Human Activity Recognition

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***Abstract*— Human Activity Recognition is the task of classifying different commonly carried out activities (like lying, standing, running, cycling, ascending stairs, etc.) based on sensory data from devices like accelerometer and gyroscope. It is an important task in the healthcare domain. By classifying activities of patients and monitoring their trends, valuable insights can be obtained. Most of today's smartphones come with IMUs (inertial measurement units), which have in-built accelerometer and gyroscope sensors. In this project we try to answer different questions based on the activity performed, the sensor data and dependency on the subject of the data.**

I. INTRODUCTION

We are looking towards human activity recognition as a multi-class classification problem. In the first scenario, we are trying to answer two different questions.

1) For the given subject, what is the activity?
2) For the given activity, who is the subject?

For the second scenario, we will try to build a user-independent model for classification problem. We will try to generalize the model so that our model can be used for any user, whilst still achieving decent performance. So, our question is as follows:

3) Predict what is the activity without any prior information about the user.

We are performing our experiment on PAMAP2 [3] dataset.

II. BACKGROUND & RELATED WORKS

There are several related works on this problem. [1],[2] and [4] are some of the works on the same dataset that we are using. To compare our work, we will also refer to the benchmark set by [3]

III. METHODOLOGY

We will be implementing logistic regression, decision tree, k-NN classification algorithms, naive Bayes classifiers and neural network to answer all the questions, and then choosing the model with the best performance.

IV. PROGRESS SO FAR

We performed the following preprocessing steps:

- Removed columns in the Data which are weakly correlated with target labels.
- Imputed missing data for some important columns like as 3D accelerometer data, 3D gyrometer, etc using linear interpolation.
- Dropped rows having NaN/NA/inf values in the Data.
- Normalization of data to scale features to same metric
- Created activity and subject wise pickle files which will be used to train models.
- Implemented logistic regression model as base model and using data with within 10ms.

We are planning to consider data for fixed time window which should be sufficient amount of time to predict the activity correctly. we are currently working on this.

V. REVISED PROJECT TIMELINE

- Week 1-2:
  - Manipulating data by merging rows for window time (let's say 5 seconds) with some step size.
  - Fitting and building Different Models for all questions(Each group member implement model for 1 question)
- Week 3:
  - Comparison of different Models and evaluating performance(Each group member implement model for 1 question)
- Week 4-5:
  - Try to optimize the model that works best for the dataset for different questions, including user-independent one. (Each group member implement model for 1 question)
  - Generation of Reports(All group members)
- Week 6:
  - If time permits, we want to check how we can achieve decent accuracy with minimal data, i.e. only heart rate monitor and 1 IMU(All group members)

REFERENCES

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