Cade Brown

Software Developer • Mathematician • Digital Artist

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Experience

NVIDIA | Machine Learning Compiler Research Intern
2022 (Summer) | Knoxville, TN, US

- **Improved performance of GPU codegen** for training and inference of Machine Learning (ML) models, as a backend for **MLIR/XLA/PyTorch**.
- **Developed polyhedral compilers** to improve code generation (matmul, conv2d), using geometric interpretations of source code.
- **Trained ML models** to optimize other ML models' training and inference using performance data for GPU kernels.

Innovative Computing Laboratory | Research Assistant (HPC)
2019 – Present | Knoxville, TN, US

- **Created an ML dataset** for ORNL's Data Challenge: **cade.site/smcefr**
- **Developed GPU supercomputing math libraries** for accelerating scientific applications at exa-flop-scale.
- **Ported and performance-tuned** the MAGMA linear algebra library for new AMD GPU hardware, aimed at the ORNL Frontier HPC system.
- **Improved performance** 60x faster for certain BLAS, 73% faster for Eigenvalue problems. **Published @ IEEE HPEC**: **cade.site/paper0**

PAIRS @ UTK | Research Assistant (HCI)
2021 - 2022 | Knoxville, TN, US

- **Implemented a research prototype** of Avocat, an automated error solver for the terminal that improves developer efficiency.
- **Developed scalable data-driven source code insights** for WorldSyntaxTree, a terabyte-scale graph database.

Leadership Computing Facility @ ORNL | Research Intern
2017 – 2018 | Oak Ridge, TN, US

- **Used CUDA, MPI, and SDL** to build a realtime distributed fractal rendering application/simulation: **cade.site/fractalvideo**
- **Programmed the NVIDIA Jetson platform** to divide and distribute the workload between 8 nodes (CPU & GPU) over a local network.
- **Used Jekyll, HTML, and GitHub** to build: **simplesummit.github.io**

Projects

- **kscript, a dynamic programming language** that I wrote from scratch, check it out: **term.kscript.org** (online REPL)
- **CARVE, an online RISC-V IDE** with an editor, debugger, and memory explorer: **carve.chemicaldevelopment.us**
- **My digital art** which is often ML/AI-generated: **cade.site/art**

My Content

- ➔ **lwn.net/Articles/833624**
- ➔ **cade.site/archive**
- ➔ **docs.kscript.org**

My Code

- ➔ **cade.site/timeline**
- ➔ **github.com/cadebrown**
- ➔ **kscript.org**

Skills

Software

Languages
C/C++ • C# (Mono) • Python
JavaScript • WebAssembly

Frameworks
CUDA • HIP/ROCm • OpenCL
OpenMP • MPI • pthreads
LLVM • Emscripten • ReactJS

Machine Learning
Tensorflow • PyTorch • TinyML

Graphics
OpenGL • WebGL • WebGPU
MatPlotLib • QT+PyQT • Unity3D

Misc
LaTeX • Blender3D • Jekyll

Education

University of Tennessee
B.S. Computer Science
Minor: Philosophy
2019 - 2023* | Knoxville, TN, US