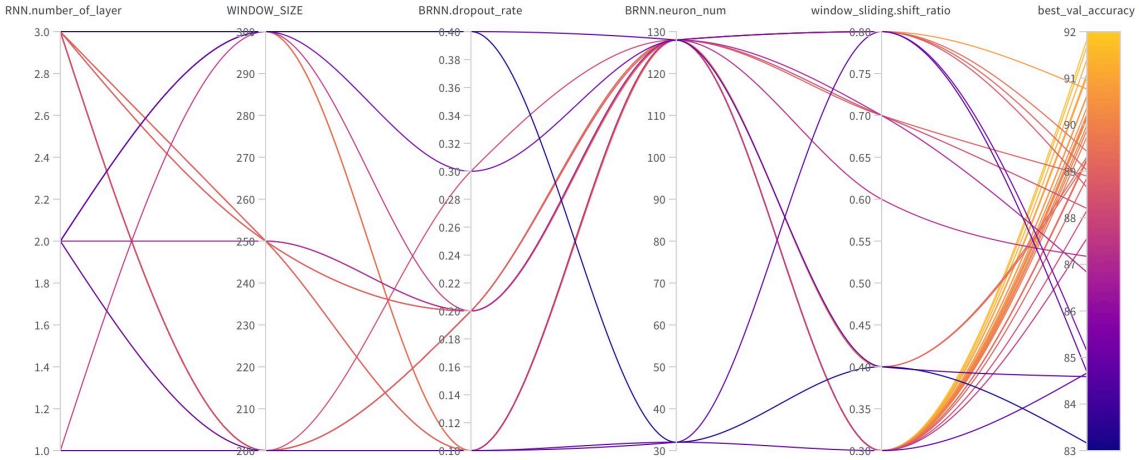


Model – HAPT

- Three models: RNN, BRNN, and GRU
- Two prediction methods: S2S and S2L
- Hyperparameter tuning for BRNN with the Bayes method

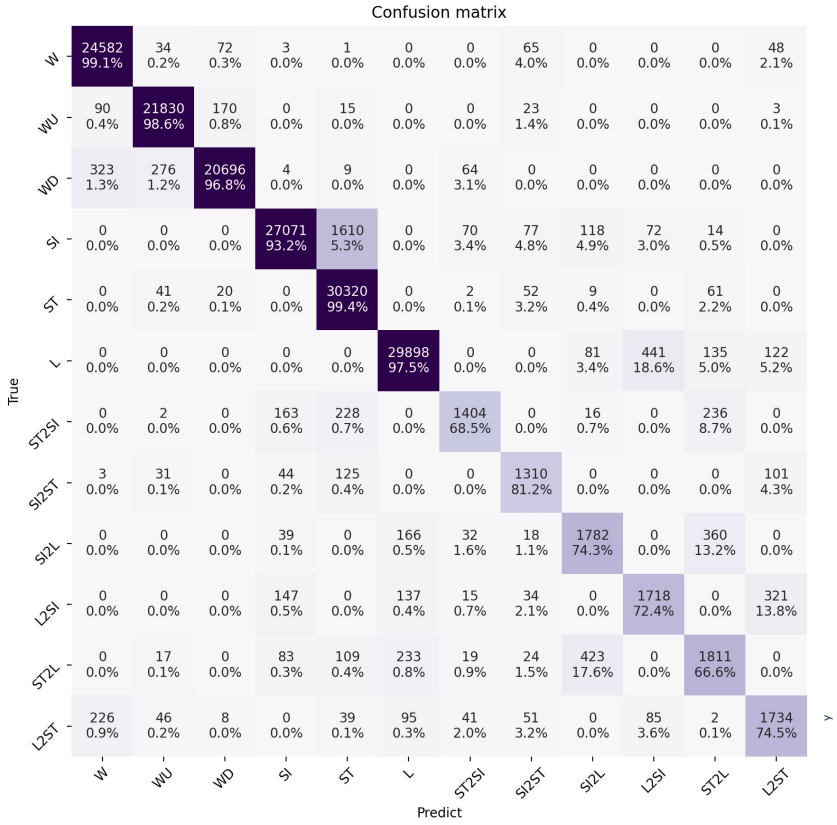
Model	S2S	S2L
BRNN	95.3%	93.6%
RNN	93.4%	93.5%
GRU	83.8%	80.7%

