Zhifei "Soso" Song

+1 647-571-1788 | soso.song@mail.utoronto.ca | github.com/soso-song | soso.dev

SUMMARY

- A permanent resident of Canada for the past 10 years, with an estimated eligibility for citizenship in 2024
- 3.91 average GPA in the last 2 years (3rd & 4th year), including 18 CS courses (3 graduate-level courses)
- Led 4+ tech teams with a collective total of 22+ unique members from NUS, UofT, and OCAD University
- Collaborated closely with 3 professors across 3 different University of Toronto campuses
- 16 months as a backend developer at IBM, earning 2 commendations, 2 appreciation letters, and a return offer
- North America 2021 IBM Intern Challenge (Hackathon) 2nd Place
- Presenter/Speaker at the 2023 CMS Research Symposium, Applied Research in Action 2023, and Level UP 2023
- Developed a 3D rendering engine and gained extensive experience in multiple 3D game development projects
- Conducted graduate-level research and implemented papers in geometry processing

EDUCATION

University of Toronto — November 2023
Honours Bachelor of Science in Computer Science, with Distinction — *Toronto, ON*
Specialist (Co-operative) Program

EXPERIENCE

IBM Canada — May 2021 – August 2022
Software Engineer Intern — *Toronto, ON*

- Earned second place in the North America 2021 IBM Intern Challenge (Hackathon) by creating a platform addressing the Zero Hunger Challenge, utilizing IBM Cloudant database and Watson AI to showcase innovative problem-solving abilities.
- Enhanced the DevOps Z Systems (IBM Z Development and Test Environment) by designing and implementing automated E2E 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.
- Redesigned the front-end and back-end of the product's License Generator to meet new licensing requirements.
- Received two commendations and appreciation letters, leading to a full-time job offer, by demonstrating exceptional adaptability and expertise.

TheClass (Coaching Group) — Nov 2018 – Jun 2019
Teaching Assistant — *Toronto, ON*

- Effectively taught multiple courses to over 60 UTSC students, adeptly balancing a full course load, employing interactive teaching methods to enhance student understanding and engagement.

PROJECTS

Zero Knowledge Proof of Location | *LaTeX, Circom, Solidity, JavaScript, TypeScript* — May 2023 - March 2024

- Collaborated closely with Dr. Thierry Sans to meticulously analyze over 50 scholarly papers, enhancing our understanding and framework for Zero Knowledge Proofs, Proof of Location, and Decentralization.
- Designed a novel proof-of-location scheme characterized by scalability, practicality, tamper resistance, and privacy preservation (utilizing ZK-SNARKs), setting the stage for a scheduled publication and grant applications, demonstrating potential industry transformation.
- Received the 2023 UTSC CMS Research Symposium Certificate for a commendable research presentation.

UTAP | *JS, TypeScript, Python, SQL, Docker, React, Node, Express, Cypress, Mocha&Chai, Axios* — August 2023

- Collaborated with Dr. Bogdan Simion to enhance the UTM TA Application System (UTAP), improving the interface and process efficiency of the TA hiring, midterm (duties) review, and hours allocation processes for applicants, faculty, and coordinators.
- Identified and rectified intermittent inefficiencies in the TA scheduler, which persisted for an extended period. Redesigned it using CSP & COP solvers to boost efficiency and accuracy, successfully deploying the improved version for the Fall 2023 admissions cycle.

- Executed full-stack development tasks, including API integration, bug fixing, and feature upgrades. Enhanced automated mock data generation, implemented generation of midterm review datasets, and Cypress E2E testing for thorough validation.

illucid | *C#, HLSL, Unity3D, Gravity Sketch, Blender* April 2023
- Developed a 3D puzzle game with unique illusion mechanisms crafted from components such as camera perspective shifts, mesh deformation, object slicing, and mirror reflection. Established a modular codebase, seamlessly integrating UI components, feedback collection instrumentation, 3 player abilities, and 9 distinct levels.
- Earned selection for a multidisciplinary capstone project involving 5 courses across UofT and OCAD University through competitive balloting, following my theoretical knowledge from graphic courses, practical experience with 5 apps published on the App Store since 2017, and proficiency in 3D modeling and VFX
- Elevated to lead a 9-member interdisciplinary team from Computer Science, Art, and Music, due to exceptional achievements in two game jams and a top-tier project proposal among over 400 submissions
- Spearheaded game design and iteration as a core developer and 3D artist, conducting playtests with experts from Gameloft, Ubisoft, Snowman Games, and Uken Games. Chosen as one of two leaders to present our top project publicly, representing department achievements.
- Presented the project at Level Up Showcase 2023, Westin Harbour Castle, Toronto.
- Selected as a presenter for Applied Research in Action 2023 by the MScAC program at Metro Toronto Convention Centre.
- Conducted independent research and implemented findings to create internal textures for sliced 3D objects in Unity, applying 3D texture patches on a tetrahedral mesh based on user-defined volumetric tensor fields. Developed a method to simulate marching tetrahedra using Unity 3D textures and custom shaders

B2ST | *React, MongoDB, Docker, Node.js, Express.js, Twilio, scikit-learn, Stripe* December 2022
| *Jest, Sentry, Sumo Logic, GitHub Actions, Heroku*
- Initiated a B2B SMS marketing automation startup, leveraging machine learning for strategic planning and MVP development, focusing on campaign oversight and sales data analysis.
- Co-led this graduate-level project within the Department of Computer Science Innovation Lab (DCSIL), collaborating with a six-member, cross-functional team from the National University of Singapore and the University of Toronto.
- Led the design of a dynamic frontend utilizing React, integrating Twilio and Stripe APIs for comprehensive SMS and payment functionalities.
- Orchestrated the backend's microservices architecture using Docker, Node.js, and ExpressJS, enabling effective communication between services like a Scikit-Learn powered sales prediction model and MongoDB, augmented by DevOps practices with GitHub Actions and Sentry for optimal integration and monitoring.
- Enhanced project progression by engaging in business development and pitching to industry leaders at Shopify, Stripe, and TD Bank, securing feedback that drove strategic refinements.

