SSAR: BUILDING SCALABLE MICRO-ACTIVITY RECOGNITION VIA LIMITED SUPERVISION

Final Project Presentation Week 10

Sarah Okome August 10, 2023

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Problem Statement

The objective of this project is to develop a ***scalable AR model*** *that can effectively* ***recognize*** *and* ***classify human activities*** *via* ***minimal supervision*** *by leveraging* ***pseudo labels*** *in a* ***semi-supervised setting***

Introduction

- Human Activity Recognition (HAR)
  - Technique to identify tasks humans perform through video, sensor readings and signals reflected from the human body (Thapa et al, p. 2).

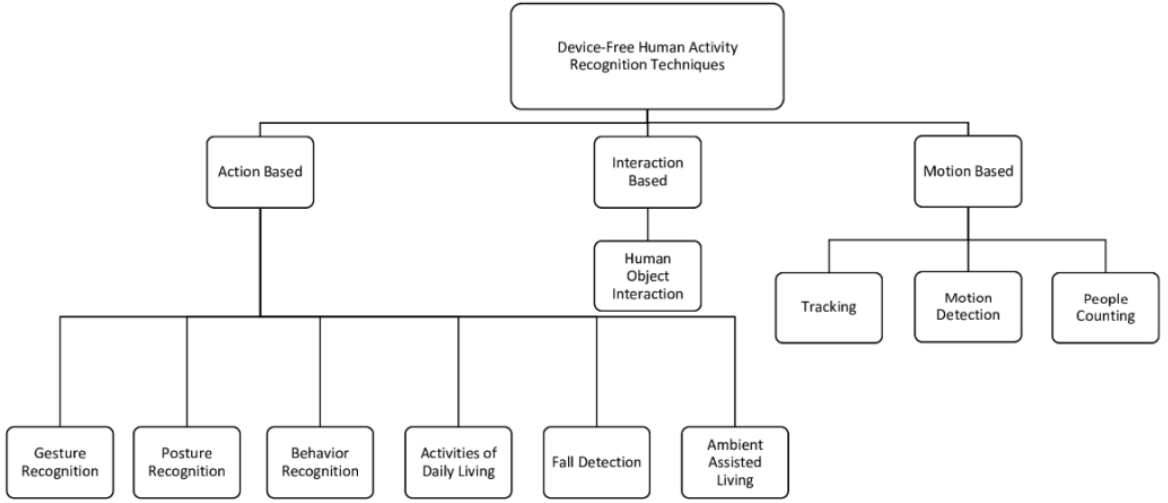


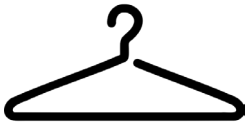
Figure: Overview of HAR techniques (Hussain et al.)

Introduction

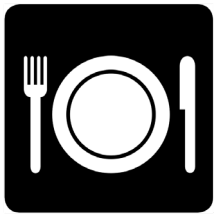
- Activities of Daily Living
  - Basic tasks for physical needs
    - e.g. walking, sitting, standing

