CPE477/ECG677 – Embedded Security & Machine Learning

Design Assignment 1

DO NOT REMOVE THIS PAGE DURING SUBMISSION:

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Github Repository link (root): https://github.com/NicolasE04/yeahsure.git

YouTube Playlist link (root): cpe_477

Follow the submission guideline to be awarded points for this Assignment.

Submit the following for all Assignments:

1. In the document, for each task submit the modified or included code (from the base code) with highlights and justifications of the modifications. Also include the comments. If no base code is provided, submit the base code for the first task only.
2. Create a private Github repository with a random name (no CPE477/677, Lastname, Firstname). Place all assignments under the root folder, sub-folder named Assignmentn, with one document and one video link file for each lab, place modified c files named as main.c.
3. If multiple ‘c’ or ‘h’ files or other libraries are used, place these files inside the folder.
4. The folder should have a) Word document (see template), b) source code file(s) with other ‘c’ and ‘h’ include files, c) text file with YouTube video links (see template).
5. Submit the PDF file in Canvas before the due date. The root folder of the github assignment directory should have the documentation and the text file with youtube video links.
6. Organize your youtube videos as playlist under the name “EMBSEC&ML”. The playlist should have the video sequence arranged as submission or due dates.
7. Only submit pdf documents. Do not forget to upload this document in the github repository and in the canvas submission portal.

1. Goal: Explain what is explored in this assignment and what was accomplished.

The data collection consists of three classes: waving, walking, and rotating the wrist. They all were roughly 1:20 minutes, with the first and last 5 seconds being static on a table. I also did three sessions of each one.

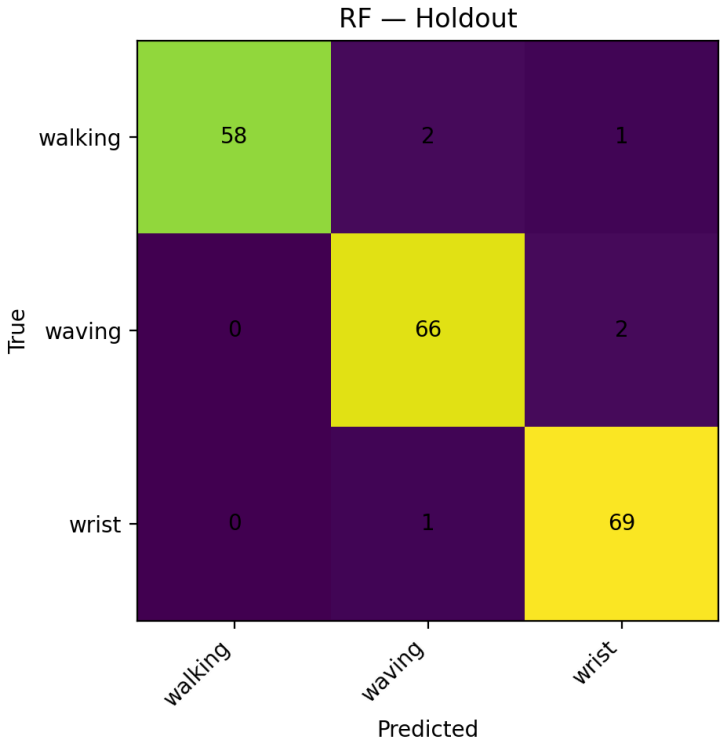
Waving was held with only my right hand, and two of the three sessions were standing, then the third was sitting. Changed speed gradually.

walking was held to the side of my thigh. My room was small, so I had to pivot a lot, but in the third session, I added more space. The pace was pretty steady.

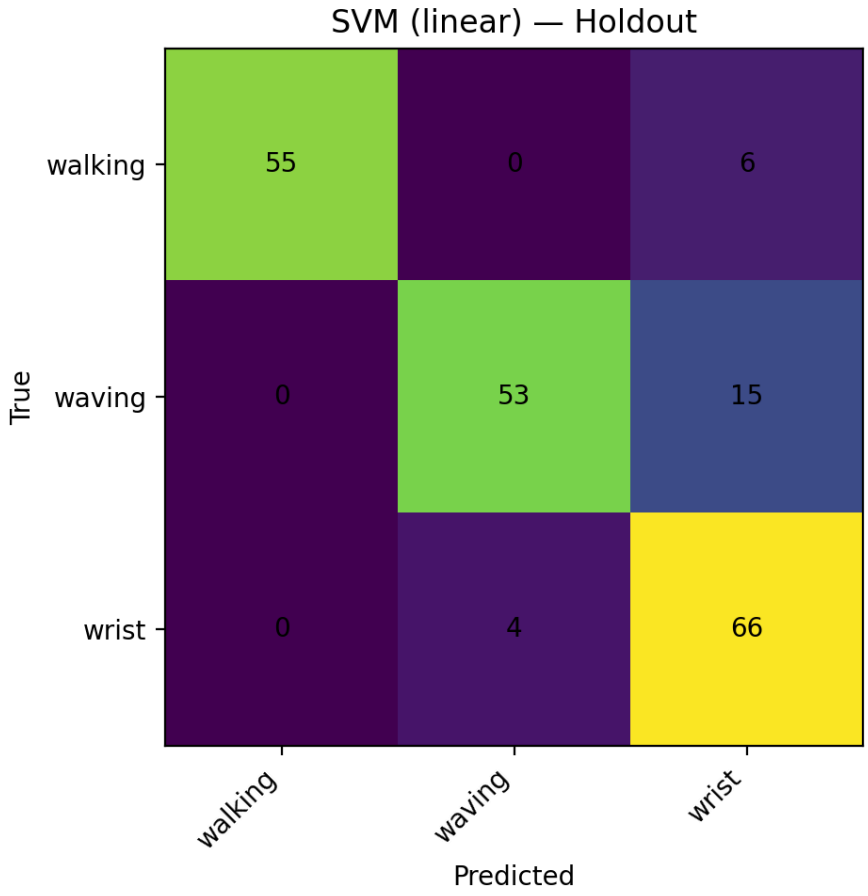
Rotating the wrist was with my right hand only; I held it like a mouse. The first one, I rotated it a weird way, like moving my shoulder rather than my wrist, so the last two I didn't do that. The pace changed steadily.

