

# Human Activity Recognition Using Neural Networks





# Overview

- Objective
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- Modeling Approach
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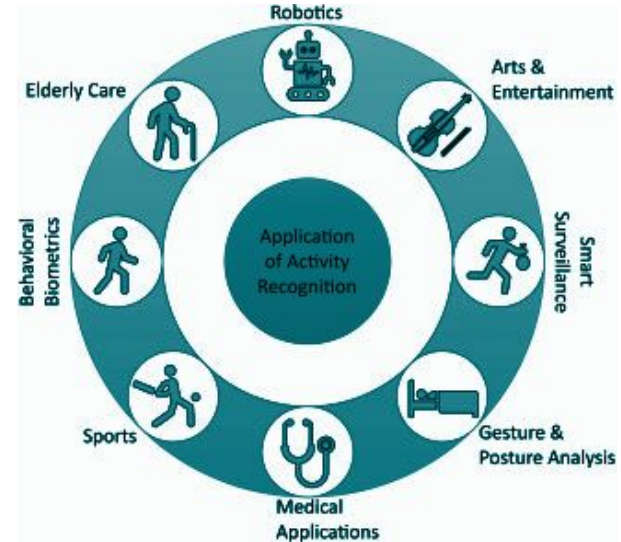
# Objective

## *What is Human Activity Recognition?*

A technology that uses sensors and machine learning to identify and categorize human actions.

## *Focus of this work*

Develop a neural networks model that can use raw time-series data from accelerometers to classify activities.

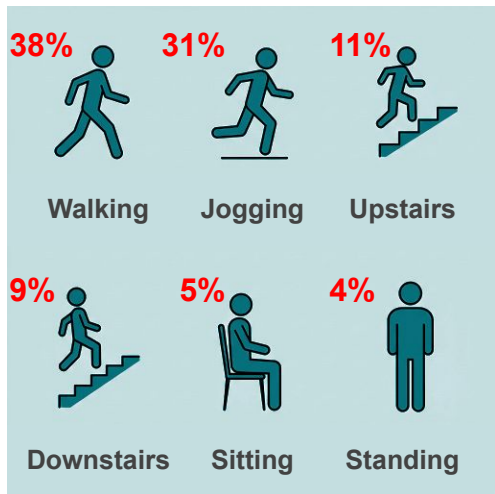


Yadav et al., 2021



# Dataset

- **Reference:** Jennifer R. Kwapisz, Gary M. Weiss and Samuel A. Moore (2010). Activity Recognition using Cell Phone Accelerometers. - [Link](#)

