

EE / CprE / SE 491 – sdddec20-proj01

PROJECT TITLE : Machine learning for pilot biometrics

Week 7-8 Report

3/2/2020 – 3/15/2020

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 are working on both the training and inferencing aspect of the project. On the training side, we had some progress in using tensorboard finding the best hyper-parameters, understanding the inner-workings of the CNN. On the inferencing side, we had some success in loading the algorithm to the ultra96v2 board and got our first performance metrics. Moreover, we invested some time in setting up the camera that will be used for feeding pre-manipulated videos to our processor.

Individual Contributions

Xuewen - Waiting for the adapter to arrive and start on the learning for the connection. For camera interface strategy next steps include researching what options exist for cameras with embedded features that will help with image recognition algorithms.

Junjie Chen - I made some progress in setting up the algorithm on both the inferencing and training side of the project. I setted up a skeleton, including k-fold validation on the training side, which is good for hyper-parameter tuning. I also deployed a skeleton on the board that can be modified later on to measure our metrics with respect to our use case.

Feng Lin-run existing algorithm on ultra96 board and find out a complete vivado project online, watch vivado and FPGA relatively video online..

Sicheng Zeng- I work on the prune a neural network in the two week. First, I load the tensorboard on my computer which shows all details about the algorithm. Second, I try to prune a sample code by using the prune method step by step. I got a better algorithm about less memory in the end.

Xiuyuan Guo- During this time, I have used the tensorflow to observe the effect of each hyperparameter to the given algorithm and use tensorflow to make a graph to present to the rest of the team.

Jianhang Liu- I'm responsible for data per-manipulation in this work. This week, I've discovered the image processing tool in Matlab that can apply various kinds of filters and processions on images in order to help increase accuracy and reduce latency of the algorithm.

Team Member	Contribution	Hours Worked for the Week	Total Cumulative Hours
Junjie Chen	Set up vitis, set up ultra96 board with flashed image 'PYNQ'	12 h	31 + 12 = 43h
Sicheng Zeng	Load tensorboard to algorithms. Prune a sample tensorflow algorithm and got less memory.	12h	8+10+12+12=42h
Xuewen Jiang	Finish Camera interface researching for image recognition algorithms, Start learning on the camera interface connection and MIPI working principle.	10h	6 + 15 + 10+10 = 41h
Feng Lin	Play with machine learning algorithms on ultra96 board, learn the layers of camera interface and how ultra96 process data from sensors.	10h	18+10=28h
Xiuyuan Guo	Change the hyperparameter of the given algorithm and use that to find the best so far to increase the accuracy of the algorithm to use the least epoches.	10h	18+10=28

Jianhang Liu	Discovered Image Processing tool in Matlab which can modify input images and help increasing accuracy, reducing latency and system memory usage.	6h	16+10+6=32

Pending Issues

--Keras is likely to produce high latency

--Need a more reliable way to gain speed in referencing process

Plans

1. Run various experiments on board and get metrics
2. Working on integrating camera
3. Improve performance from software perspective(slim down the model)
4. Improve performance from hardware perspective(quantization, hardware acceleration)