Principles and Design of IoT Systems (PDIoT) [INFR11150/INFR11239]

Peer Reviewers Details

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Date completed: 01/12/2022

A. Setup instructions

1. On a scale of 1 to 5, how easy was it to follow the setup instructions provided by the team? (1 - very easy, 5 - very hard)

3

2. On a scale of 1 to 5, how easy was it to install the apk of the app on your device? (1 - very easy, 5 - very hard)

5 (The .apk file did not work)

3. Comment on how it can be improved.

• The .apk file did not work, and Group D had to be contacted to provide the source code to their mobile application. This was mainly due to the application requiring high android versions, which many phones do not have. One improvement could be to have to app be accessible to lower versions. • Many other specifications (which would have been very useful) such as SDK version were not provided. • Alternatives to installing the app were not provided. Only the apk file was provided, which means that if that failed and the group was not contacted, there would have been no other way to test the application.

B. Any additional setup

1. Were there any additional setup for the app (for example creating an account on a website or changing settings on your phone?)

There was one additional setup before using the application, which was to create a new account.

2. Describe these steps and how easy it was to follow them. Add any comments on how you would improve them.

User interface for creating an account was quite standard and intuitive. No additional guide was needed to create an account.

C. App usability

1. Comment on the functional usability of the app. Focus on the following: ease of navigation, working components such as buttons, sensor connections, and any dropdowns or graphs within the app.

Functional usability score: 4/5 The application was quite easy to navigate. There were only four buttons on the menu and the name of the buttons were clear and helpful. There were no issues connecting to the sensors. However, the application is sometimes buggy, and the graphs do not show. Additionally, in the historical data, the time spent performing each activity was shown in seconds. It was not clear whether this represents the entire history of activities for the user or for that day only.

2. Rate the interface usability of the app: was the place to click intuitive? How easy was it to get to the page showing live classification? Were the other features easy to find?

User interface score: 4/5 It was very easy to get to the live classification page. The user simply had to click on the “Watch Live Processing” button. The UI is very simple and minimalistic, which is nice, making features easily accessible. All buttons had self-explanatory names making it very easy to new users to understand how to use the application without needing to read a manual. However, some font sizes were quite small, and some text in the graph was quite crowded. Some text in the graphs were shown in bright red color which was sitting on top of some other bright colors, making it quite difficult to read.

D. Real-time classification

1. For the list of activities implemented (find the list in the group's submission material), record the classification result for each activity - a column for each student. If the app you are testing implements multiple models (for example, one model which classifies a subset of activities and one model which classifies all activities), then create a table for each of the models.

Activity Name	**Try 1 - Passara**	**Try 2 - Joe**	**Try 3 - Pradnesh**
Climbing stairs	Climbing stairs	Walking	Climbing stairs
Descending stairs	Descending stairs	Descending stairs	Descending stairs
Deskwork	Sitting	Sitting	Deskwork
Lying down left	Lying down left	Lying down left	Lying down left
Lying down on back	Lying down on back	Lying down on back	Lying down on back
Lying down right	Lying down on right	Lying down on right	Lying down on right
Movement	Movement	Movement	Movement
Running	Running	Running	Running
Sitting	Standing	Standing	Deskwork
Sitting bent backward	Sitting	Lying down on back	Sitting bent backward
Sitting bent forward	Sitting bent forward	Sitting	Deskwork
Standing	Deskwork	Deskwork	Standing
Walking	Movement	Movement	Movement

2. Comment on the perceived accuracy of the real-time classification. What do you notice that can be improved?

In general, the real-time classification accuracy is very accurate when it comes to distinct activities such as running, ascending stairs, descending stairs and lying down in various positions. However, the model seems to have difficulty differentiating between different sitting positions. Sitting is also often mistaken for desk work and standing and vice versa. Interestingly, walking could not be classified, and the result only showed 'movement' while walking.

The main areas to improve would mainly be for stationary activities as the model has difficulty differentiating between stationary activities. Additionally, there seems to be 'overclassification' of movement in stationary activities and some dynamic activities.

E. Offline classification

You will have been emailed the test dataset along with your assigned group's materials.

Use the evaluate_model.py script provided by your assigned group to run their model on the unseen test dataset.

