

# IN4254 Assignment 1

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## Introduction

This assignment is to design an android application which can recognize activities and locations of the user. The android application is implemented on **HUAWEI ANE-AL00 (Android 8.0.0, API 26)**. The code is implemented on the basis of **example 2**<sup>1</sup> provided in the course repository. The KNN classifier utilizes related classes from Weka<sup>2</sup>. Zhao Yin implements the part of activity recognition. Hang Ji implements the part of localization. The UI of this application is shown in Figure 1.

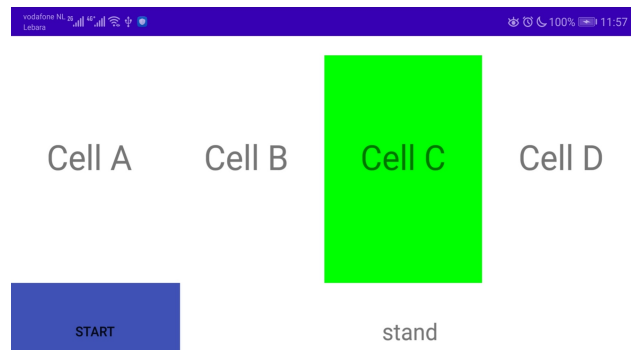


Figure 1: User Interface

## Activity Recognition

The application is designed to recognize four activities, which are **stand**, **walk**, **run**, **jump**. The user holds the phone on his/her right hand to collect the data from the accelerometer. The accelerometer collects the raw data of  $ax$ ,  $ay$ ,  $az$ . **In the training process, the square root of  $ax^2 + ay^2 + az^2$  and the variance of the square root are calculated at a window size of 50 samples and chosen as features for the training data.** The square root of  $ax^2 + ay^2 + az^2$  can capture the value of accelerations in all directions. The variance of the square root can capture the changes of the value of accelerations in all directions at different activities. KNN classifier is used to recognize the current activity.  $k$  is set as 7. **In the testing process,** The window size of the testing data is set as 50 to recognize the current activity. The same user holds the phone to collect the testing data. The confusion matrix of the testing result is shown in Figure 2a.

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<sup>1</sup>Example 2 in the course repository

<sup>2</sup>IBk classifier class in Weka

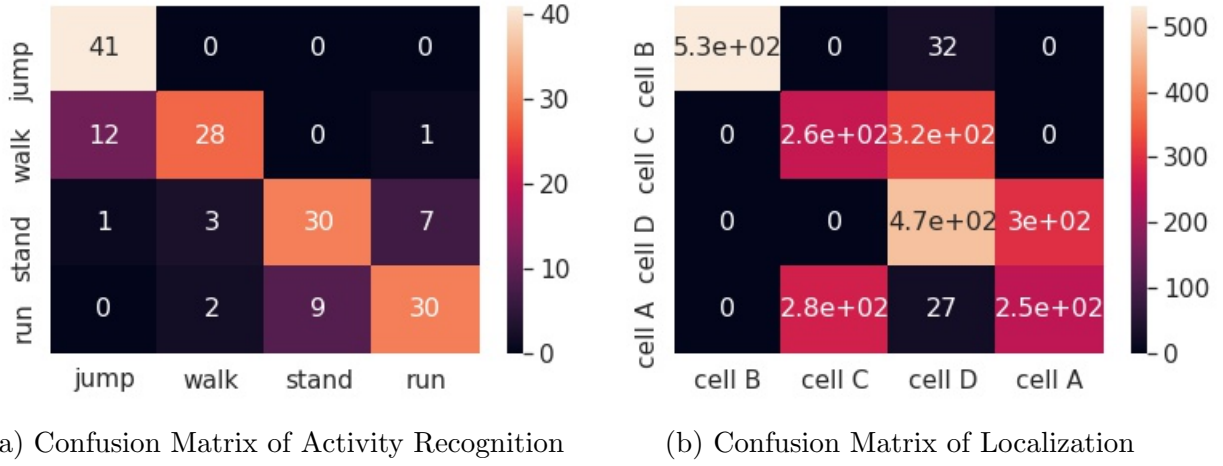


Figure 2

## Localization

The application is also designed to detect the cell where the user is. The detection scenario is shown in Figure 3. Each cell is  $1\text{m} \times 3\text{m}$ . **In the training process**, the RSS of 10 specific WiFi ID is collected as features in the training data. The training data is collected at the center of each cell. KNN classifier is also used to recognize current cell.  $k$  is set as 7. **In the testing process**, each sample of the RSS of the 10 specific WiFi ID is collected as a testing data to recognize current location. The testing data is collected at the center of each cell as well. The confusion matrix of the testing result is shown in Figure 2b.

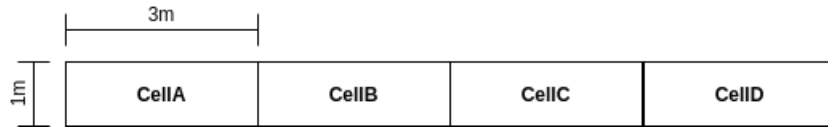


Figure 3: The layout of cells to be detected