Ambulation

Bathing



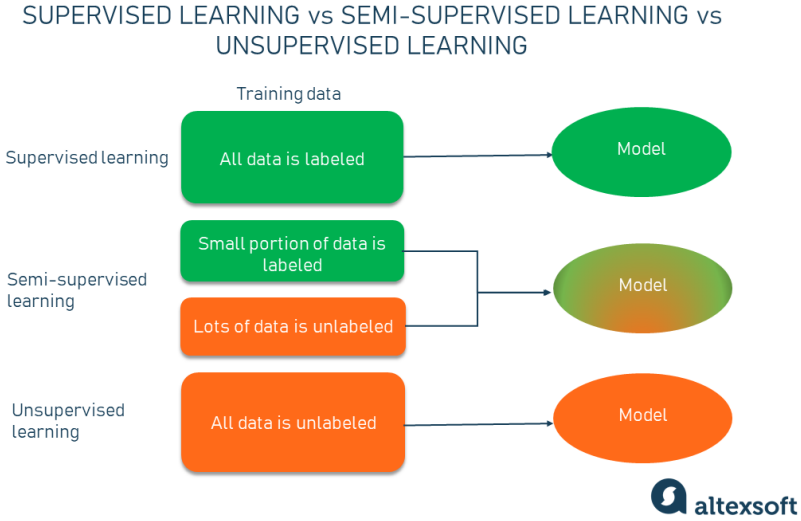
Dressing

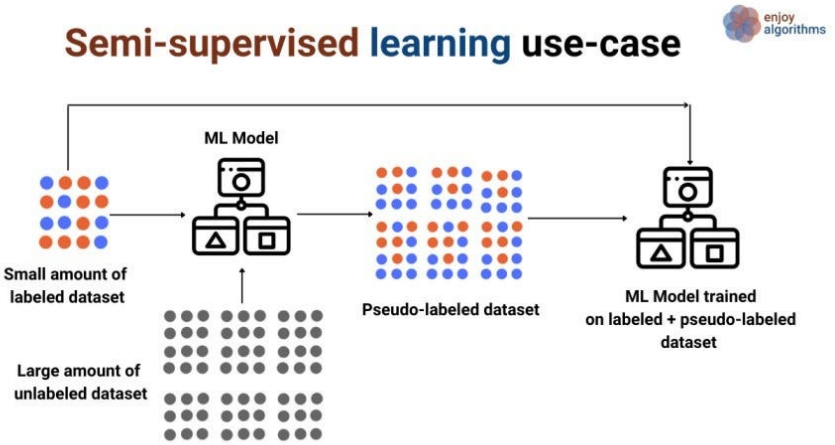


Feeding

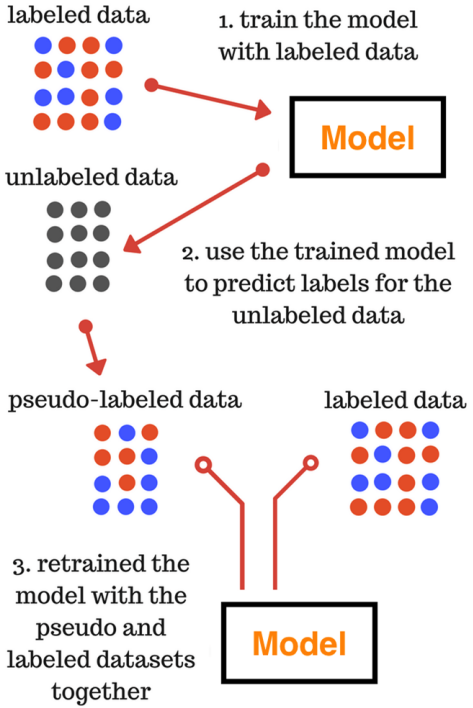
Semi-supervised learning (SSL)

- Combination of supervised and unsupervised learning
- Small portion of labeled data with large quantity of unlabeled data.