Hyperparameter	Value
Window size	200
Window shift	60
Dropout rate	0.1
Recurrent layers	3
Dense layer	1
Learning rate	0.0001
Stateful	False

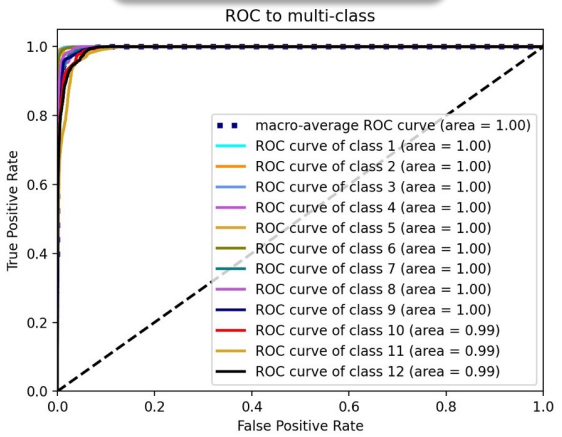


Evaluation – HAPT

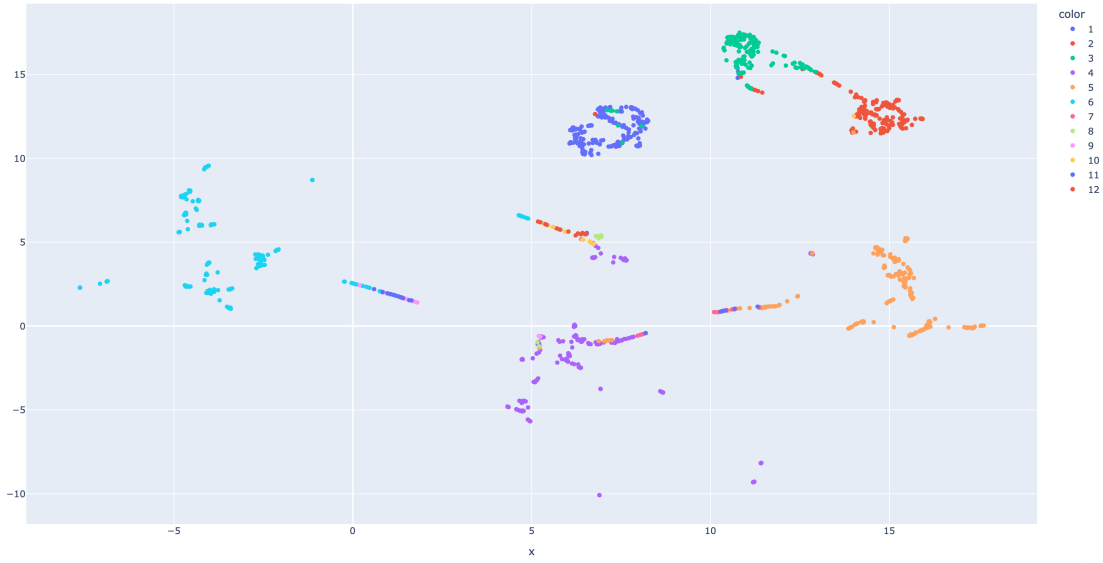
Confusion matrix



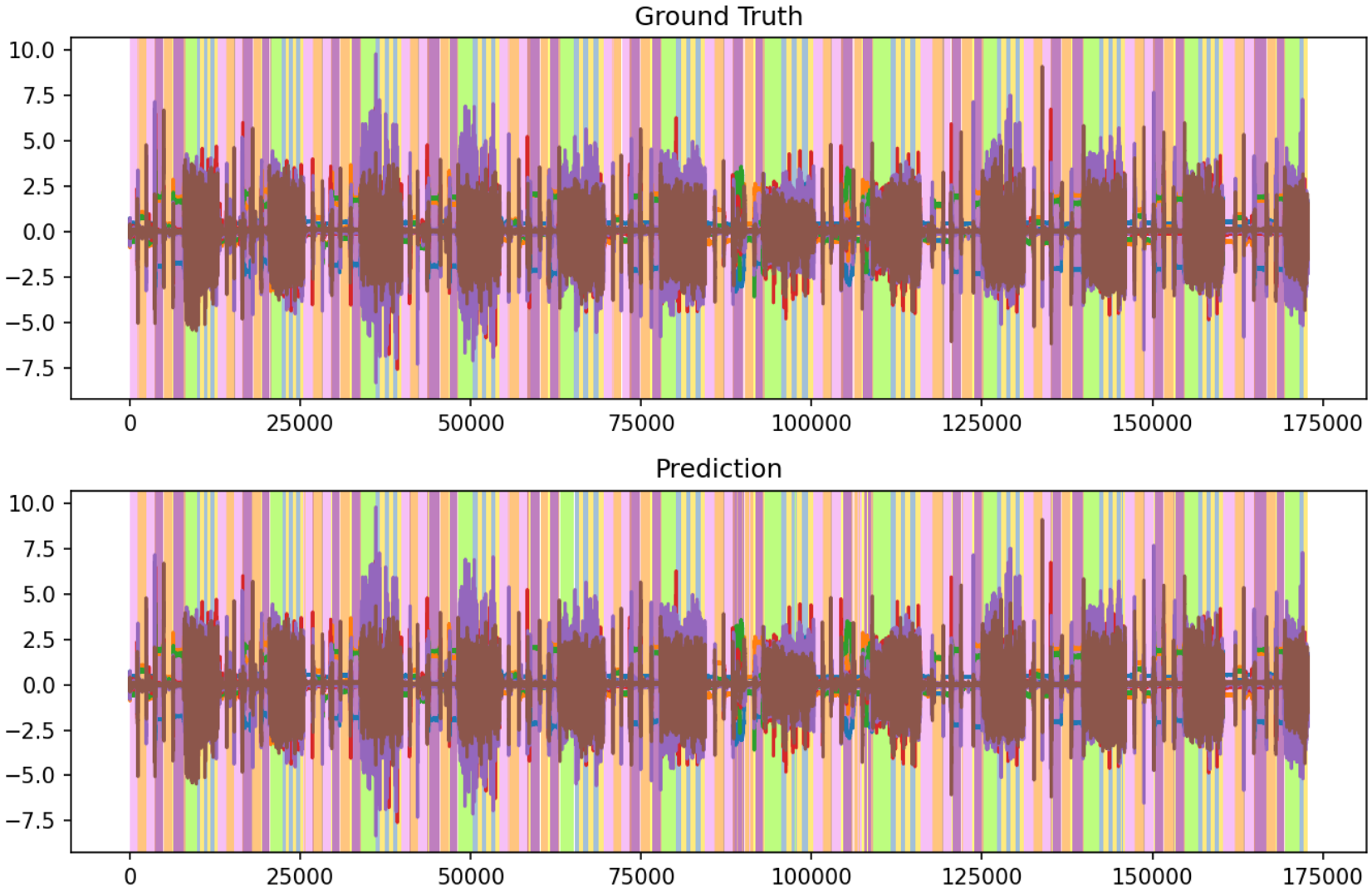
ROC



