Kelly Shiptoski

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https://github.com/krs85/
https://krs85.github.io/

Statement

I am a systems programmer with knowledge in and experience with low-level systems development, the Linux programming interface, and the programming languages Rust, C++, and C.

Education

University of Pennsylvania, 2017 - June 2023 (expected)
Ph.D. in Computer Science, advised by Joseph Devietti
M.S. in Computer Science (completed in 2019)

Drexel University, 2012-2017
B.S. in Computer Science & B.A. in Mathematics

Experience

VMware Research Group / Research Intern
Summer 2020

- Developed expertise with distributed systems and incremental computation to inform the design of a distributed API for Differential Datalog, an incremental computing language modeled on differential dataflow.
- Adapted the APIs of the Differential Datalog language engine to utilize the observer pattern, allowing for dynamic reconfiguration of nodes within the network and providing robust fault tolerance.
- Implemented integration and unit tests to maintain backward compatibility and ensure correctness of new features.

Clarivate / Software Engineering Intern
April 2016 - August 2017

- Improved skills with SQL and Java in order to implement new features and interfaces to enhance metric reporting for the Web of Science, a publisher-independent global citation database.
- Incorporated agile software development tools to aid in reporting of team progress and issues.
- Maintained and updated unit and integration tests for new features to ensure smooth integration with the core development pathway.

Bentley Systems / Software Engineering Intern
April 2015 - September 2015

- Broadened the complexity of the design of the user database schema creation application, enhancing the breadth of data analytics provided by the application.

- ❖ Cultivated expertise with Windows WPF and WinForms (.NET) application development and C# in order to implement high quality features.
- ❖ Expanded the testing suite of unit tests and integration tests.

Independence Blue Cross / Software Engineering Intern
April 2014 - September 2014

- ❖ Developed knowledge of SAS and SQL to write efficient queries against large databases.
- ❖ Utilized advanced analytics, data integration, statistical reporting, and data modeling to enhance a comprehensive healthcare data system.
- ❖ Implemented solutions to support analytical applications, business systems analysis, and predictive modeling.

Skills

Experienced: Rust, C, C++, Linux Systems Programming, Git

Familiar: Docker, Java, C#

Research Projects

Process Cache: a system for automatic caching of arbitrary Linux programs at the process level.

- ❖ Cultivated an in-depth knowledge of the Rust language, including asynchronous runtime and future-based design, integration tests infrastructure, and design patterns for safe mutability across async tasks.
- ❖ Conceptualized all milestones with task breakdowns and clear goals, paying special attention to project scope.
- ❖ Coordinated and led weekly meetings: topics included project design and scope, short-term and long-term milestones, and any major issues on the critical path of implementation.
- ❖ Researched real-world systems across many disciplines to construct a realistic benchmark suite to analyze speed and space performance and verify correctness of the system.
- ❖ Managed and mentored a masters student in the following capacities: interviewing and onboarding, pair programming sessions, mentoring in design, systems programming, Rust, coordinating and reviewing pull requests.

Reproducible Containers: a container abstraction for Linux which guarantees reproducibility of unmodified Linux programs run through it.

- ❖ Developed skills with C++, the Linux system call interface and process scheduling paradigms to inform a design for a faster container scheduler.
- ❖ Redesigned the preliminary, sluggish sequential scheduler to allow for parallel execution of processes in system-call-free regions, reducing the overhead of compute-bound workflows to 2%.
- ❖ Implemented a parallel scheduler based upon priority queues, ensuring fairness while also eliminating the risk of deadlock.

Publications

- *ProcessCache: Automatic Memoization for Linux Processes*
  Kelly Shiptoski, Omar S. Navarro Leija, Pranoti Dhamal, Ryan Newton, and Joseph Devietti
  Symposium on Operating Systems Design and Implementation *(OSDI '23, Under Review)*

- *Reproducible Containers*
  Omar S. Navarro Leija, Kelly Shiptoski, Ryan Scott, Ryan Newton, and Joseph Devietti
  International Conference on Architectural Support for Programming Languages and Operating Systems *(ASPLOS '20)*