

EE/CprE/SE 491

HAML: Heterogeneous and Accelerated Computing for Machine Learning

Week 11 Report

4/2/24 - 4/8/24

Faculty Advisor : Phillip Jones

Client : JR Spidell

Team Members:

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

Summary for Progress This Week

This week's objectives were to continue working towards completing the "4-week plan." This included implementing the ability to run inferences on the board and debug multiple other programs constructed by the team for adjustments. The debugging created new insight the group will research and find a solution before the next implementation session to finish the "4-week plan" for its final week. Utilizing different profiling techniques using the VART library to monitor the system performance and how monitor the mean square error of neural networks operating on the Kria board environment.

Major development this week is that our team successfully implemented the eye-tracking model into our main program, we also identified issues with the blink model, which we are working to correct, test, and integrate into the main program as well. We are also working on training an image pre-processing model. Finally, in terms of profiling, we are working on determining the dependencies of the VART libraries.

This Week's Individual Contributions

- Justin
 - Continued four-week plan, by meeting with group members to begin running inference tests on the Kria board, to integrate `blink_algo.cc` into `main()`, found issues that need addressed before further implementation.
 - Xmodel for blink inference is not compiled for current DPU architecture and must be recompiled to match.
 - Blink needs a different pre-processing approach compared to eye tracking inference.
 - Researched into different memory isolation techniques that will be outlined in a presentation to share each technique with group members to further understanding and implementation ideas.
- Jonathan

- Work with Justin to try running the blink model on the board.
- Rewrite Makefile to compile and link project code with required libraries.
- Added some bootstrap styles to team website.
- Do Vitis AI tutorials to familiar myself with the SDK.
- Josh
 - Met with Justin to get guidance on separating pupil tracking from the main code
 - Met with team to implement the first code into the board
 - Finished pupil tracking code for the 4-week plan but, didn't get to implement the xmodel yet.
- Kai
 - Modified the image segmentation code
 - Able to run the training sequence with CPU instead of GPU
 - Tried to figure out which part of the code worked out image segmentation and image labeling
- Santiago
 - Got Vaitrace tools set up on the board
 - Determined necessary steps to fully set up all profiling functionality
 - (On-going) Set up necessary profiling tools on the board

Team Member	This Week's Task	Completion Date	Hours Took	This Week's Hours	Total Project Hours
Justin Wenzel	Attended meetings	NA	3	11	68
	Met with group members to begin running inference tests on the Kria board using blink_algo.cc, and integrate program into main.cc.	4/6	5		
	Researched memory isolation techniques the group could use to isolate memory for threads and data on the Kria board.	4/4	3		
Jonathan Tan	Attended meetings	NA	3	16	68
	Workday (to test blink model and algorithm w/ Justin)	4/6	4		
	Rewrite Makefile to compile and link project code with required libraries.	4/7	2		
	Team website.	4/5	1		
	Vitis AI tutorial.	4/8	6		
Josh Czarniak	Attended meetings	NA	3	9	63
	Met with Justin	4/5	1		

	Met with group to test blink algorithm on the board	4/6	3		
	Made the pupil tracking code separate from main	4/6	2		
Kai Heng Gan	Attended meetings	NA	3	8	76.5
	Modified the image segmentation code (Use CPU to run training sequence)	4/13	5		
	Tried to figure out which part of the code worked out image segmentation and image labeling				
Santiago Campoverde	Attended meetings	NA	3	7	56
	Got Vaitrace tools set up on the board	4/6	2		
	Determined necessary steps to fully set up all profiling functionality	4/6	2		

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	Recompile xmodel for blink inference, using Vitis AI. Document process for group incase recompiling is needed again.	4/9	3
	Implement and test blink model using different pre-processing and output processing operations. Including testing different inputs and formats.	4/10	7
	Create a presentation to share different memory isolation techniques the group could use to isolate memory for threads and data on the Kria board.	4/11	3
Jonathan Tan	Continue working with other teammates to integrate components into main().	4/13	5
	Start working on program to be run on PC that runs the same ML model, to be used as a benchmark for accuracy when running models on board.	4/13	5
Josh Czarniak	Work on xmodel for the pupil tracking	4/12	3
	Make a bounce diagram for the pupil tracking algo	4/11	2

	Identify input and output for pupil tracking algo	4/13	3
Kai Heng Gan	Modify code to output a black & white segmented images	4/13	7
	Continue work on taking some images into image pre-processing process and analyze the result	Ongoing	4
Santiago Campoverde	Adding or setting up XRT on the board	4/12	2
	Running Vitis Analyzer with xclbin.ex.run_summary	4/12	1
	Measure latency of softmax function	4/13	1