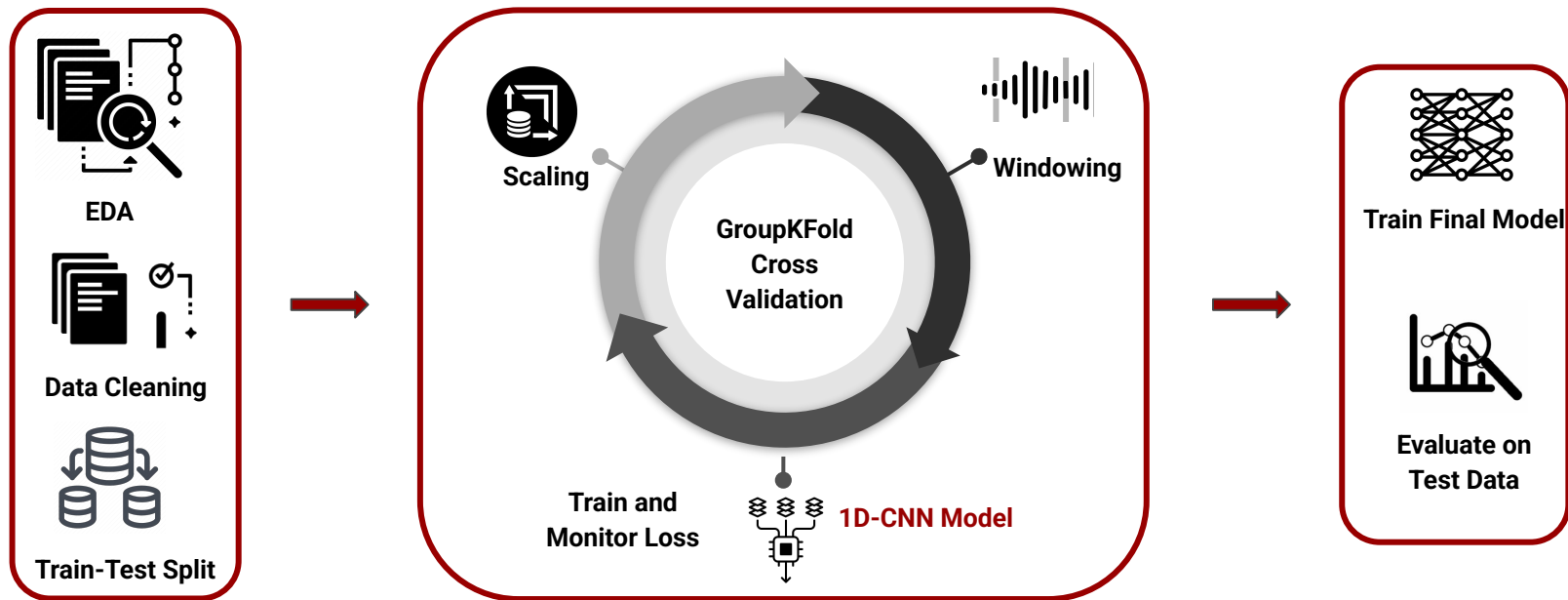


	Raw Time Series	Transformed
# of Entries	1098208	5000
# of Features	3	43

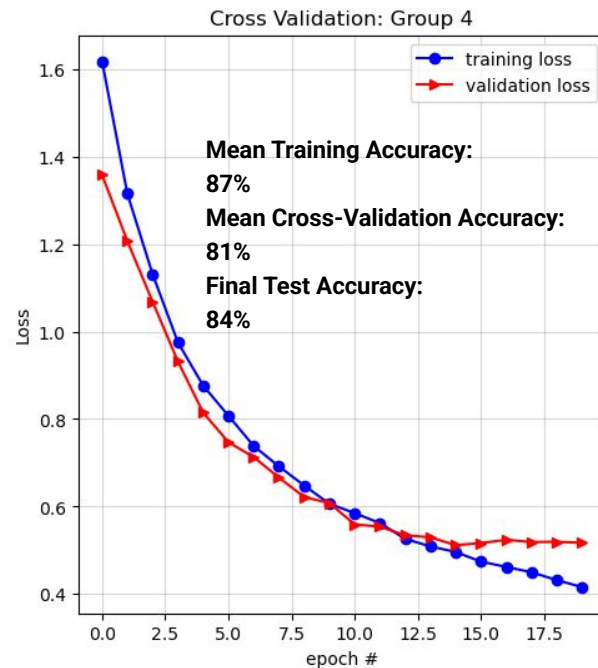
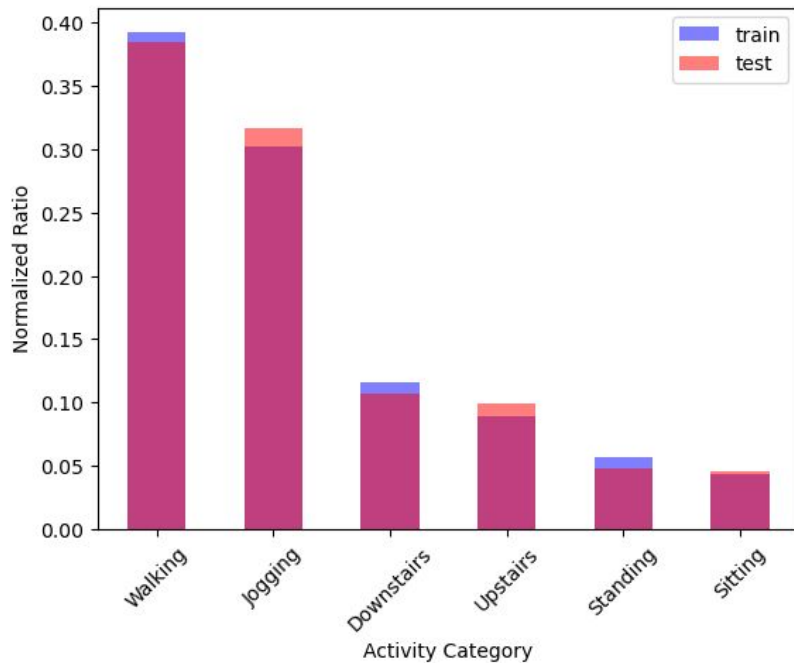
Created by Gemini 2.0  
%s are not exact.

# Modeling Approach

- The transformed data was used to train a **baseline logistic regression** model (considering *class imbalance*) that serves as a baseline model. Weighted average F1 score: **70%**.

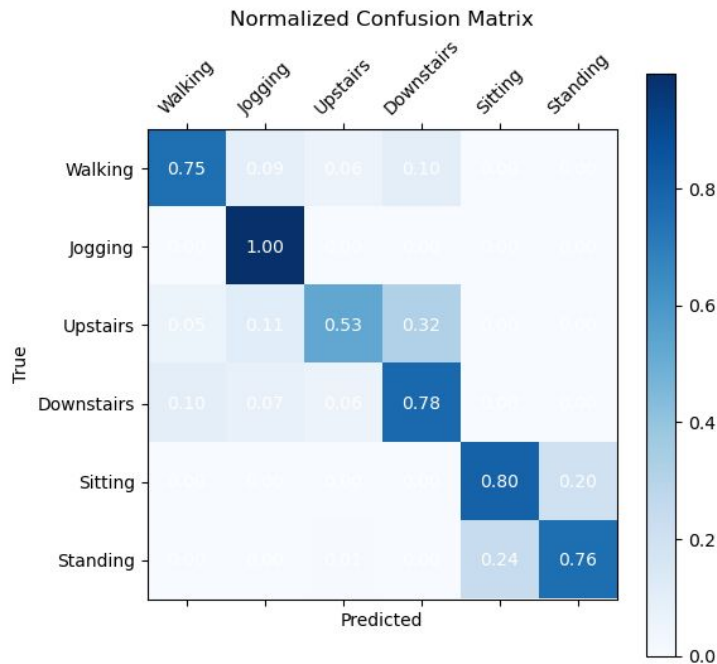


# Modeling Approach - Cont'd





# Results



- Average weighted F1-score: 83%
- Improvement wrt. baseline model: +13%
- Upstairs often misclassified as downstairs but not the other way round (directional asymmetry)
- Average cross-validation time: ~10 minutes
- Average final train time: ~4 minutes
- Average inference time: ~0.2 ms



## Limitations & Next Steps

- Combining similar classes to increase performance (sitting & standing, upstairs & downstairs)
- More systematic hyperparameter tuning
- Personalization