Marisa Kirisame

Email | Website | GitHub

Education

University of Utah, PhD in CS *2020 –*
University of Washington, Master in CS *2019 – 2020*
University of Washington, Bachelor in CS *2015 – 2019*

Projects

Spineless Traversal

Implemented an incremental computation algorithm that beats SOTA web layout by 3.23×.

- Novel incremental attribute grammar algorithm that reduces cache misses
- Staged compilation DSL; compiler in OCaml, output high-performance C++
- Complex data structure (order maintenance, priority queue)
- Custom allocator, hand-written assembly, cmov to reduce branch prediction, rdtsc for measurement

Kirisame et al. "Spineless Traversal for Layout Invalidation", submitted to PLDI 2024, at ArXiv.

MemBalancer

Reduced garbage collection time by 30% for V8, the JavaScript engine behind Chrome.

- Optimal formula for heap sizing with Calculus and Lagrange Multipliers
- Control theory to smooth input signal and set heap limit to optimal value from the formula
- Implementation utilizes concurrent programming and garbage collection knowledge

Kirisame, et al. "Optimal Heap Limits for Reducing Browser Memory Use." In *OOPSLA*, 2022

DTR

Enabled PyTorch Neural Networks to be trained using as little as 20% of the original memory budget.

- Cache system evicts tensors to save memory when OOM; recomputing them back when needed
- Choose the stalest, largest, cheapest to recompute tensor to evict, and avoid evicting long chain
- Cache policy saves large memory with small time overhead; in practice closed to optimal policy
- Work with engineers at Megengine and Oneflow to get it adopted in the industry

Kirisame, et al. "Dynamic Tensor Rematerialization." In *ICLR*, 2021

TVM

Contributed to the design of Relay, a higher order, differentiable IR.

- Top 20 contributor to high performance ML compiler-runtime
- Implemented Algebraic Data Types, Automatic Differentiation, Ahead-Of-Time Compiler
- Use Partial Evaluator, and Continuation Passing Style Transform to reduce AD overhead

Skills

Expertise: Incremental Computing | Compiler | Garbage Collection | Program Analysis | ML System | Proof Assistant | Functional Programming | SMT Solver | Computer Architecture | Operating System
Programming Languages: Assembly | C | C++ | Coq | Haskell | OCaml | Python | Scala | Verilog
Languages: English | Mandarin | Cantonese