

Zhifei “Soso” Song

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HIGHLIGHTS

- A highly adaptable and quick learner who can independently contribute to projects within a short timeframe.
- Led 7 tech teams with over 22 unique members from NUS, UofT, and OCAD University.
- Presenter/Speaker at the 2023 CMS Research Symposium, Applied Research in Action 2023, and Level UP 2023.
- 3.91 average GPA in the last 2 years (3rd & 4th year), including 18 CS courses (3 graduate-level courses).
- North America 2021 IBM Intern Challenge (Hackathon) 2nd Place.

EDUCATION

University of Toronto

Honours Bachelor of Science (H.B.Sc.) in Computer Science, with Distinction
Specialist (Co-operative) Program, Software Engineering Stream

November 2023

Toronto, ON

EXPERIENCE

IBM

Software Engineer Intern

May 2021 – August 2022

Toronto, ON

- Enhanced the DevOps Z Systems (IBM Z Development and Test Environment) by designing and implementing automated E2E (End to End) and API tests with qTest, boosting test coverage by 60% and efficiency through strategic test redesign.
- Contributed to the CI/CD pipeline as a member of the development team for the IBM Wazi Sandbox component within the IBM Z and Cloud Modernization Stack in OpenShift.
- Re-engineered the License Generator’s frontend and backend to align with updated licensing requirements, incorporating expanded user options.
- Received two commendations and appreciation letters for demonstrating exceptional adaptability and expertise.

PROJECTS

Zero Knowledge Proof of Location | *Circom2, snarkjs, Solidity, JavaScript, TS, LaTeX*

May 2023 – May 2024

- Collaborated with Dr. Thierry Sans to design a novel proof-of-location protocol utilizing ZK-SNARKs that ensure security and user privacy. Demonstrated practicality through implementation and stress testing, showing significant performance improvements over existing works in terms of both time and space complexity.
- Analyzed over 60 scholarly papers to refine understanding of Zero-Knowledge Proofs, Proof of Location, and Decentralization concepts.
- Received the 2023 UTSC CMS Research Symposium Certificate and became a full paper candidate for the ACSAC 2024 conference.

UTAP | *React, Node, Express, TypeScript, GitLab, Python, SQL, Docker, Cypress, Mocha, Chai, Axios*

August 2023

- Collaborated with Dr. Bogdan Simion on the UTM TA Application System (UTAP), improving user experience, workflow efficiency, and system performance for the TA hiring, midterm (duties) review, and hours allocation processes. This work benefited applicants, faculty, and coordinators.
- Revamped TA scheduling system using CSP and COP solvers, resolving long-standing, intermittent inefficiencies to boost accuracy for the Fall 2023 admissions cycle.
- Executed full-stack development tasks (API integration, bug fixing, feature enhancements) and enhanced testing capabilities by expanding automated mock data generation, implementing midterm review dataset generation, and deploying Cypress for E2E validation.

Pintos | *C, Perl, x86 Assembly, Docker, Pintos, GCC, GDB/GNU, Bochs/QEMU*

August 2023

- Directed a team of 3 to overhaul a multi-threaded OS, enhancing threading, user programs, virtual memory, and file systems, securing a 97% project score.
- Developed and optimized a multitasking operating system by implementing advanced scheduling algorithms, system calls for process and file management, virtual memory with demand paging and swap management, and an efficient file system with inode-based structure and caching techniques, significantly enhancing system performance and security.

illucid | *C#, HLSL, Unity3D, Gravity Sketch, Blender*

April 2023

- Led game design and development as a core developer, employing a milestone-driven approach. Collaborated closely with other developers and artists (music, environment, character, VFX) to gather internal feedback and ensure the project stayed aligned with key objectives.
- Conducted playtests with experts from Gameloft, Ubisoft, Snowman Games, and Uken Games.

B2ST Startup | *React, Node, Express, MongoDB, Docker, Twilio, scikit-learn, Stripe*
| *Jest, Sentry, Sumo Logic, GitHub Actions, Heroku*

December 2022

- Initiated a B2B SMS marketing automation SaaS startup, Co-led an international team in the DCSIL, Engaged with industry leaders at Shopify, Stripe, and TD Bank to gather insights for strategic project enhancements.
- Developed a MERN stack sales prediction model using Scikit-Learn to provide efficient promotions for the business, resulting in reduced operational costs and increased customer loyalty.
- Designed microservices architecture featuring 3 backend services: Machine Learning, SMS notifications, and account service with subscription management.
- Strictly followed DevOps practices using GitHub Actions and Sentry, resulting in a code quality rating of A from Code Climate.

