Jeffrey Helt

jhelt@cs.princeton.edu
www.jeffreyhelt.com

- 6+ years of experience designing and building fault-tolerant distributed systems and databases.
- Other experience: 3 years as full-stack SWE; scalable blockchain systems; network function modeling and synthesis; instructor of record for introductory systems course; course experience in ML and CV; research mentoring experience.
- Interested in distributed systems, databases, computer networks, secure systems, and ML systems.

Projects & Experience

Princeton University | ***Assistant Researcher*** Sep. 2018 – Feb. 2024

- Designed C5, the first database backup replication system to provide bounded replication lag.
  - Impact: Led to deployment of new MyRocks replication scheduler at Meta, which reduced maximum observed lag from about two hours to seconds and eradicated issues caused by excessive replication lag.
  - Contributions: Proved existing primary-backup schemes susceptible to unbounded lag from locking granularity mismatch on primary and backup. C5 guarantees bounded lag by ensuring backup's granularity always matches primary's.
  - Implemented C5-MyRocks in about 500 lines of C++ to fix lag at Meta and C5-Cicada, a highly optimized and parallel prototype, in about 5K lines of C++, demonstrating C5 helps state-of-the-art, in-memory databases.
  - Paper published in top-tier database conference, VLDB 2023.
- Designed Spanner-RSS, a new distributed concurrency control protocol offering lower read latency than Google's Spanner.
  - Impact: Reduced tail read-only transaction latency by about 50% (with same read-write latency) in experimental settings.
  - Contributions: Developed new consistency model to provide same simple API as strict serializability while relaxing system constraints on reads. Re-designed Spanner's protocol to leverage relaxed constraints and improve tail latency.
  - Implemented research prototype in about 5K lines of C++.
  - Paper published in top-tier systems conference, SOSP 2020.

Google | ***Intern - Scalable Blockchain System*** Jul. 2023 – Oct. 2023

- Designed scalable state certification service as part of a new, elastically scalable blockchain.
  - Impact: Demonstrated state certification can scale to nearly 1M writes per second, 50-100X more than existing chains.
  - Contributions: Leveraged recent advances in homomorphic, cryptographic hash functions for parallel hash computation of blockchain state, enabling verifiable checkpointing and recovery. Distributed hash computation across workers, enabling elastic scalability. Leveraged Merkle trees for verifiable proofs of transaction execution and finality.
  - Implemented initial version of certification service in about 7K lines of production-ready C++.

Squarespace | ***Full-Stack Software Engineer*** Mar. 2014 – Jun. 2016

- Helped design and build new features including subscription management system, marketing campaign data visualizer, third-party image library manager, and simplified authentication flow.

Goldman Sachs | ***FICC Technology Analyst*** Jun. 2013 – Mar. 2014

- Worked with quantitative strategists to improve FICC pricing models and algorithmic trading applications.

Technical Skills

Programming Languages: Proficient: C/C++, Python, Java; Prior Experience: JavaScript, SQL, Verilog
Tools: Linux, performance profiling (perf, pprof), command scripting (bash), version control (git, hg), visualization (R)

Education

Doctor of Philosophy | ***Computer Science*** Jan. 2020 – Feb. 2024
Master of Arts | ***Computer Science (GPA: 3.9)*** Sep. 2018 – Jan. 2020
Princeton University | Advisor: Wyatt Lloyd Princeton, NJ

- Relevant Coursework: Advanced Computer Systems, Computer Architecture, Theoretical ML
- Awards & Honors: Dr. Ilian L. Mihov '96 Graduate Fellowship, Graduate Student Teaching Assistant Award

Master of Science | ***Computer Science (GPA: 4.0)*** Sep. 2016 – May 2018
Carnegie Mellon University | Advisors: Srini Seshan & Vyas Sekar Pittsburgh, PA

- Relevant Coursework: Advanced OS & Distributed Systems, Computer Networks, Graduate Intro. to ML
- Awards & Honors: Siebel Scholar, NDSEG Fellowship Alternate

Bachelor of Arts | ***Computer Science, Economics (GPA: 3.7)*** Sep. 2009 – May 2013
Amherst College Amherst, MA

Other Publications

Multi-Dispatch Linearizability Liberates Applications for Lower Latency In submission
Anja Kalaba, **Jeffrey Helt**, Amit Levy, Wyatt Lloyd

Accelerating Skewed Workloads with Performance Multipliers in the TurboDB Distributed Database NSDI 2024
Jennifer Lam, **Jeffrey Helt**, Wyatt Lloyd, Haonan Lu

Morty: Scaling Concurrency Control with Re-Execution EuroSys 2023
Matthew Burke, Florian Suri-Payer, **Jeffrey Helt**, Lorenzo Alvisi, Natacha Crooks

Alembic: Automated Model Inference for Stateful Network Functions NSDI 2019
Soo-Jin Moon, **Jeffrey Helt**, Yifei Yuan, Yves Bieri, Sujata Banerjee, Vyas Sekar, Wenfei Wu, Mihalis Yannakakis, Ying Zhang