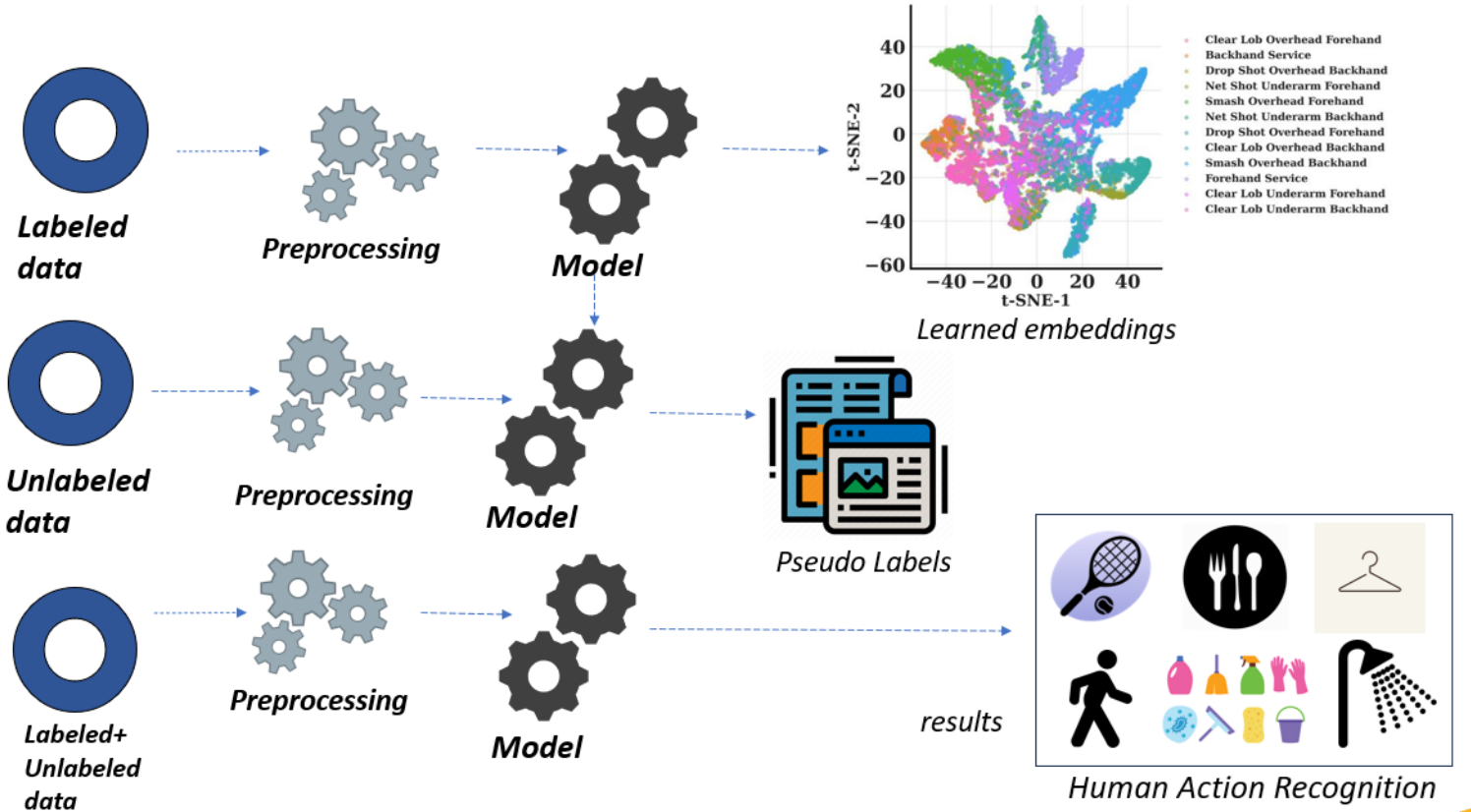


Pseudo Labels

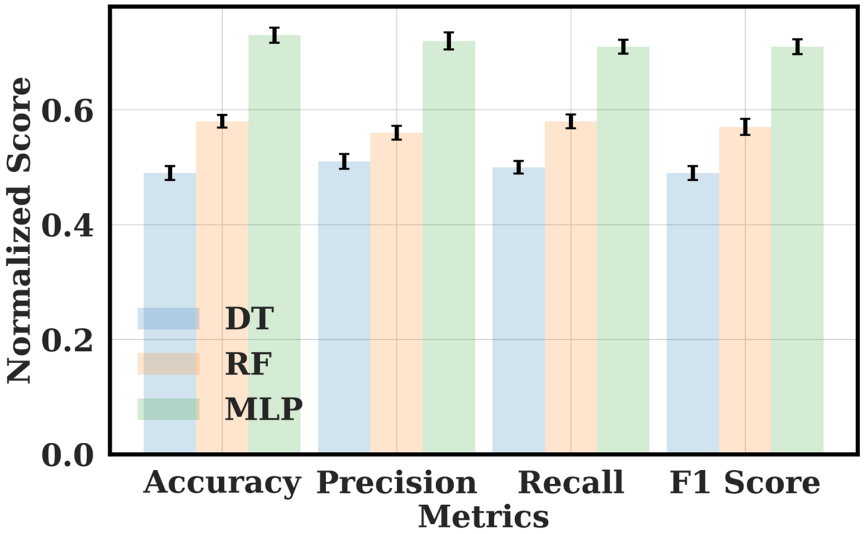


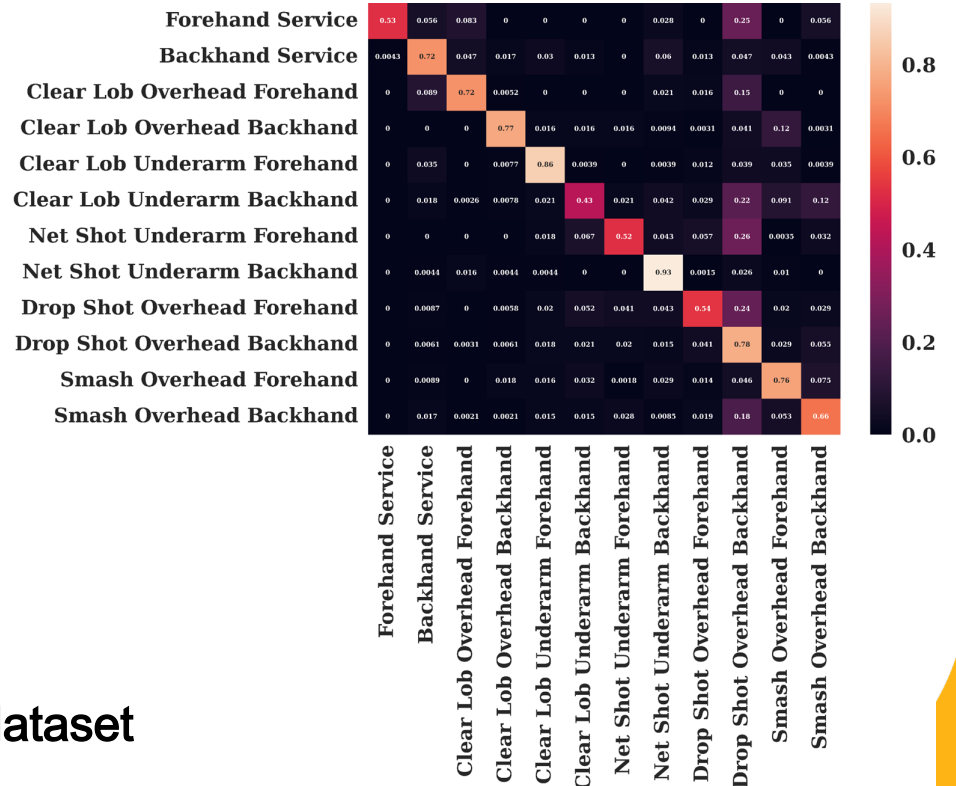
- Proxy Labels
  - Data used to approximate labels that aren't available in the dataset
- Types: Self Training and Multi-view training
  - Self Training: a supervised classifier trains labeled data and pseudo labeled data from previous iterations of the algorithm (van Engelen and Hoos)
    - E.g. *Pseudo labels*: using a labelled data model to predict labels for unlabelled data