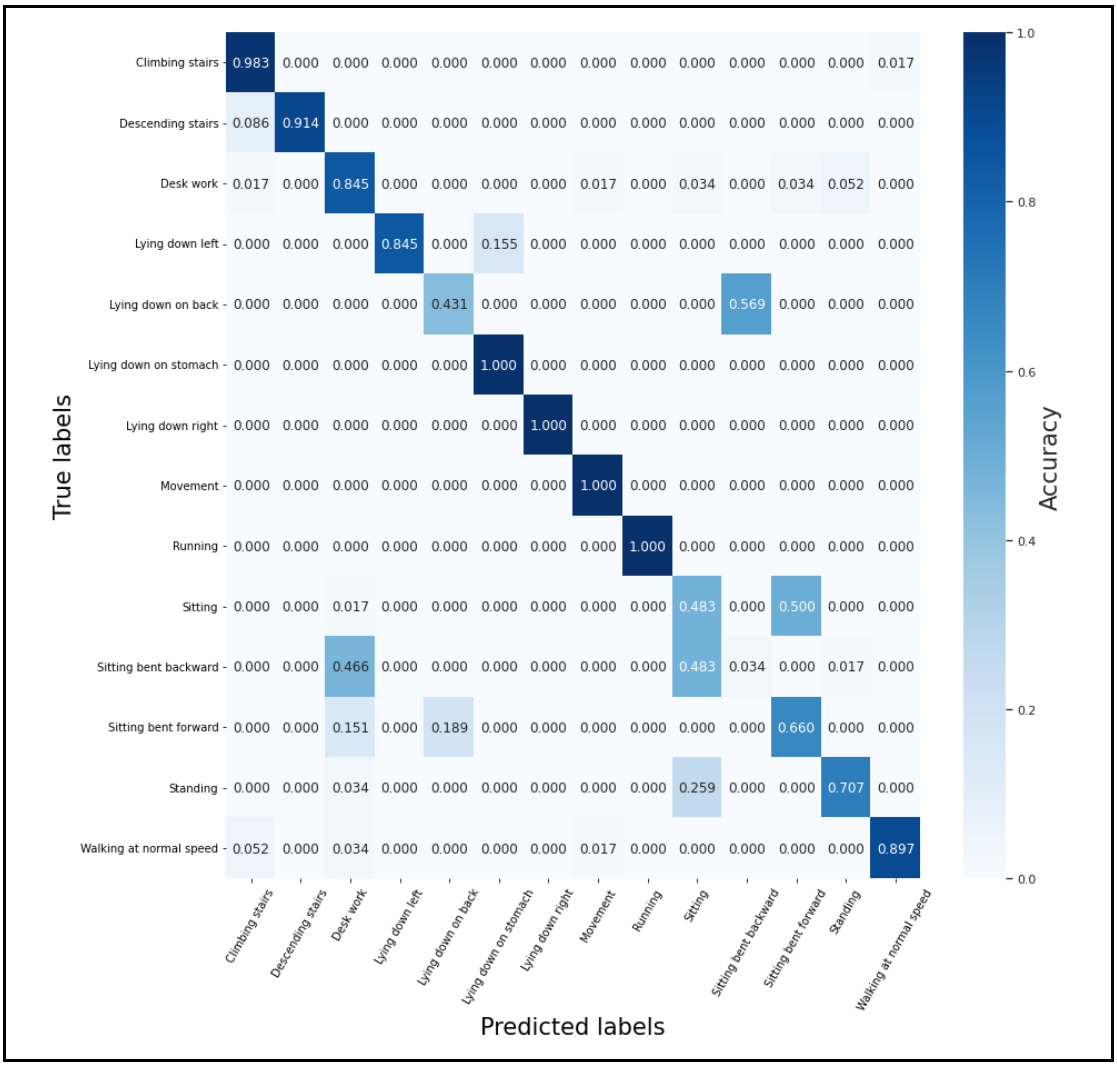
1. Paste the classification report here:

