EE/CprE/SE 492 GROUP PROGRESS REPORT

Group number: May
2020-10
***Project title:* Embedded Systems Machine Learning**
Client: Dr. Diane Rover
Advisor: Dr. Diane Rover
Team Members: *Jackson Lopata, Isaac Stich, Eric Reusch, Frankie Mago,* Hailey Lucas, Christian Williams, and James Gossling.

- **Project Summary:** *(Short summary about the project. What are the design goals? Have the direction or scope of the project changed? This should be about a paragraph in length.)*

This project's main goal is implementing machine learning into the current ISU curriculum**.** Using machine learning we will implement a smart door lock capable of locking/unlocking doors once the appropriate keyword is uttered. The design goal is to train the keyword spotter with an accuracy of 90% or greater, meaning that the door functions correctly 90% of the time when the keyword is uttered. Another design goal is to have the locking mechanism finish its locking or unlocking state in under five seconds.

- **Accomplishments** *(Please describe/summarize as to what was done, by whom, when and, collectively as a group since the last report. This should be about a paragraph or two in length. Bulleted points are acceptable as well. Please keep only your technical details related to your project. Figures, schematics, flow diagrams, pseudocode, and project related results are acceptable, but please ensure that they are legible (clear enough to read) and to provide an explanation. If researching a topic, please add a few details about what was learned and how it is relevant to the project. If two or more people worked on a single task, be sure to distinguish how each member contributed to the task. Specific details relating to the assistance provided to other members may be included here.**)**

1. Jackson Lopata
    a. Designed, manufactured, and tested the axel connector for the deadbolt.
    b. Figured out how to connect a gear to the deadbolt axel
    c. Manufactured and tested the servo mount.
2. Isaac Stich
    a. Worked on wiring up a second prototype of the circuit. Connected all hardware components to the main Arduino board.
3. Eric Reusch
    a. Worked with James beginning a python program to simplify testing data collection.
    b. Teaching myself python and the various libraries that will allow us to distribute the data collection program.
4. Frankie Mago

a. Used the python curation scripts on the synthetic data downloaded from the Google Speech Command Dataset.
b. Uploaded the curated files to Edge Impulse to begin experimenting with model parameters.
c. Focussed on the MFCC block to start, after 20+ different versions. I would tweak each MFCC variable one at a time, then combine the ones that yielded the highest accuracy, which produced 85.82% after optimizations.
d. Will start tweaking the NN block to further increase the accuracy as high as possible before introducing 'real data' in hopes that the parameters used now will yield the highest accuracy once the real data is introduced, thus saving time later.

5. James Gossling
    a. Started implementing and testing the python data collection program with Eric
    b. Used Frankie's new model to test on a nano with a motor.
6. Hailey Lucas
    a. Wired our first hardware model connecting an Arduino Uno to various motors and other hardware components
    b. Started looking at testing the circuit using simple Arduino programs
7. Christian Williams
    a. Looked over the circuit and made sure I understood how it worked incase problems manifested.
    b. Started looking into PCB creation and tools to help us create PCBs.

- **Pending issues** We talked about how to go about getting a good amount of diverse data from ourselves and others, and need to to get people to give us email lists to ask people to send us voice data. We need to figure out how to get fine grained control of the machine learning library. We need to get a fully functional prototype working.

- **Advisor Input/Signature:**

  Please select one of the options below and sign.

  _____ I am pleased with the progress the team is making.
  _____ The team's progress could use some minor improvements which I will discuss with them.
  _____ The team's progress has some major concerns that I will discuss directly with Dr. Bigelow

  bigelow@iastate.edu , 515-294-4177

  Signature: Diane T. Rover

- **Client Input/Signature:**

  Please select one of the options below and sign.

  _____ I am pleased with the progress the team is making.
  _____ The team's progress could use some minor improvements which I will discuss with them.
  _____ The team's progress has some major concerns that I will discuss directly with Dr. Bigelow

  bigelow@iastate.edu , 515-294-4177

Signature: Diane T. Rover

CyMail

James Gossling <jgos@iastate.edu>

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Rover, Diane T [E CPE] <drover@iastate.edu> Thu, Feb 24, 2022 at 11:17 AM
To: "Gossling, James L" <jgos@iastate.edu>

Thanks James. I'm satisfied with the progress of the team.

Diane Rover

University Professor, F. ASEE, F. IEEE

Electrical and Computer Engineering

Iowa State University

[Quoted text hidden]