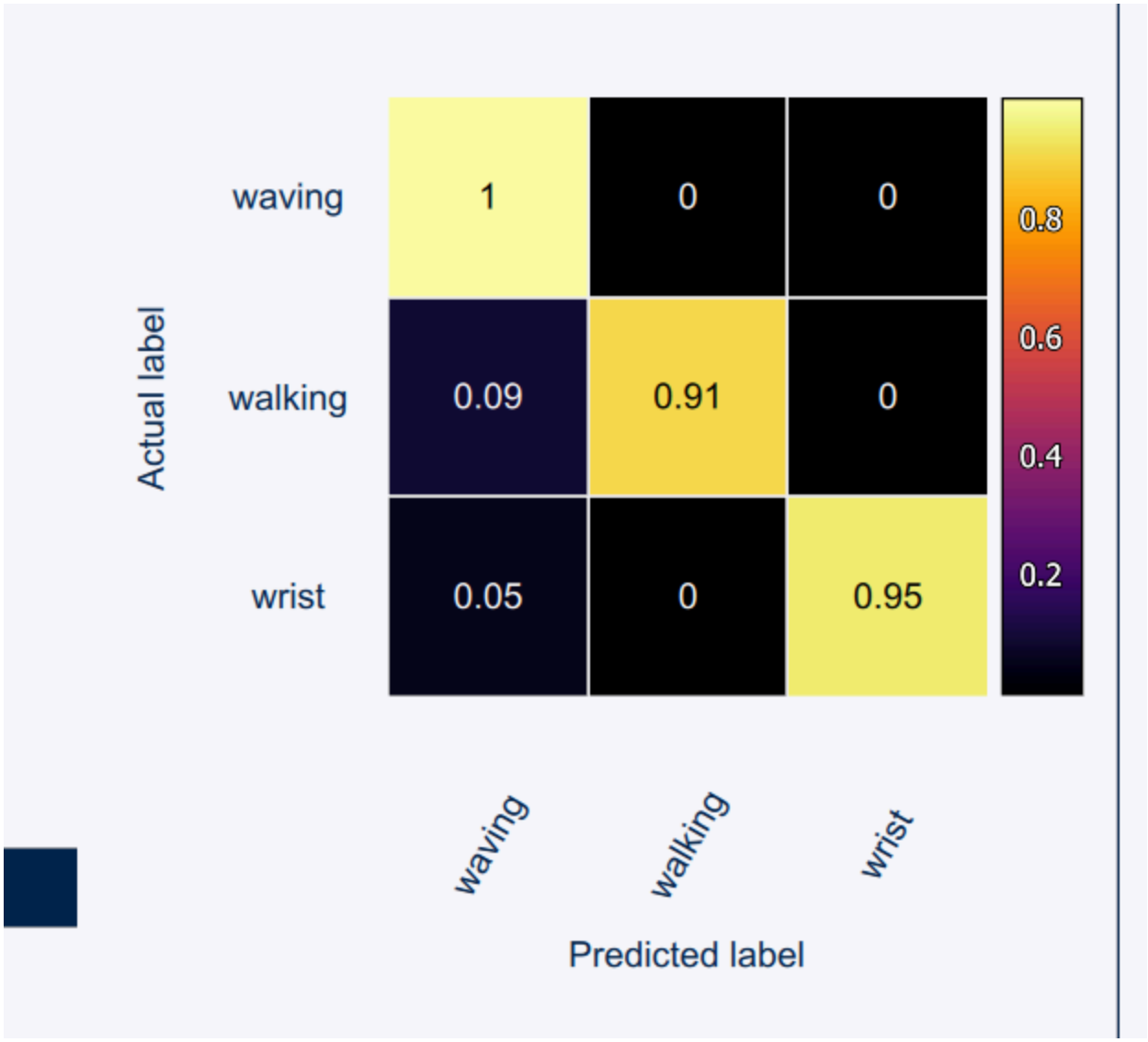
MLC training was done by the mems studio. For the Python scripts, I used the ARFF file from mems.

Decision tree



SVM


SVM (linear) — Holdout
walking
waving
wrist
True
55
0
6
0
53
15
0
4
66
walking
waving
wrist
Predicted



The best was from the mems studio. But a random forest performed similarly. The SVM was not good at all, with an 88% while the other two had 95.5% and 94.86%.

The assignment was fun and interesting. Using mems was amazing; they make it very simple. Yet the number of features feels endless. I was struggling at the beginning, but I got the hang of it.

2. Screenshots of the IDE, physical setup, and debugging process – Provide screenshots of successful compilation, screenshots of graphs, etc.


```
=== Random Forest ===
Accuracy: 0.9698
Confusion Matrix:
 [[58  2  1]
 [ 0 66  2]
 [ 0  1 69]]
CV Accuracy (mean±std): 0.9486 ± 0.0170

=== SVM (LINEAR) ===
Accuracy: 0.8744
Confusion Matrix:
 [[55  0  6]
 [ 0 53 15]
 [ 0  4 66]]
CV Accuracy (mean±std): 0.8840 ± 0.0307
```

3. Declaration

I understand the Student Academic Misconduct Policy - http://studentconduct.unlv.edu/misconduct/policy.html

"This assignment submission is my own, original work".

Name of the Student