# EE / CprE / SE 492 – sddec20-proj01
# PROJECT TITLE：Machine learning for pilot biometrics
# Week 1-2 Report

*8/17/2020 – 8/30/2020*
*Client: Rockwell Collins*
*Point of contact: JR Spidell*
*Faculty Advisor: Akhilesh Tyagi*

**Team members:**
Jianhang Liu--Data Manipulation SME
Feng Lin--Hardware SME
Xuewen Jiang --- Camera Interface SME
Xiuyuan Guo --- Algorithm SME
Sicheng Zeng - python SME
Junjie Chen --- C code SME
Sicheng Zeng - Team leader

**Bi-weekly Summary**

For these two weeks, we continue the work for last semester such as improving the algorithm with various techniques like hyper-parameter tuning, quantization, pruning and hardware acceleration. We also need to finish the PCB design and move on to the next stage.

We made some progress with the xilinx toolsuite and decided which framework we would like to choose for our hardware mapping process. We have also started working on quantizing the pruned model to the tf.lite format. Moreover, we are combining the image pre-manipulation with grid search in order to determine the effect of image pre-manipulation on the structure of CNN model.

**Individual Contributions**

Xuewen - We have almost finished the schematic design of our daughter card. Only one of the things is to choose a Tof module, because many parts we want to use are not available to buy. If we decide one of the Tof modules to use then we can move on to the next stage.

Junjie Chen - I have been able to get ‘Vitis AI’ running with some of the machine learning algorithms, as an example, for what we are going to need to deploy to the board. Further down the road.

Feng Lin- Trying to re-do the face detection project which is using DPU to do the inference acceleration. Now I am able to config DPU and set up all the environment variables. However, during the hardware synthesis step, there still something went wrong. After discussing it with our team, we think it might be out of memory.

Sicheng Zeng- During several weeks, I worked on the lucid code to visualize our model. The process is transferring the h5 model to .pb format and importing the pb file to google colab. The visualization process can help our team reduce model memory. And we can detect which layer can reduce. I will continue to reduce model memory next week.

Xiuyuan Guo- During this time, changed our algorithm by changing the hyperparameter of our model model which include use the early stopping to find the best epoch and the learning rate scheduler to find the best learning rate.

Jianhang Liu- For the past two weeks, Issac and I have almost finished the pcb layout for the energy part, mypi camera interface, and ultra96 board interface. The only thing needed to be done is the few traces connections between connector ports and ultra96 board interface components.

| Team Member | Contribution | Hours Worked for the Week | Total Cumulative Hours |
|---|---|---|---|
| Junjie Chen | Built petalinux, ran examples within ‘Vitis Ai’ and DNNDK | 10 h | 55 + 10 = 65h |
| Sicheng Zeng | Transfer the keras open/close eyes code to tensorflow lite and run in an ultra 96 board. Fix several problems about sparsity and frequency number. | 12h | 8+10+12+ 12+12= 54h |
| Xuewen Jiang | Almost finish schematic design; finishing schematic review with the team. | 10h | 10h |

| | | | |
|---|---|---|---|
| Feng Lin | Trying different systems and versions of vivado to see if it works for our practicing face detection project | 6h | 6h |
| Xiuyuan Guo | Change the hyperparameter of the given algorithm and use that to find the best so far to increase the accuracy and decrease latency of algorithm by reduce the layer of the CNN | 10h | 18+10=28 |
| Jianhang Liu | Almost finished the PCB layout design, needs to do the trace connections between connector and ultra 96 board interface. | 7h | 47h |

**Pending Issues**

1. Cannot find more information on buying suitable Tof modules.

**Plans**

1. Finish schematic design.
2. Optimize total latency about the pruned model running on board.