Geodesic Paths | *C++, Eigen, libigl*

December 2022

- Implemented the “FlipOut” algorithm for enhancing geodesic path computation on complex surfaces, employing Eigen and libigl for efficiency.
- Developed a mesh improvement algorithm to enhance mesh quality through edge flips and shell transformations, leading to improved accuracy and efficiency.

NaiveOracle | *Solidity, React, Ethers.js, Netlify, Hardhat, Mocha&Chai, Waffle, OpenZeppelin, Remix* November 2022

- Led a 3-person team in researching and applying insights from Chainlink’s white papers to build a decentralized oracle network, advancing understanding of blockchain oracles.
- Architected and deployed on-chain contracts, including a Service Level Agreement with reputation management, order-matching, and aggregation components, ensuring data security, accuracy, and cost-effectiveness.
- Developed NaiveTokens, an ERC20 token model, to facilitate transactions within the network. Created a user-friendly frontend interface and local nodes to monitor, receive, and execute orders from user contracts, demonstrating practical skills in decentralized network operations.

Kickstarter | *Solidity, Hardhat, React, Ethers.js, MetaMask, OpenZeppelin, Chai, Remix Netlify*

November 2022

- Designed, implemented, and deployed a decentralized fund management application (dApp) on Ethereum using Solidity smart contracts, incorporating ERC20 token issuance and token-based stakeholder voting to enable DAO-based governance within a Web3 ecosystem.
- Implemented core dApp features (ETH deposits, spending proposal creation/voting, execution of approved spending requests), utilizing Hardhat and Goerli testnet for robust contract functionality, security, and thorough testing.
- Developed a responsive React frontend with Material UI styling, integrated Ethers.js for seamless blockchain interaction, and enabled MetaMask for secure user authentication, emphasizing an intuitive user experience.
- Implemented rigorous security measures and comprehensive testing strategies utilizing OpenZeppelin contracts for secure smart contract development, and Mocha, Chai, and Waffle for extensive unit and integration tests, mitigating potential vulnerabilities and enhancing contract security.

Sosocoin | *Python, JS, Docker, React, Flask*

November 2022

- Engineered a fully functional ledger-based blockchain cryptocurrency, incorporating essential Bitcoin concepts such as proof of work, race conditions, validation, transaction pools, and a non-deterministic wallet.
- Architected and deployed an intuitive development environment, featuring a React frontend and APIs, to facilitate monitoring and interaction with blockchain nodes within isolated Docker containers, enabling seamless internal and external communications that efficiently simulate blockchain components.
- Developed comprehensive blockchain testing protocols covering node addition, minting, block creation, synchronization, and adaptive difficulty, ensuring system robustness under various conditions.

scikit-learn Contributions | *Python, Cython, scikit-learn, NumPy, SciPy, pytest, GitHub*

May 2021

- Led a team of 6 members in the scikit-learn community, contributing 2 new features and an in-depth analysis of 3 potential bugs to guide future development. Utilized Agile methodologies (Jira, Scrum) to enhance algorithm optimization and data handling.

JSScene | *JavaScript, C++, libigl*

August 2020

- Developed a 3D rendering library in JavaScript and C++ with features like Camera, Lighting, and Meshes, focusing on performance and advanced 3D functionalities such as ray tracing and multi-threaded rendering.

- Included an STL parser for 3D object compatibility and extended the library with libigl for complex operations like mesh handling and kinematics.

LOQAL | *Node, Express, MongoDB, Mongoose, bcryptjs, Cloudinary, MVC Architecture, Heroku* August 2020

- Led a team of four to build a localized Q&A web application using the MEN stack, facilitating efficient community knowledge sharing. Employed agile methodologies to deliver continuous improvement based on user feedback and analytics.
- Implemented features including question/answer posting, content moderation with dedicated user and admin interfaces, personalized feeds, keyword search, and user/tag following.
- Optimized performance through efficient database indexing, integrated Cloudinary for streamlined user file management.

