

EE / CprE / SE 491 – sdddec20-proj01

PROJECT TITLE : Machine learning for pilot biometrics

Week 5-6 Report

2/17/2020 – 3/1/2020

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 modifying the existing binarized neural work to train our own images. Based on our pre-manipulated images, we are working on reshaping the images to fit the LFC and CNF algorithm. Ultimately, we will adopt the binarized neural network because it can drastically increase our inference speed. Some members of our team had some success in finding the optimized hyper-parameters using various technologies.

Individual Contributions

Xuewen - 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 am responsible for building convolutional neural networks from scratch. So I spent some time building CNN. I had success with basic conv nets with 3 simple layers. I have also participated in BNN existing algorithm adoption process. I set up docker so it saves my time in the future. I also spent some time pre-manipulate the images so it fits in the data format requirement for our binarized neural network.

Feng Lin- for training BNN we are going to test several parameter settings on existing algorithms in order to train our own dataset.

Sicheng Zeng- I work on the prune a neural network research and try to use the method to reduce memory in our openeye code this week. I also make a presentation about what is prune a neural network. I did research and studied pytorch 3d.

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. Also have start to work on the new task of BNN traning

Jianhang Liu- I'm responsible for data per-manipulation in this work. This week, I discovered the edge detection function in Matlab which can detect the edge of input images with specific filters. Besides, I studied some other functions in image processing sections of Matlab.

Team Member	Contribution	Hours Worked for the Week	Total Cumulative Hours
Junjie Chen	Set up vitis, set up ultra96 board with flashed image 'PYNQ'	13 h	18 + 13 = 31h
Sicheng Zeng	prune a neural network research, a powerpoint about prune, learn about pytorch 3d, use the prune function in openeye code.	12h	8+10+12=30h
Xuwen Jiang	Camera interface researching for image recognition algorithms	10h	6 + 15 + 10 = 31h
Feng Lin	Test BNN on board and set up BNN training environment, learn how to train model with our own dataset	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	Practice using Matlab to do the edge detection of input images with different filters, also played with some other image processing functions in Matlab.	10h	16+10=26
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Pending Issues

--need to dig deep into the BNN adoption process, some images are not formatted correctly
--still trading BNN as black box, which limits our ability to debug and customize

Plans

1. Adopt BNN algorithm to correctly classify our own images
2. Deploy the modified BNN to the ULTRA96 board
3. Connect the board to a camera and start inferencing