

Classification of human posture and movement

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Abstract

Coming soon...

1 Introduction

Human activity classification has wide reaching applications, such as in providing medical assistance to disabled or elderly persons. This project implements several machine learning algorithms to classify human posture and movements. The different activities being classified are:

- Sitting
- Sitting down
- Standing
- Standing up
- Walking

The difference between “Sitting” and “Sitting down” is that the former is the static posture, whereas the latter is the transitional movement from standing to sitting.

1.1 Past work

Coming soon...

2 Data

2.1 Source

The data is made publicly available on UCI’s Machine Learning Repository. It can be accessed at: <http://groupware.les.inf.puc-rio.br/har#dataset>.

2.2 Description

The dataset contains the following features

- Age
- Weight
- Body Mass Index
- Height
- x,y,z axis readings from 4 different accelerometers

Table 1: Frequency of each class

Class	Frequency
Sitting	50631
Sitting down	11827
Standing	47370
Standing up	12415
Walking	43390

3 Features

The features used in our models are the 12 accelerometer readings.

4 Gaussian Discriminant Analysis

4.1 Binary classification

The first model implemented was the GDA model. For each class, 90% of the class's data is used as positive training examples, while 90% from each of the other classes are concatenated to be used as negative training examples.

4.2 Multi-class classification

For a testing example, in order to make a prediction into 1 of the 5 classes, the posterior distribution is calculated for each class, and the predicted label is chosen depending on the largest posterior.

That is

$$h_{\theta}(x) = \arg \max_y p(x|y)p(y)$$

where $y \in \{1, 2, 3, 4, 5\}$.

4.3 Results

The confusion matrix of the results is shown below:

	Sitting	Sitting down	Standing	Standing up	Walking
Sitting	3916	1126	0	22	0
Sitting down	0	1112	63	7	2
Standing	0	601	4136	0	1
Standing up	116	558	454	103	11
Walking	0	1257	900	48	2135