MULTIMODAL DOMAIN ADAPTATION FOR HUMAN ACTIVITY RECOGNITION:
A SURVEY

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Problem Statement

Write a Survey on Multimodal Domain Adaptation for Human Activity Recognition by:

- looking for gaps in the available literature

- deploying investigative techniques -- analyzing different parts of each paper and questioning why they did certain things

- for example, how many loss functions were used? why was that amount used? etc.
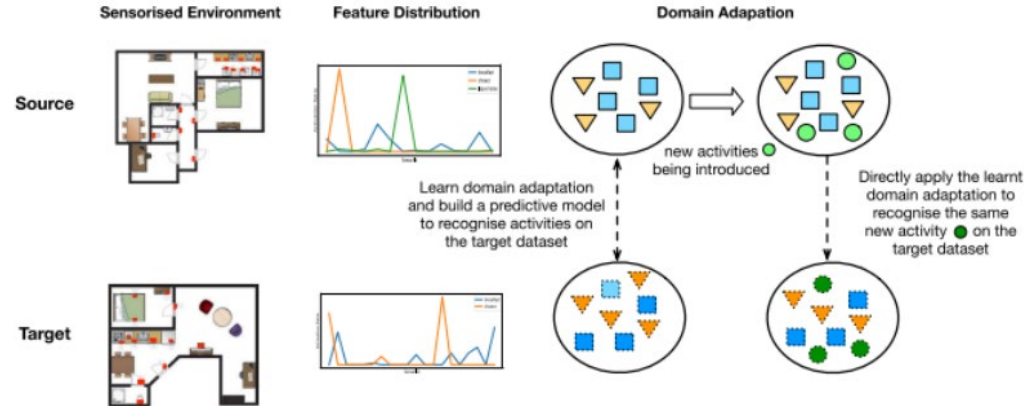
A Breakdown of the Title

Human Activity Recognition - a subset field in Artificial Intelligence that interprets human motion using computer vision, sensors, audio, and other signals to identify, detect, classify, and predict movements/activities.
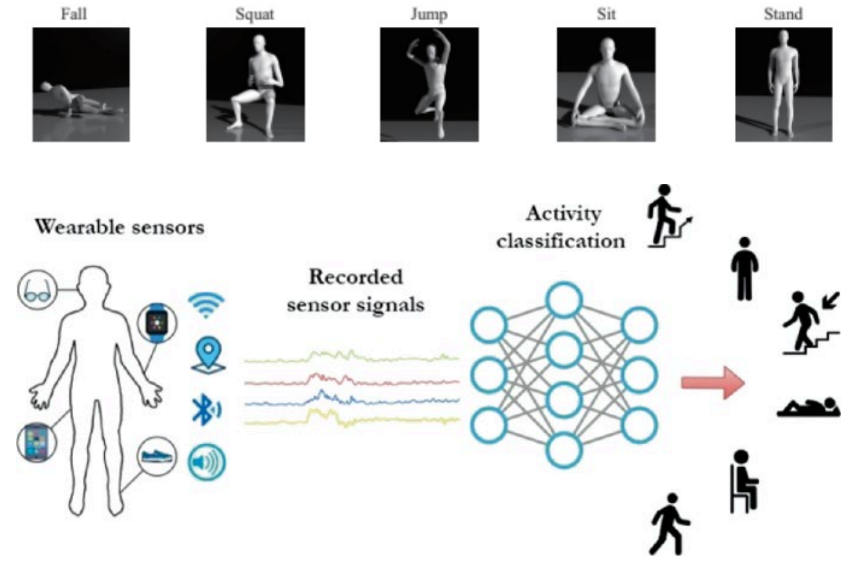
A Breakdown of the Title

Domain adaptation - a transfer learning technique that allows researchers to leverage the learned knowledge from an existing labeled dataset to annotate an unlabeled dataset resulting in more viable data
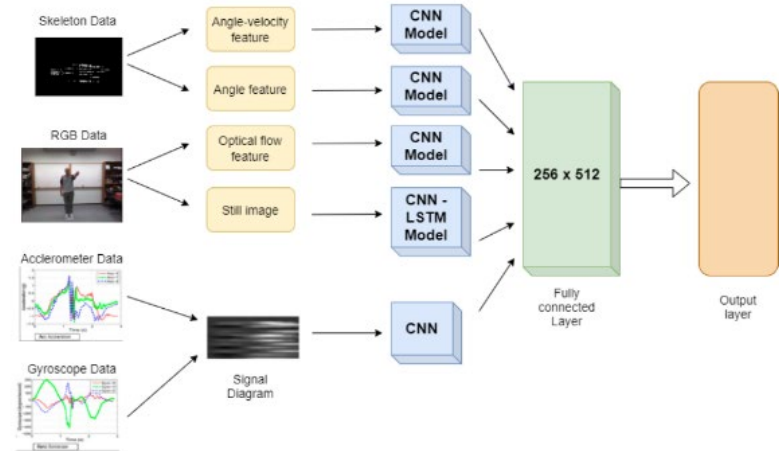
A Breakdown of the Title

Multimodal domain adaptation utilizes data with multiple modalities, like:

- text

- image

- sound

Multimodal domain adaptation mitigates the problem that is insufficient data, while also improving deep learning models by learning from multiple modalities.

The Survey

- Using an AI-Powered tool, Semantic Scholar, we compiled dozens of academic papers concerning the topic

- The terms "Human Activity Recognition", "Multimodal", and "Domain Adaptation" were used for paper selection

- After the papers were collected, we analyzed and categorized them based on motivation, proposal, dataset (in-house or public), technique, and the unaddressed issues/limitations

- Then, we created two data tables for the dataset, and the technique used in each paper (what are the pros and cons? What type of loss function was used? How many loss functions were used?

Discussion and Future Works

- This survey serves as a resource for researchers that need an outline of the available literature in the HAR field and use it as a reference point to which parts of the field have not been explored

- The survey shows a clear need more labeled data, but also different techniques to mitigate the problem

- In the future, researchers will be able to use existing data in different modalities to train models

- Some limitations researchers ran into include performance degradation and the models' lack of adaptability

Skills Acquired during the REU Program

- Deep Learning Model Applications
  - Image Captioning
  - Machine Translation
- **Implementing and using various Python packages and libraries**
  - torch
  - numpy
- Troubleshooting a deep learning model
- How to skim through long academic papers and fully understanding
- LaTeX through Overleaf
- How to write an academic paper

Research Experience gained during the REU program

o This experience really taught me what research really entails – before the program, my knowledge about what actually goes into research was limited

o Working firsthand with the students at the MPSC Lab and CARDS gave me a new perspective on research

o This REU program, specifically, allowed me to gain experience in the field of Artificial Intelligence and Deep Learning

o I also gained some skills that have allowed me to become a better researcher

Acknowledgement