

EE/CprE/SE 491

HAML: Heterogeneous Computing for Machine Learning Algorithms

Week 9 Report

3/19/24 - 3/25/24

Faculty Advisor : Phillip Jones

Client : JR Spidell

Team Members:

Jonathan Tan	- DPU Management, Kria Board Manager
Josh Czarniak	- Pupil Center Location Algorithm, Meeting Leader of the Week
Justin Wenzel	- Blink/No-Blink Algorithm
Kai Heng Gan	- OpenCV
Santiago Campoverde	- Data Profile/Model Analytics

Summary for Progress This Week

This week's objectives were to start working towards completing the "4-week plan." This included figuring out setting up skeleton code and GitHub repo, figuring out dataflow, modifying previous team's code, recompiling ML model files (because the existing one is in an incompatible format), research into preprocessing techniques, and looking into profiling techniques using the VART library.

This Week's Individual Contributions

- Justin
 - Worked on converting .h5 model to xmodel, many configuration issues existed during conversion which resulted in new approaches in achieving the xmodel format required.
 - Wanted to create xmodel using .h5 model file for a new xmodel and build skills and understanding in the models, instead used past groups xmodel due to conversion issues.
 - Wrote out the pseudocode to be implemented in blink_algo.c to run a single frame inference on the Kria board.
- Jonathan
 - Found hardware mutex on the Zynq Ultrascale+ MPSoCs and how to use them.
 - Set up skeleton code and GitHub repo.
 - (On-going) Coordinated with Kai, Josh, and Justin to figure out proper dataflow of the system.
- Josh
 - Researched further on pupil tracking
 - Looked up online and from previous teams code how it can be done
 - Started to work on previous team's code
 - Focusing on removing the need to use the RPU
 - What section of the main.cc code is related to pupil tracking
 - How the code relates to the hardware.
- Kai
 - Worked on the semantic segmentation machine learning model for image pre-processing. (Con't)
 - (Con't) Set up the environment (found out lack of CUDA toolkit)
 - Debug the machine learning model
- Santiago
 - Investigated board build to see if profiler dependencies are included
 - Set personal Linux environment to test Yocto profiler

Team Member	This Week's Task	Completion Date	Hours Took	This Week's Hours	Total Project Hours
Justin Wenzel	Attended meetings	NA	3	10	47
	Achieved the xmodel format for the blink model to run on the Kria board.	3/23	2		
	Wrote the pseudocode for the program that will be implemented in blink_algo.c to run inferences on the Kria board	3/22	2		
Jonathan Tan	Attended meetings	NA	3	5	47
	Looked into hardware mutex on Zynq Ultrascale+.	3/23	1		
	Set up GitHub skeleton code	3/20	1		

Josh Czarniak	Attended meetings	NA	3	10	37
	Continue to look at previous team's code	3/27	3		
	Continued work on the previous team's code	3/28	4		
Kai Heng Gan	Attended meetings	NA	2	11	51.5
	Worked on the semantic segmentation machine learning model for image pre-processing.	Ongoing	9		
	Researched on the image segmentation technique. Set up the environment and debug the image segmentation code.				
Santiago Campoverde	Attended meetings	NA	3	7	44
	Investigated board build to see if profiler dependencies are included	3/23	2		
	Set personal Linux environment to test Yocto profiler	Ongoing	1		
	Investigated GMIO ports	3/23	1		

Note: 1. This is per week hours, Σ "hours taken" = "week hours". 2. Due to multiple meeting times, meetings' "completion date" are "NA".

Plans for Coming Week

Team Member	Plans for Coming Week	Planned Completion	Planned Hours Required
Justin Wenzel	Continue four week plan, by fully implementing blink_algo.c and running a complete inference and tests on Kria board, working with Jonathan to set up blink_algo.c with main.c.	3/31	3
	Create low level bounce diagram for blink_algo thread, for documentation and understanding among group.	3/31	2
Jonathan Tan	Coordinate with Kai, Justin, and Josh to figure out dataflow of in main().	4/6	1
	Code out the dataflow once has info from teammate.	4/6	5
Josh Czarniak	Lead this weeks meetings	3/25-3/30	5
	Work more on the previous teams code	3/27	4
	Understand more of the main.cc code from the previous teams to reduce RPU usage	3/26	3

Kai Heng Gan	Continue research on the image segmentation technique. Set up the environment and debug the image segmentation code.	3/30	7
	Continue work on taking some images into image pre-processing process and analyze the result	Ongoing	4
Santiago Campoverde	Test profiling and tracing environments	3/30	2
	Set up necessary profiling tools on the board	3/30	3