

EE/CprE/SE 492

HAML: Heterogeneous and Accelerated Computing for Machine Learning

Semester 2 Week 11-12 Report

11/1/24 - 11/14/24

Faculty Advisor Phillip Jones

Client JR Spidell

Team Members:

Jonathan Tan	- Memory Affinity, Kria Board Manager
Josh Czarniak	- DPU Control Developer
Justin Wenzel	- Multi-threaded Developer
Kai Heng Gan	- Image Processing/Semantic Segmentation Developer
Santiago Campoverde	- Model Analytics

Summary for Progress These Two Weeks

Over the past two weeks, we successfully deployed and tested both the blink and semantic segmentation models, receiving the accurate results from both models. We profiled the multithreaded application to identify and optimize time-consuming sections, implementing timing analysis, ensuring proper data cleanup, and fixing termination-related bugs. We verified that we achieved client timing requirement of a throughput of 40ms. We are still attempting to retrieve accurate results from the eye-tracking model. We started working on the design document and final presentation slides deck.

These Two Weeks' Individual Contributions

- Justin
 - Debugged the segmentation faults and runtime errors in the multi-threaded program and achieved the models running in parallel on our Kria board.
 - Involved ensuring no null pointers occurring or memory being overwritten or lost in-between function calls.
 - Debugged blink detection model input to improve accuracy to match original model performance.
 - Began updating and outlining new program diagrams and flow diagrams.
 - Worked with Kai to begin exploring the eye tracking model and improving the accuracy of the model.
- Jonathan
 - Wrote timing code for the multi-threaded program to perform timing analysis, and sanity check that it works.
 - Ensure proper data clean-up in the multi-threaded program, and fixed bugs related to program termination.

- Continue working on debugging issue with representative in Xilinx forum regarding creating DPU using Vitis flow, no luck, decided to pause the effort to get to the bottom of the error when running vaitrace profiler.
- Work on creating graphics/powerpoint for use in lightning talk, final industry panel presentation, and poster.
- Josh
 - Made Dpu bounce diagram based on DPU implementation
 - Issue occurred while testing system
 - Communicated with Justin about errors coming from the DPU
 - Adjusted DPU code to return a struct rather than a runner which was causing the errors
- Kai
 - Worked on the semantic segmentation cpp code by deploying the xmodel
 - Successfully retrieve the segmented result from the xmodel
 - Sent the results getting from the semantic segmentation xmodel to Santi for accuracy test.
 - Got the accuracy of 98.4273%
 - Wrote simple profiling tools to record each function processing time.
 - Worked with Justin to retrieve accurate result from the eye tracking model.
 - Ran the floating-point model that given by the client and got inaccurate result.
 - Waiting for our client to send us the test and train dataset for the eye tracking model.
- Santiago
 - Finished Blink algorithm accuracy test script
 - Finished all test method specific computations, tested with Ground Data only
 - Started working on Eye Tracking accuracy test script
 - Tested the semantic segmentation pc vs board model sets
 - Results matched with little to no difference
 - Began developing a presentation on outstanding outliers results in the semantic segmentation

Team Member	These Two Weeks' Task	Completion Date	Hours Took	These Two Weeks' Hours	Total Project Hours
Justin Wenzel	Attended meetings	NA	7	36	194
	Debugged segmentation and runtime errors in multi-threaded program	11/2	12		
	Debugged blink detection input for accuracy	11/11-11/12	8		

	Program diagram work	11/9-11/10	5		
	Work with Kai on eye tracking model performance	On-going	4		
Jonathan Tan	Attended meetings	NA	6	14	185.5
	Change Vivado flow to Vitis flow	11/11	3		
	Worked on timing analysis	11/5	3		
	Work on graphics and PPT	On-going	2		
Josh Czarniak	Attended meetings	NA	1	7	121
	Made bounce diagram of DPU	11/2	2		
	Worked on changing what the DPU function returns	11/9	4		
Kai Heng Gan	Attended meetings	NA	5	19	187
	Worked on the semantic segmentation cpp code by deploying the xmodel and validated the output of the SS xmodel	10/13	9		
	Wrote simple profiling tools to record each function processing time.	10/13	1		
	Worked with Justin to retrieve accurate result from the eye tracking model.	On-going	4		
Santiago Campoverde	Attended meetings	NA	3	10	113
	Finished Blink algorithm accuracy test script	11/3	3		
	Started working on Eye Tracking accuracy test script	11/6	2		
	Tested the semantic segmentation pc vs board model sets	11/10	1		
	Began developing a presentation on outstanding outliers results in the semantic segmentation	11/12	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 Two Weeks

Team Member	Plans for Coming Week	Planned Completion	Planned Hours Required
Justin Wenzel	Implement semantic segmentation model execution into the multi-threaded program	11/15-11/17	8
	Continue program diagrams and flow diagrams	11/20	4
	Continue working on eye tracking with Kai	On-going	6
	Work on accuracy results with Santi	11/15-11/20	2
Jonathan Tan	Memory analysis	11/19	2
	Continue work on final presentation and poster	12/11	7
	Try a system with 2 DPU to allow parallel DPU exec	11/20	10
Josh Czarniak	Fix errors in the DPU code	11/16	5
	Meet with Justin to talk about results	11/17	1
Kai Heng Gan	Continue work with Justin to retrieve accurate result from the eye tracking model.	On-going	10
	Connect with another team from UOI on optimizing the semantic segmentation model.	NA	10
Santiago Campoverde	Finish Eye tracking testing script	11/16	2
	Test algorithms with actual datasets and provide feedback	On-going	3
	Create a slide deck on outstanding outliers results	11/17	2