

# Taylor Lloyd

SOFTWARE DEVELOPER · COMPUTER SCIENTIST

Seattle, Washington

☎ (+1) 206 861-9523 | ✉ [taylor@taylorlloyd.ca](mailto:taylor@taylorlloyd.ca) | 🌐 [taylorlloyd](https://taylorlloyd.com) | 📄 [taylor-lloyd](#)

## Work Experience

### Cruise, Kernels Optimization and Performance

Seattle, Washington, USA

STAFF SOFTWARE ENGINEER

May '23 - Present

- Implemented and benchmarked optimized implementations of MLIR operators in OpenCL, CPU/Highway, and CUDA
- Collaborated on next-generation accelerator software strategy, performing experiments and working with Perception, Hardware, and Runtime teams to fit algorithms and ML models to our future accelerator designs
- Implemented Pytorch operator that wraps an elementwise function and executes it CUDA, CPU, or OpenCL, unblocking model deployment
- Worked with a third-party vendor to improve OpenCL code generation and expose hardware intrinsics, improving throughput over 30%
- Implemented clangd code completion for CUDA, OpenCL, and DSP sources and collaborated with build team to deploy across Cruise
- Implemented proof-of-concept DSP toolchain in Bazel, and worked with vendor to enable DSP compilation in remote Bazel environment

### Google, gChips Software Experiences

Seattle, Washington, USA

SENIOR SOFTWARE ENGINEER TEAM LEAD/MANAGER (TL/M)

Feb '22 - May '23

- Prototyped efficient camera algorithms accelerated across GPU, TPU, and DSP for Pixel 7 and future devices
- Performed silicon and simulation experiments to drive hardware requirements for future Pixel devices
- Developed OCLTrace - Tooling for linking GPU activity to detailed traces, to diagnose performance opportunities in OpenCL code
- Hired and managed a small team of engineers to investigate silicon requirements for future health use-cases

### Amazon.com, Robotics - Industrial Internet of Things (IIoT)

Seattle, Washington, USA

SOFTWARE DEVELOPMENT ENGINEER II

May '19 - Feb '22

- Designed and implemented a DSP and GPU-accelerated image processing pipeline for mobile SoCs.
- Designed and implemented a serverless corporate device management solution using AWS IoT and Lambda.
- Designed and implemented Android OS modifications to expose custom hardware peripherals.
- Implemented a realtime projected-light augmented reality system for sortation use-cases.
- Mentored teammates and interns through work review and weekly 1-on-1s

### Amazon.com, Alexa for Business

Seattle, Washington, USA

SOFTWARE DEVELOPMENT ENGINEER I

May '18 - May '19

- Designed and implemented Polycom video conferencing integration with Alexa for Business.
- Implemented Full-CD pipeline and policies for team, including testing requirements and automated deployments.

### IBM Canada, Compilers Group / Cloud Innovation Lab

Toronto, Ontario, Canada

CAS STUDENT FELLOW / Co-OP SOFTWARE DEVELOPER

Dec. '15 - May '16, May '14 - June '15

- Implemented GPU data transfer for OpenMP 4.5 in the XL compiler.
- Prototyped and shipped novel GPU loop optimizations, speeding GPU execution by 25%.
- Developed a functional programming language (IBM Dash) and compiler for GPU execution. Wrote language specifications, compiler optimizations, and language runtime extensions.
- Implemented automated testing and continuous deployment on projects across the team with GitLab and Jenkins.

## Skills

### Programming Languages

C/C++, Java, OpenCL, CUDA, Python

### Platforms & Frameworks

LLVM/Clang, OpenMP, OpenCL, Android, Linux,

MLIR, AWS Lambda, AWS IoT

### Areas of Interest

Heterogeneous Computing, Mobile Development,

GPU Acceleration, Performance Optimization,

Compiler Optimizations

## Education

### M.Sc. Computing Science

UNIVERSITY OF ALBERTA

- Specialization in Compiler Optimizations for GPU Computing
- GPA 4.0/4.0

### B.Sc. Specialization in Computing Science

UNIVERSITY OF ALBERTA

- GPA 3.6/4.0

## Projects

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### GPUCheck

STATIC GPU PERFORMANCE ANALYSIS

GPUCheck detects GPU performance problems like non-coalescable memory accesses and divergent branches through LLVM analysis. GPUCheck improves benchmark performance up to 25%, and can be integrated into the build process of any GPU executable compiled using LLVM.

### Wedding RFID

TRACKING/GUIDANCE FOR GUESTS

Guests are issued an RFID tag, used at terminals throughout the event. Tags are tied to guests by web API, while touchscreens and RFID sensors allow interaction. The terminals allow sign-in, direct guests to seats, and track engagement.

## Publications & Presentations

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### Efficient Parallel Barcode Subpixel Alignment

US PATENT US11188727B1

Nov '19



### Memory-access-aware Safety and Profitability Analysis for Transformation of Accelerator-bound OpenMP Loops

ACM TRANSACTIONS ON ARCHITECTURE AND CODE OPTIMIZATION - ACO

July '19



### Program Analysis and Compiler Transformations for Computational Accelerators

UNIVERSITY OF ALBERTA MASTER'S THESIS

[Edmonton, Alberta, Canada](#)

May '18



### GPUCheck: Detecting CUDA Thread Divergence with Static Analysis

EDUCATION & RESEARCH ARCHIVE - ERA

March '18



### Automated GPU Grid Geometry Selection for OpenMP Kernels

WORKSHOP ON APPLICATIONS FOR MULTI-CORE ARCHITECTURES - WAMCA

[Lyon, France](#)

Sept '18



### Run-Length Base-Delta Encoding for High-Speed Compression

INTERNATIONAL CONFERENCE ON PARALLEL PROCESSING - ICPP

[Eugene, Oregon, USA](#)

Aug '18



### Divergence and Arithmetic Control Form: Analyzing GPU Applications

16TH COMPILER-DRIVEN PERFORMANCE WORKSHOP - CASCON

[Markham, Ontario, Canada](#)

Nov '17



### Run-length base-delta encoding for high-speed compression

US PATENT US11070230B2

Nov '17



### A Case for Better Integration of Host and Target Compilation When Using OpenCL for FPGAs

FPGAs FOR SOFTWARE PROGRAMMERS - FSP

[Ghent, Belgium](#)

Sept '17



### GPGPU Offloading with OpenMP 4.5 in the IBM XL Compiler

15TH COMPILER-DRIVEN PERFORMANCE WORKSHOP - CASCON

[Markham, Ontario, Canada](#)

Nov '16



### Minimizing execution time of a compute workload based on adaptive complexity estimation

US PATENT US10389800B2

Oct '16



### Modern analytics with the IBM Dash Compiler

13TH COMPILER-DRIVEN PERFORMANCE WORKSHOP - CASCON

[Markham, Ontario, Canada](#)

Nov '14

## Honors & Awards

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2018 **Outstanding Thesis Award - Runner-up**, University of Alberta

[Edmonton, AB](#)

2017 **Queen Elizabeth II Graduate Scholarship - Master's Level**, University of Alberta

[Edmonton, AB](#)

2013 **Undergraduate Student Research Award(USRA)**, NSERC

[Edmonton, AB](#)

2013 **Amdahl Academic Scholarship in Computing Science**, University of Alberta

[Edmonton, AB](#)

2011, 2012 **Jason Lang Academic Excellence**, University of Alberta

[Edmonton, AB](#)

2009 **First Place - Iverson Computing Science Exam**, University of Alberta

[Edmonton, AB](#)