Overview of Framework- Pipeline



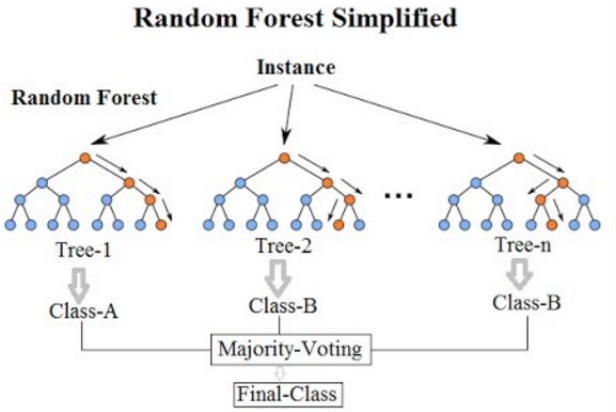
Results - Supervised Setting





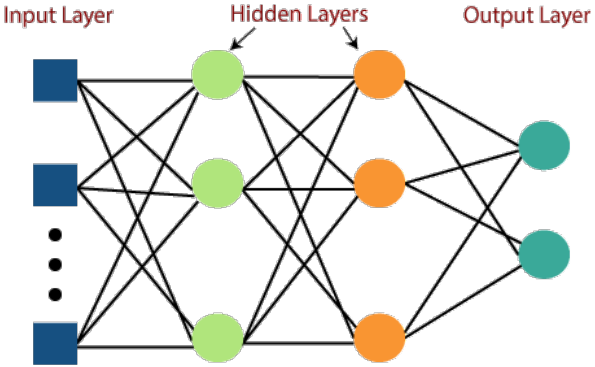
BAR dataset

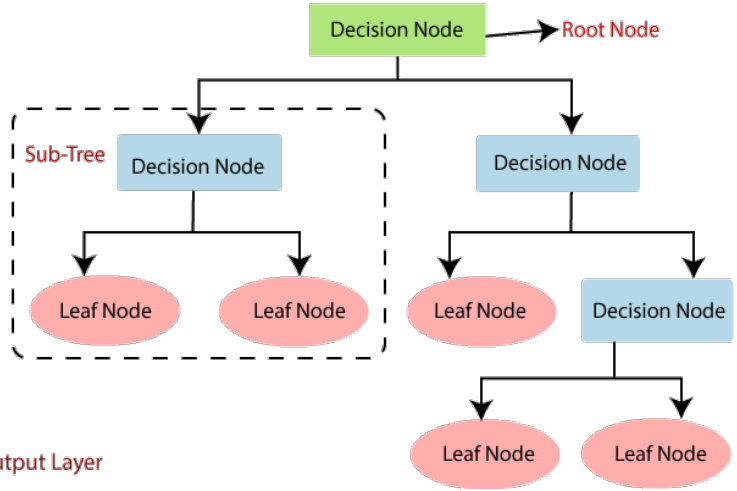
Classification methods



Random Forest

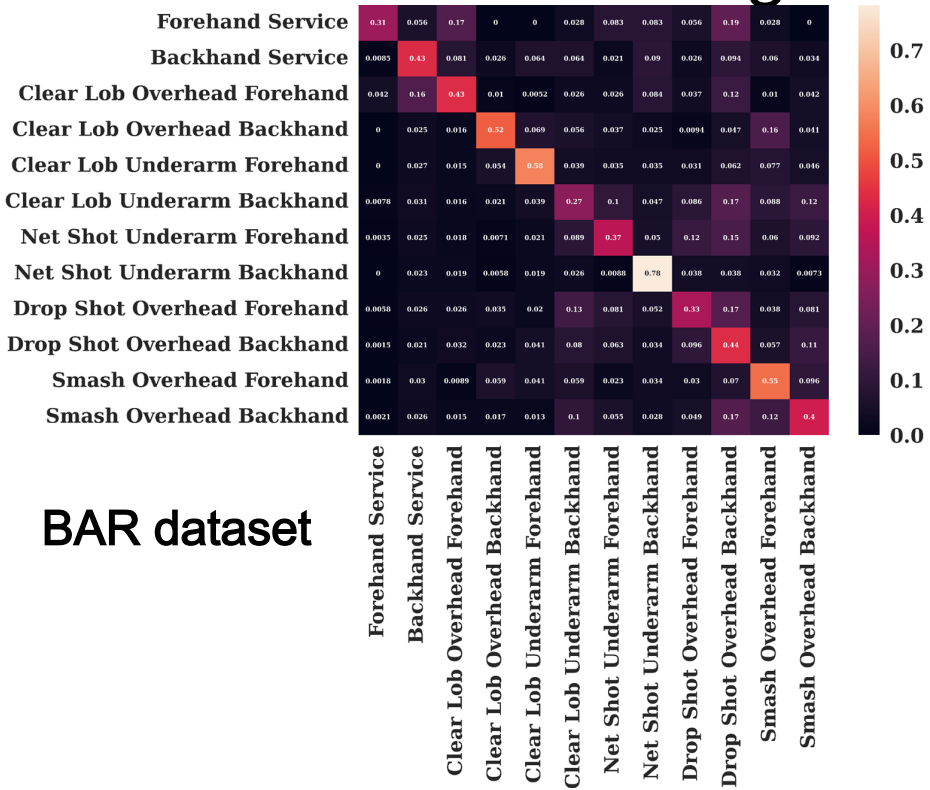
Multi -layer perceptron



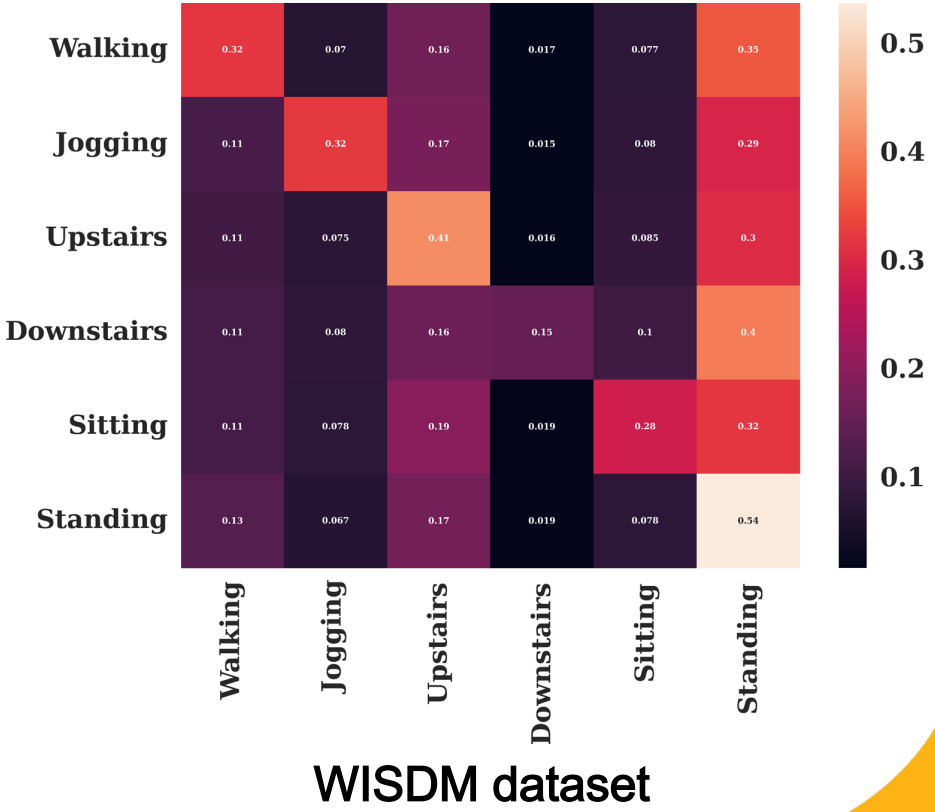


Decision Tree

Results - SSL Setting - 30% labeled dataset



BAR dataset



WISDM dataset

Conclusion & Future Works

- This project demonstrates that it’s possible for a HAR model to correctly classify human actions that vary in range of complexity in motion.
- The proposed method can be upgraded in the future to improve the performance and distinguish more complex human actions

Skills learned

- Reading academic papers
- Python in ML
- LaTeX-Overleaf
- Google Colab
- Supervised, Unsupervised & Semi-Supervised learning

Acknowledgements & Thanks

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