

Human Activity Recognition (HAR) Transfer Learning

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Abstract

In the previous iteration of this project, using transfer learning in the domain of human activity recognition (HAR) was performed. The project specifically looked at adding in new activities, using data from the same dataset. This allows for the model to look only at the activities without having to decide if the activity comes from one collection method or another.

This iteration of the project proposes to tackle that problem, and see if transfer learning is a valid approach to working with multiple datasets. If so, this would indicate a way for handling real-world problems where data collection methods might differ between locations and patients due to obstacles such as sensor availability, safety restrictions, collection protocol, etc.



Workflow

Group Contact:

Text messaging over discord

Weekly 1 hour meetings over Zoom.

Version Control:

Google Colab, Google Drive



Dataset(s)

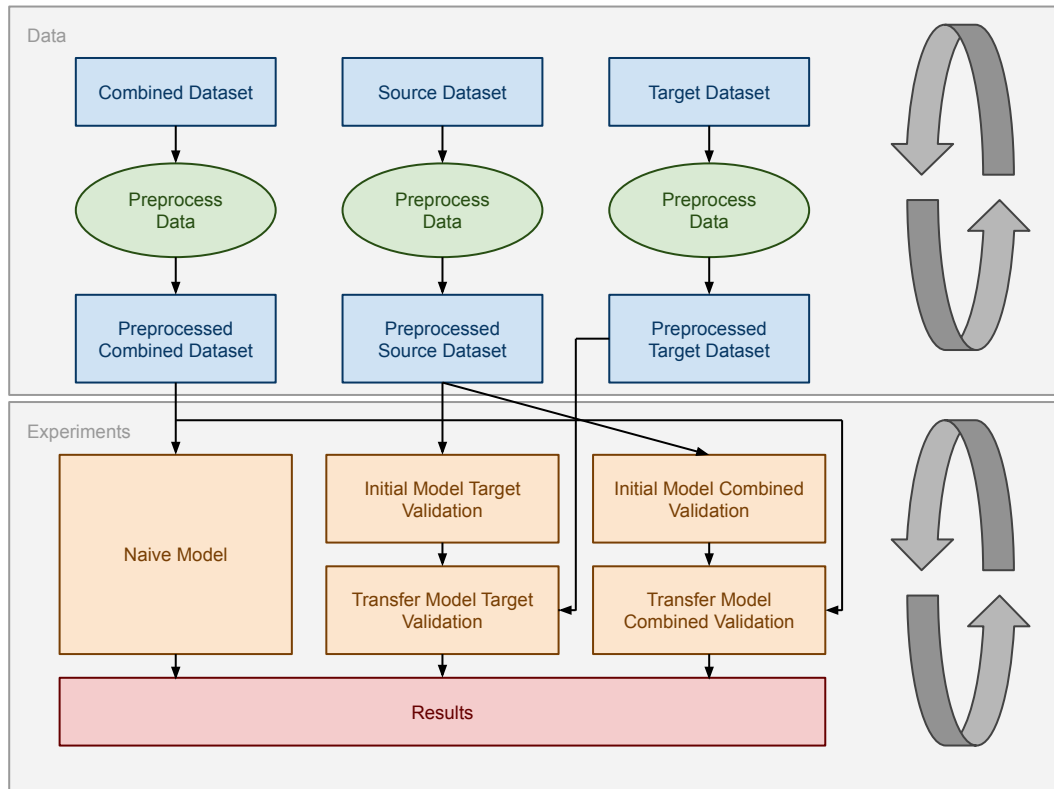
Name	Users	Shape	Tasks
Wearable HAR	22	(11,600, 121)	7 (jump, lie down, sit, stand, stairs down, stairs up, and walk)
UCI HAR dataset	30	(20,598, 562)	6 (lie down, sit, stand, stairs down, stairs up, and walk)
UCI HAPT	30	(20,432, 562)	6 (lie down, sit, stand, stairs down, stairs up, and walk) + 2 (stand-to-sit, sit-to-stand)
UniMiB	30	(12,428, 454)	9 (jump, lie down, sit, stand, stairs down, stairs up, and walk, Jogging)
WISDM	36	(4,774, 406)	6 (Walking, Jogging, Upstairs, Downstairs, Sitting)



Project Design

Data will be analyzed then preprocessed only once, initially. This will be repeated if experimentation requires it and time allows.

Experiments will be run in sets of 5, with a naive, two initial/source, and two transfer models.





Project Technologies

- Google Colab
- Google Drive
- Keras
- Python
- Transfer Learning
- CNN



Milestones

- Oct. 26 Select data.
- Oct. 31 Finish initial data preprocessing.
- Nov. 2 Setup selected experiments.
- Nov. 4 Have initial results.
- Nov. 4 Start full-data experiments.
- Nov. 6 Analyze results.
- Nov. 7 Start writing report.



Related Projects

1. HAR Using Deep NN Notebook
 - a. <https://www.kaggle.com/code/euneun000/har-using-deep-nn>
 - b. Kaggle notebook of a deep NN applied to the UCI HAR dataset.
2. Previous Transfer Learning with Gesture Recognition Project Proposal
 - a. <https://docs.google.com/document/d/1KqirKmlku6rEnOwq15qis8jAqeeJV2uS32YsoERjczw/edit>
 - b. Project proposal from the Fall 2021 semester of CSCE 5380.
3. Iteration 1 of Transfer Learning for HAR
 - a. https://drive.google.com/drive/folders/1OfG6Cd6fOdH9MHvVWq_Ru7ZggMH8w8TI?usp=sharing



References

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Levin, R., Cherepanova, V., Schwarzschild, A., Bansal, A., Bruss, C. B., Goldstein, T., ... & Goldblum, M. (2022). Transfer Learning with Deep Tabular Models. arXiv preprint arXiv:2206.15306.

Pang, J. (2018). Human Activity Recognition Based on Transfer Learning.

Patel, S. (2022, April 15). Deep Transfer Learning for Human Activity Recognition. Medium. Retrieved September 14, 2022, from <https://medium.com/@sarjakpatel1999/deep-transfer-learning-for-human-activity-recognition-d291a7731154>

Yan, Y., Liao, T., Zhao, J., Wang, J., Ma, L., Lv, W., ... & Wang, L. (2022). Deep transfer learning with graph neural network for sensor-based human activity recognition. arXiv preprint arXiv:2203.07910.