Jingwen (Steven) Shi

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EDUCATION

University of Toronto Toronto, ON
Honors Bachelor of Science 2020 – Present
Double Majoring in Computer Science (Full Stack) and Applied Statistics, Minors in Mathematics

- **Relevant courses:** Algorithm Design, Data Structures, Scalable Computing, Operating Systems, Computer Networks, Software Engineering, Parallel Programming, Software Design, System Programming, Computer Organization and Structures, Web Programming, Machine Learning, Neural Network and Deep Learning, Artificial Intelligence, Information Security, Computer Security, Databases

SKILLS

- **Programming Languages:** C (OpenMP, MPI, CUDA), Python (Django, NumPy, Pandas, PyTorch), Java (JavaFX), SQL, HTML, CSS, JavaScript (React), Swift (SwiftUI), R, Scala, RISC-V
- **Services & Tools**: Nginx, Docker, Redis, Cassandra, Apache Spark, AWS (Lambda, ElastiCache, CloudFormation, API Gateway, S3, IAM, VPC, DynomonDB, CDN), RISC-V Microprogramming & Digital Logic Circuits Simulation, Makefile, Git, Shell

ACADEMIC ACHIEVEMENT

- 2021 Winter Sessional GPA 3.78
- 2021 Summer Sessional GPA 3.70
- 2022 Summer Sessional GPA 4.00
- 2023 Winter Sessional GPA 3.88
- STA258, 260, 304, 305, 399 GPA4.0
- CSC309, 343, 384, 413 GPA3.7+
- STA258 project received full credits as group leader.
- STA304 and STA305 project with a grade of 100% and 97% as team lead, both selected as examples for future students.

ACADEMIC STUDY & RESEARCH

CSC367 Parallel Programming Teaching Assistant (University of Toronto) Toronto, ON
Teaching Assistant Sep 2023 – Dec 2023

- Provided critical in-lecture support and facilitated review sessions to address student questions and provide supplemental instruction.
- Invigilated quizzes and exams to ensure academic integrity and proper exam conduct.
- Undertook responsibility for in-term quizzes and final exam grading, ensuring accuracy and fairness.
- Administered lecture exercise marking and grade entry, maintaining up-to-date records of student performance.

Twitter Algorithmic Bias and Misinformation Research (University of Toronto Rotman School of Management) Toronto, ON
Lead Research Assistant May 2023 – Aug 2023

- Spearheaded a research team, managing three research assistants, to collect and analyze Twitter data using Twitter 2.0 API.
- Advocated against Elon Musk's initiative to privatize Twitter API, capitalizing on publicly available data for comprehensive analysis.
- Designed and executed representative subsampling strategies for Twitter producers and their follower base.
- Deployed, maintained, and ensured reproducibility of experiments through meticulous management of code and API.
- Generate micro and macro-level engagement graphs and statistics for supporting hypothesis analysis and testing.

Information Theory Research Opportunity Program (University of Toronto) Toronto, ON
Student Researcher May 2023 – Aug 2023

- Conducted research on the application of information theory in statistics under the mentorship of Prof. Labadi.
- Proved a series of entropy formulas pertaining to various probability distributions and demonstrated the concept of KL Divergence.
- Currently exploring an innovative application of extropy, with plans to present findings at the **Summer Undergraduate Research Fair** in a scientific poster format.

EXTRACURRICULAR ACTIVITIES

International College Students' 'Internet+' Innovation and Entrepreneurship Competition Toronto, ON
Co-Lead July 2023

- Steered a seven-member team towards the planning of an advanced medical big data trading platform designed to empower individuals with complete control over their medical data and facilitate profitable data transactions for users.
- Fostered cross-disciplinary collaboration with a team of Biology students to capture precise user requirements, resulting in the creation of detailed and insightful user stories.
- Developed and executed a comprehensive business plan for the enhancement and expansion of the current medical big data trading platform, strategically addressing and innovating potential new needs.

DeerHacks (Hackathon) Toronto, ON
Team Lead April 2023

- Led a team of 4 to create a Windows application for auto-adjusting screen brightness based on ambient light.
- Utilized diverse video data from the University of Toronto to train a Convolutional Neural Network (**CNN**).
- Achieved efficient convergence and prevented overfitting using the Adam optimizer, attaining 99% test accuracy.

- Engineered the application to function offline, using webcam images and preloaded weights for real-time brightness adjustments.