Dimensional reduction



Evaluation – HAPT

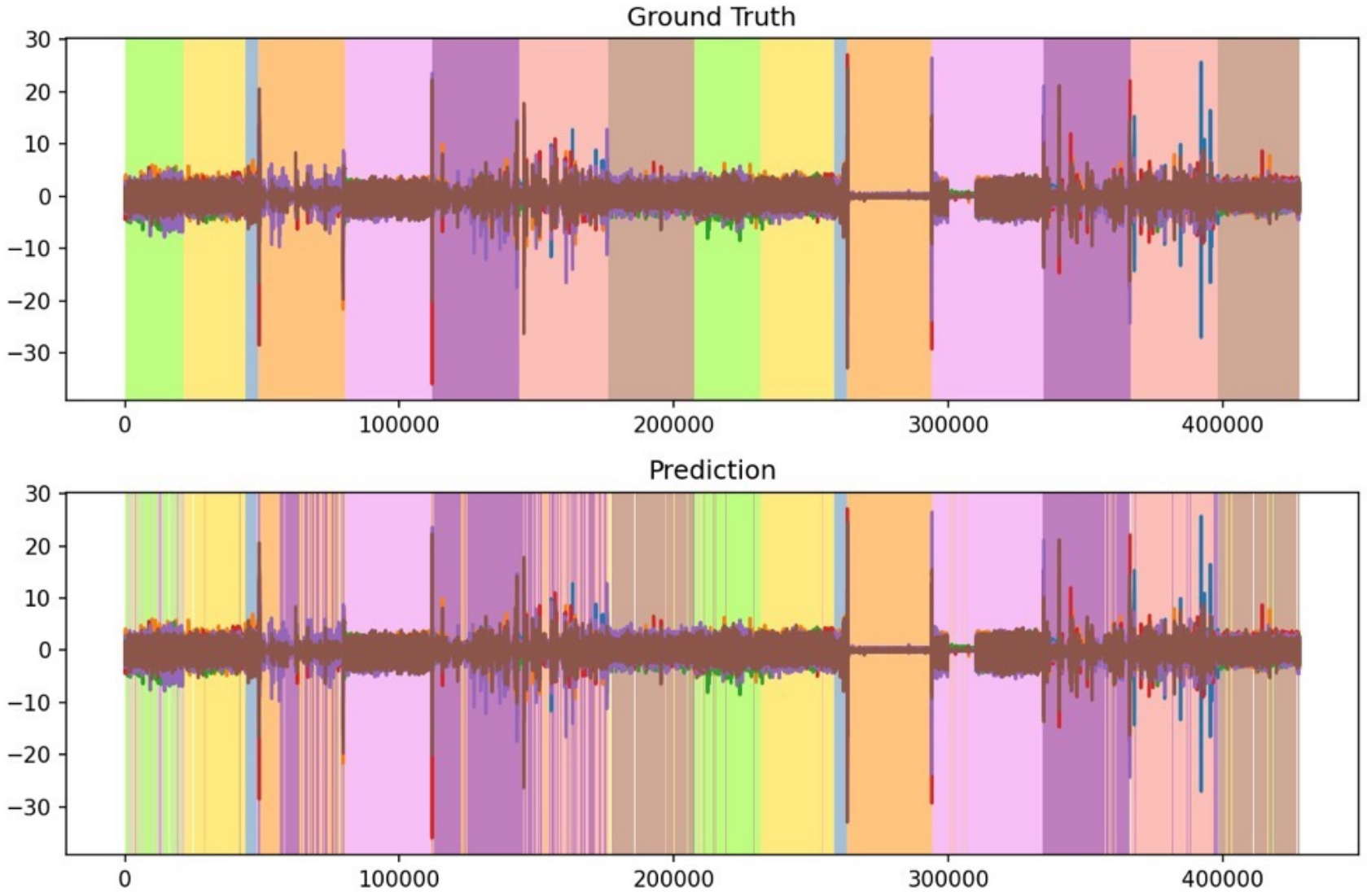


Evaluation – realworld2016

With reference to the W&B sweep based on upper arm using random method, we applied BRNN model with dropout rate of 0.1, window size of 250 and window shift of 125:

Position	Test accuracy	F_measure	Recall	Precision
Waist	84.0%	85.7%	85.5%	87.6%
Shin	80.8%	82.9%	83.2%	83.2%
Chest	79.0%	80.6%	81.4%	81.5%
Upper arm	76.2%	77.4%	78.8%	77.1%
Forearm	69.9%	71.6%	72.2%	73.1%
Head	67.9%	70.4%	69.9%	72.0%
Thigh	61.1%	63.2%	61.7%	68.7%
Multiple	73.0%	70.8%	72.2%	70.8%

Evaluation – realworld2016 (Waist)



Thank you for your attention!