EE/CprE/SE 491 WEEKLY REPORT 02 01/29/2018 – 02/04/2018
Group number: *18*
Project title: *Deep Learning with Radar for Object Recognition and Tracking*

Client &/Advisor: Michael Olson (Danfoss) and Dr. Wang
Team Members/Role:
Tucker Creger - Project Manager
Eric Bishop - Software Developer
Kellen O'Connor - Deep Learning Architect
Clayton White - Hardware Design Engineer
Mitch Hagar - Radar System Lead
Nihaal Sitaraman - Hardware Developer

o **Weekly Summary**
This week we had an onsite meeting with Michael Olson and Dr. Wang. We also continued work on defining the scope of the project. We were able to conduct some small radar tests with Walabot development kits. Kellen had the 15 antenna kit working on his PC and Nihaal was able to get the 3 antenna kit working on his PC. We will be starting to collect data and test our the units. Tucker is collecting notes from the textbooks he checked out.

o **Past week accomplishments**
- Met with Danfoss client Michael Olson in Ames
    - The team was able to get questions answered regarding deliverables, expectations, and timelines from Michael
    - Dr. Wang attended the second half of this meeting.
- Made progress with the Walabot kits
    - Walabot is a company which uses the RADAR chip made by Vayyar
    - Nihaal has 3 antenna kit which is limited in its functionality
    - Kellen has 15 antenna kit which has added functionality and more range
    - Austin has 18 antenna kit which did not work for Kellen or Nihaal, and will be connecting to it via a phone app
- We have all signed our NDA/IP Agreements
- We are investigating which deep learning platform we want to use. We are currently evaluating Keras, Caffe, and Pytorch.
- Eric updated the website with the weekly report
- Tucker and Nihaal have been researching companies to gather data on possible alternatives for Vayyar
    - Omniradar, NXP, and Infineon.
- Tucker and Kellen have done research on RADAR physics related to utilizing beamforming with FMCW (Frequency Modulation Continuous Waveform)

o **Pending issues**

The major pending issues are the system requirements and target parameters. These were scheduled to be completed by the end of week 4, but are still working documents. This is largely due to still working on narrowing down the applications for our system. We also want to get our project plan finalized and published to the website by the end of the week.

o **Individual contributions**

Name	Accomplishments	Hours This Week	Hours Cumulative
Tucker Creger	Handled correspondence with Danfoss, Dr. Wang, Vayyar, NXP, and Omniradar. Started work on the first version of the project plan. Researched the physics of radar and started looking at simulating a radar system in Simulink.	12.75	24.75
Eric Bishop	Continued to look into and study deep learning. Continued to refresh my python skulls. Updated website material, and looked into a better overall look for the site through bootstrap.	9	16.5
Kellen O'Connor	Continued research of physics behind radar. Installed Ubuntu on two computers to experiment with Walabot evaluation kit. Researched TI radar options. Researched TIDL as an option for embedded systems deep learning deployment. Explained deep learning basics to some team members at Monday's meeting.	8.5	13.5
Clayton White	Continued research on deep learning and physics of radar. Introduced research on PCB design using Multisim/Ultiboard which will become useful later in the semester. Team meetings with advisor and client took place.	8	13
Mitch Hagar	Met with Danfoss contact, and Dr. Wang: Learned more about the scope of the project. Studied the basics of Python.	14	19

	Studied the basics of deep learning. Learned how to add files to GitLab. Researched the physics of radars. Discussed implementing a small scale deep learning model on the radar system we currently possess.		
Nihaal Sitaraman	Learned about Python. Continued learning about neural nets. Researched some RADAR physics. Was unsuccessful at getting the 15 antenna kit to work, but was able to get the 3 antenna kit working.	7	12.5

o **Comments and extended discussion**

We will be reporting back on the Walabot radars at the end of the week. We will also be reporting back on meetings with Omniradar and Vayyar.

o **Plan for coming week**

This week we will be meeting with two possible suppliers(Omniradar and Vayyar) for RADAR hardware. We are also going to be working on publishing the project plan. We are finalizing the RADAR, and also testing the capabilities of the Walabot RADAR kit. Kellen will start working on the neural net, and suggested we pair a camera with the RADAR. The camera would be paired with the RADAR to provide capabilities for easier labeling of objects in the radar data by correlating it to the camera data. Tucker is also going to be attempting to simulate a proposed RADAR system in Matlab/Simulink.

o **Summary of weekly advisor meeting**

During our meeting with Dr. Wang we reviewed our progress from the week. Additionally, Dr. Wang stressed to us the importance of understanding the basics of RADAR and developing to a minimal marketable feature so we don't finish the semester without a working prototype.