PROJECT EXPERIENCES

ext2 File System (University of Toronto, CSC369 Operating System) Toronto, ON
Main Developer Nov 22, 2023 – Dec 06, 2023
- Implemented concurrency **ext2** operations, including creating directories, copying and removing files in a parallel environment.
- Engineered **fine-grained** inode level **synchronization** and avoiding deadlocks for handling file system metadata.
- Avoided undefined behavior by ensuring the validity of file paths within the ext2 image and edge cases when dealing with indirect blocks.

r/place (University of Toronto, CSC409 Scalable Computing) Toronto, ON
Developer Nov 24, 2023 – Dec 07, 2023
- Implemented Reddit's r/Place on AWS, leveraging multiple **available zone** deployment for enhanced **availability**.
- Orchestrated infrastructure as code (**IaC**) using CloudFormation, ensuring efficient deployment and management of AWS resources.
- Employed Redis clusters and CDN for **state caching**, alongside WebSockets for broadcasting real-time updates to clients.
- Achieved high **scalability** and **concurrency** by abstracting components into **serverless** functions using AWS Lambda.

Distributed URL Shortener System (University of Toronto, CSC409 Scalable Computing) Toronto, ON
Team Lead & System Architecture Designer Sep 24, 2023 – Oct 09, 2023
- Developed a multi-threaded **reverse proxy** and URL shortener, accomplishing **4000 GET requests** from 4 users in 4 seconds.
- Instituted **disaster recovery** auto-restart mechanism for load balancers, application servers, and data restoration monitored in real-time.
- Ensured system **scalability**, facilitating seamless automatic expansion and contraction (from n to n+-1 nodes) without any downtime.
- Implemented **orchestration** mechanisms, automating the launch and termination of clusters on specified systems, which included the automation of adding or removing hosts within the cluster.
- Designed a **fault-tolerant architecture**, where, in case of failures, the load balancer re-partitions data and initiates data migration from backup databases to active servers.

DL Weather Forecasting (University of Toronto, CSC413 Neural Networks & Deep Learning) Toronto, ON
Team Lead March 24, 2023 – April 23, 2023
- Coordinated task distribution among team members and directed training and tuning processes.
- Implemented **Transformer** and **GRU** model to predict the next 24 hours' temperature by the previous 72 hours' data in **PyTorch**.
- Trained and tuned the GRU model, directed the Transformer's training process, and visualized data with **Plotly**.
- Engineered the features selected and achieved a normalized **loss of 0.0004 and 0.077** on the Transformer and GRU.

Easy Chef Recipe Web App (University of Toronto, CSC309 Programming on the Web) Toronto, ON
Team Lead, API & Database Designer Feb 24, 2023 – April 23, 2023
- Segregated frontend and backend servers in **React** and **Django** for modularity.
- Designed and developed a series of **RESTful APIs** with 30+ endpoints in **Django**, achieving **CRUD** for all database entity sets.
- Implemented server-side pagination and search auto-completion to optimize API response time and enhance **UX**.
- Designed and implemented the **database** in **3rd Normal Form** with eleven models/tables.
- Constructed the front end using React **JS** and **Bootstrap** framework to achieve smooth and clean **UI**.

Image Processing (University of Toronto, CSC367 Parallel Programming) Toronto, ON
Main Developer Oct 3, 2022 – Dec 3, 2022
- Implemented Laplace operator to obtain artistic effects, sharpen blurry photos, perform edge detection, etc., with **C** and **CUDA**.
- Optimized Laplace operator with **data parallelization** and **work pool**, achieving 600% speedup compared to sequential implementation.
- Accelerated program with GPU reduction technique, improving run time by 3.8 times than the best CPU implementation.

Database Operation Optimization (University of Toronto, CSC367 Parallel Programming) Toronto, ON
Main Developer Oct 31, 2022 – Nov 9, 2022
- Optimized join operation with **C** for the query that finds all students who are also staff members of the university.
- Parallelized and implemented sort-merge and hash join with **fragment-and-replicate** and **symmetric partitioning** techniques for different situations, attaining a maximum speed up of 325% and 490% for each method.
- Applied the algorithms on both shared memory devices by **OMP** and parallel computing architectures by **MPI**.

Linux Shell (University of Toronto, CSC209 System Programming) Toronto, ON
Individual Developer Jan 2022 – Apr 2022
- Crafted a shell that replicated basic functionalities of the native Linux shell and command lines (pipe, cd, wc, ls, echo, etc.) using **C**.
- Constructed a linked list with memory allocation with no memory leaks.
- Established pipe between child and parent processes created by fork and facilitated client-server communications with the socket.

Three Musketeers Game (University of Toronto, CSC207 Software Design) Toronto, ON
Team Lead Nov 2021 – Dec 2021
- Spearheaded a team of four to design and develop a Java-based game by using **JavaFX SDK** and implemented **GUI**.
- Facilitated software design and implementation through **agile development** and **version control**.
- Ensured program correctness with **unit testing** and **STLC** life cycle while monitoring effective collaboration using **GIT**.
- Employed design patterns (e.g., visitor, observer, strategy, etc.) to expedite the development process and deployed the game with 98% in the final grade.