Allan Henriques

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Education

University of Toronto – Honours Bachelor of Science in Computer Science and Mathematics Expected 2026

- CGPA: 3.71/4.00, Dean's List Scholar
- Relevant Coursework: Operating Systems, **Distributed Systems**, **Software Engineering**, **Algorithms**, **Formal Methods**

Experience

Potential Potato Research at U of T under Lisa Zhang

- Designed and implemented a dependently-typed functional programming language extending the Pie language, aimed at **formal proof construction and verification** through code synthesis.
- Developed advanced language features including **recursive total functions**, **expressive pattern matching**, and hierarchical universe types, significantly enhancing the language's logical expressiveness.
- Built a sophisticated **bidirectional type-checker** and **normalization engine**, enabling **automated proof verification** and reducing human error in mathematical validations.
- Demonstrated practical applications of **dependent type theory**

Teaching Assistant at University of Toronto 2022-2024

- Taught the following: Algorithm Design and Complexity, Data Structures and Analysis of Algorithms, Introduction to the Theory of Computation, Introduction to Computer Programming, Linear Algebra, Calculus I
- Developed and evaluated midterms and assignments, demonstrating a strong grasp of the subject matter. Conducted tutorials offering guidance and mentorship to students, fostering effective communication and support.

Projects

Distributed URL Shortener

- Built a **low-latency distributed backend service** in **Java**, deploying multiple **SQLite-backed HTTP servers** to handle high-volume URL shortening and redirection requests.
- Implemented **consistent hashing** and **dual-node replication** for **fault-tolerant sharding**, improving system availability and resilience to node failure.
- Designed a custom **reverse proxy** with **round-robin load balancing**, health monitoring, and **LRU caching**, reducing response times under concurrent traffic.
- Performed rigorous **load testing** using **k6**, validating system throughput, latency, and fault recovery under simulated production conditions.

QuickBytes

- Developed a **full-stack, real-time food delivery platform** using **TypeScript, React, Node.js**, and **Firebase**, enabling dynamic order placement and live tracking.
- Integrated secure **Firebase Auth**, and real-time geo-coordinates via **Google Maps API** and **Firebase Realtime Database**.
- Automated deployments with a production-ready **CI/CD pipeline** using **GitLab CI, Docker, Netlify, Heroku**.
- Stress-tested backend performance with **k6** to ensure scalability across user base spikes.

Deep Learning Super Sampling U of T Deerhacks

- Engineered an SRGAN-based system for **4x image super-resolution**, optimizing for perceptual quality and inference speed.
- Designed **Coarse-to-Fine** architecture with **residual blocks** and **pixel shuffling**, enabling efficient compute distribution.
- Trained on the **DIV2K dataset** with **Adam Optimizer, AutoGrad**, and custom learning rate scheduler for high-res applications like drone imagery and microscopy.

Skills

Languages: **Java**, Scala (basic), Python, Go, TypeScript, JavaScript, SQL, C++, C, Haskell, Racket
Frameworks/Tools: React, Node.js, **Docker**, **Git**, Firebase, GitLab CI/CD, Heroku, Netlify, PostgreSQL, SQLite, **Jira**, k6
Concepts: **Distributed Systems**, Load Balancing, Fault Tolerance, **CI/CD Pipelines**, **SDLC**, **Data Structures & Algorithms**, Low-latency Systems