Scenario

Motivations: Many conditions are hard when body is moving.

Hardwares

Coherent Human Activity Recognition (Co-HAR) with single-location sensors.

Challenges

(1) The single location of sensors has mutual impact on signals.
(2) The imbalanced domination of different activities could fade away the signals of the other activities.
(3) The multi-label window problem for activities of various duration.

Deep architectures for a new encoding module

A more general likelihood estimation

Raw data likelihood formula
\[ p(Y_1, \ldots, Y_t|X) = p_{y_1}(Y_1|X)p_{y_2}(Y_2|Y_1, X) \ldots p_{y_t}(Y_t|Y_{t-1}, \ldots, Y_1, X) \]  

Existing approaches: multi-label classification assuming conditional independences

Baseline models: SVM, UNet

Experiment results

Two alternatives of Conditional-Unet:
(a) DWcoDH, Walking conditioned on Head
(b) DHcoDW, Head conditioned on Walking

Limitations:
Real-life scenarios are more complicated.
Need to include more deep learning methods to compare.
We run deep models on desktop GPU, but computation power is constrained in real-world wearables.

Future works
Is such trained model transferred for real-world scenario? Or need re-training?
In the data likelihood loss, hierarchical labels can be considered or imbalanced class problem can be studied in the future.