	precision	recall	f1-score	support
Climbing stairs	0.864	0.983	0.919	58
Descending stairs	1.000	0.914	0.955	58
Desk work	0.551	0.845	0.667	58
Lying down left	1.000	0.845	0.916	58
Lying down on back	0.714	0.431	0.538	58
Lying down on stomach	0.864	1.000	0.927	57
Lying down right	1.000	1.000	1.000	58
Movement	0.967	1.000	0.983	58
Running	1.000	1.000	1.000	58
Sitting	0.384	0.483	0.427	58
Sitting bent backward	0.057	0.034	0.043	58
Sitting bent forward	0.530	0.660	0.588	53
Standing	0.911	0.707	0.796	58
Walking at normal speed	0.981	0.897	0.937	58
accuracy			0.772	806
macro avg	0.773	0.771	0.764	806
weighted avg	0.774	0.772	0.765	806

2. Paste the breakdown of classes and their corresponding metrics here:

```
Sitting/Standing …. Accuracy: 0.467, Precision: 0.733, Recall: 0.467, F-score: 0.477-
Climbing stairs …. Accuracy: 0.983, Precision: 1.000, Recall: 0.983, F-score: 0.991
Descending stairs …. Accuracy: 0.914, Precision: 1.000, Recall: 0.914, F-score: 0.955
Desk work …. Accuracy: 0.845, Precision: 1.000, Recall: 0.845, F-score: 0.916
Lying down left …. Accuracy: 0.845, Precision: 1.000, Recall: 0.845, F-score: 0.916
Lying down on back …. Accuracy: 0.431, Precision: 1.000, Recall: 0.431, F-score: 0.602
Lying down on stomach …. Accuracy: 1.000, Precision: 1.000, Recall: 1.000, F-score: 1.000
Lying down right …. Accuracy: 1.000, Precision: 1.000, Recall: 1.000, F-score: 1.000
Movement …. Accuracy: 1.000, Precision: 1.000, Recall: 1.000, F-score: 1.000
Running …. Accuracy: 1.000, Precision: 1.000, Recall: 1.000, F-score: 1.000
Sitting bent backward …. Accuracy: 0.034, Precision: 1.000, Recall: 0.034, F-score: 0.067
Sitting bent forward …. Accuracy: 0.660, Precision: 1.000, Recall: 0.660, F-score: 0.795
Walking at normal speed …. Accuracy: 0.897, Precision: 1.000, Recall: 0.897, F-score: 0.945
```

3. Paste the confusion matrix (or matrices) here:



4. Did you have any issues running the offline classifier(s)?

Nope, everything ran smoothly.

5. How does the performance of the offline classifier(s) compare to what you saw in real-time on the app?

In general, the offline classification performance quite accurately represents the online classification performance. Both the real-time and offline classifiers have difficulty differentiating between different sitting positions (sitting bent forward, sitting straight, and sitting bent backward). The classifier also struggled to differentiate sitting and standing. One interesting thing to note is that in the offline classifier, it can be seen that movement has an accuracy of 1. This could be due to ‘overclassification’ as, during the testing of the offline classification, we saw that sometimes other activities, such as walking or ascending stairs, would be classified as movement. Sometimes

stationary activities such as standing or sitting will be classified as movement also. In order to avoid this, the user would have to sit or stand very still, which is not realistic in real-world applications. However, this is not really the fault of the methodology implemented, but more from the nature of how the dataset was collected as the dataset was collected in very controlled environments and the activities were not being performed ‘naturally’.

F. Overall experience

1. Comment on your overall experience using the application.

The overall experience was quite standard. The application was simple and minimalistic (which is good). There were no surprises or confusion felt while using the application and everything worked mostly as expected (apart from a few errors during live classification).

2. Comments on how you would improve this application.

The main thing we would suggest improving would be how historical data is displayed. The text in the graphs was quite hard to read, and it was unclear whether the historical data displayed (in time) was shown for that specific data or the overall period. If it is the overall period, it is not so useful, as users might benefit more from knowing what activities they performed on specific days rather than the breakdown of all activities they performed since they started using the application.

Another aspect that could be improved would be implementing the classification model inside the cloud instead of in the app. Having the model inside the app takes up much more space. This fairly simple and minimalistic application takes 50MB of space with just one machine-learning model. It might not be scalable in the future if you want to add more ML models.