SportsCred | *React, Golang, Gin, Neo4j, Docker, Cron, Google Cloud, JWT, Agile* August 2020

- Collaborated in designing and developing a sports-focused social media platform using a modern stack (Golang, React, Neo4j). The platform features user profiles, interactive posts, trivia games, leaderboards, and predictions. Worked within a 7-member team, utilizing the Agile SCRUM methodology.
- Built a robust user management system (profile customization, JWT authentication, Google Cloud Storage integration) with a security focus: endpoint protection, data encryption (rest/transit), MFA, and RBAC to ensure comprehensive data protection.
- Developed interactive features (likes, comments, hashtags) and a trivia system with single and multiplayer modes. Integrated a notification system to drive engagement through alerts about game invites, debate outcomes, and prediction results.

16-bit MIPS CPU | *Python, Assembly, Verilog, FPGA(Quartus Prime), MIPS Architecture* April 2019

- Designed and developed a 16-bit MIPS CPU on FPGA, utilizing RISC architecture principles to achieve optimized instruction efficiency. Created a custom Python assembler to streamline assembly-to-binary code conversion.
- Engineered an instruction set (33 operations) covering arithmetic, logic, memory access, and control flow operations, enabling the execution of complex computational tasks, including recursive algorithms such as Bubble Sort and the Fibonacci sequence. Implemented a VGA controller, empowering the CPU with real-time graphical output capabilities.
- Authored comprehensive documentation with enhancement outline, adopted as a future course resource.

RELEVANT COURSEWORK (4.0/4.0 GPA)

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|---------------------------------|--------------------------------------|--------------------------------|---------------------------|
| • All Calculus Courses | • Engineering Large Software Systems | • Blockchains and DApps | • UofT UTAP Project |
| • Database and Web Applications | • Artificial Intelligence | • Theory of Computation | • Innovation Lab |
| • Programming on the Web | • Computer Graphics | • Algo Design & Analysis | • Business Software |
| | • Research on P2P | • Computability and Complexity | • Geometry Processing |
| | • Computer Organization | • Video Game Design | • Computability and Logic |

TECHNICAL SKILLS

Languages: C, C++, C#, Cython, Go, Haskell, Java, JavaScript, TypeScript, PHP, Python, R, Ruby, Perl, Rust, Swift, SQL, Solidity, Circom, HLSL, Verilog, Assembly, HTML/CSS, LaTeX, Markdown, Shell, Sh, Bash, Zsh, PowerShell

Developer Tools: GitHub (Version Control), GitLab, GitHub Actions, Gerrit, Jenkins, Ansible, Maven, Ant, Visual Studio, Eclipse, Xcode, VS Code, Android Studio, Selenium, GDB/GNU Debugger, JUnit, qTest, Jira, Docker, Docker Compose, Bochs/QEMU, WinDbg, pgAdmin, Quartus Prime, Postman, Operator SDK, Remix, OpenZeppelin, Angular, IBM ZD&T, Figma, Blender, Gravity Sketch, Procreate, Unity3D, Unity Ads, Slack.

Tech Stacks: ReactJS, snarkjs, MUI(Material UI), NPM, Node.js, Express.js, Flask, Gin, Java Spring Boot, PostgreSQL, MySQL, MongoDB, Mongoose, Neo4j, DB2, IBM Cloudant, Cypress, Chai, Mocha, Jest, pytest, Hardhat, Waffle, Ethers.js, MetaMask, scikit-learn, NumPy, SciPy, Watson AI, Google Cloud, AWS, IBM Cloud, Heroku, Netlify, Cloudflare, DigitalOcean, Linode, Kubernetes, OpenShift, Dagger2, Axios, JWT, Sentry, Sumo Logic, Twilio, Stripe, libigl, Eigen, OpenGL, Vulkan, Wazi, Cloud Modernization Stack, Ubuntu, Unix, Linux, macOS, Windows, z/OS, Pintos, HiveOS, IBM HTTP Server, Hypervisor(VirtualBox, VMware, KVM, Hyper-V), Cloudinary, Nginx, LAMP, WordPress.

Development Practices, Design Patterns and Standards: Agile, SCRUM, Extreme Programming (XP), Lean Software Development, Feature-Driven Development (FDD), Test-Driven Development (TDD), SAsFe, Waterfall model, DevOps, CI/CD, MVC Architecture, Microservices Architecture, PEP 8, ERC Standards (ERC-20, ERC-721).