Geodesic Paths | *C++, Eigen, libigl* December 2022
- Implemented the "FlipOut" algorithm from a scholarly article for a graduate-level geometry processing project, achieving significant enhancements in geodesic path computations and mesh quality on complex surfaces through code development using Eigen and libigl's built-in solvers.
- Engineered a mesh improvement solution using edge flips and shell transformations, achieving measurable enhancements in mesh quality indicators, including triangle normals and dihedral angles.

NaiveOracle | *Solidity, React, Ethers.js, Netlify, Hardhat, Mocha&Chai, Waffle, OpenZeppelin* November 2022
- Led a team of three to research and apply insights from Chainlink's white papers, building a decentralized Oracle network to enhance understanding of blockchain oracles.
- Designed and implemented on-chain contracts, including a Service Level Agreement (SLA) featuring reputation management, order-matching, and aggregation contracts, ensuring data security, accuracy, and cost-efficiency.
- Engineered NaiveTokens, an ERC20 token model, to enable transactional processes within the network and developed a user-friendly front-end interface and local nodes to monitor, receive, and execute orders from user contracts, demonstrating practical skills in decentralized network operations.

Kickstarter | *Solidity, Hardhat, ReactJS, Ethers.js, Metamask, OpenZeppelin/ERC20, Chai, 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.

- 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, 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.
- Designed rigorous testing protocols for blockchain functionality, including peer node addition, coin minting, block creation, block synchronization, and adaptive-difficulty mining, to validate the blockchain's robustness and performance across different scenarios.

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 providing in-depth analysis of 3 potential bugs to guide future development. Utilized Agile methodologies (Jira, Scrum) to enhance algorithm optimization and data handling.
- Played a pivotal role in enhancing scikit-learn's data preprocessing and validation capabilities by implementing an Imputation transformer for matrix completion, enabling handling of NaN values in OrdinalEncoder, and addressing issues with default kwargs in scipy.linalg functions.
- Developed a GroupTimeSeriesSplit class for scikit-learn, enhancing model training and validation with group-aware, time-based cross-validation capabilities.
- Proposed the integration of Fibonacci heaps into scikit-learn's Ball Tree algorithm, potentially leading to significant improvements in nearest neighbor search efficiency.

JScene | *JavaScript, C++, libigl*   August 2020
- Developed a comprehensive, standalone JavaScript 3D library for rendering 3D objects, incorporating elements such as Camera, Light, Material, Objects, and TriangleSoup.
- Integrated advanced features including a graphics canvas, optics, illumination, reflectance, radiometry, curves, and ray tracing, without external dependencies.
- Augmented the library's performance by implementing multi-threaded rendering with Web Workers, thus optimizing JavaScript's inherent inefficiencies.
- Enhanced compatibility by developing an .stl parser for converting 3D objects into the custom triangle soup format
- Implemented a C++ version using libigl, supporting advanced features like bounding volume hierarchy, meshes, shader pipeline, kinematics, and mass-spring systems.

LOQAL | *JS, Node.js, Express.js, MongoDB, Mongoose, bcryptjs, Heroku, Cloudinary, MVC Architecture* August 2020
- Spearheaded the development of LOQAL, a localized Q&A web application built on Node.js, Express, MongoDB, and Cloudinary to facilitate efficient community knowledge sharing. Led a team of 4, employing agile methodologies to deliver continuous improvement based on user feedback and analytics.
- Secured LOQAL with robust data modeling (Mongoose ORM), password hashing (bcryptjs), session management (express-session), and comprehensive user authentication featuring input validation.
- Designed an intuitive, responsive UI/UX, ensuring accessibility across devices. Integrated Cloudinary for seamless image management and connect-multiparty for efficient file handling to enhance user interaction.
- Pioneered key features including question/answer posting, comprehensive content moderation with dedicated user and admin interfaces, personalized feeds, keyword search, and user/tag following. Optimized performance with efficient database indexing for scalability.
- Prepared LOQAL for smooth deployment with detailed documentation, ensuring easy cloud-hosting integration and long-term maintainability.

SportsCred | *Golang, Gin, Neo4j, Docker, Cron, Google Cloud, JWT, ReactJS, Agile SCRUM*   August 2020
- Collaborated in the design and development of a sports-focused social media platform (Golang, ReactJS, Neo4j) with features including user profiles, interactive posts, trivia games, leaderboards, and predictions. Optimized platform performance and scalability (Google Cloud Compute Engine) through strategic database indexing and query optimization, utilizing Agile SCRUM methodology within a 7-member team.

- Built a robust user management system (profile customization, JWT authentication, Google Cloud Storage integration) with a security focus: endpoint protection, advanced data encryption (rest/transit), MFA, and RBAC to ensure comprehensive data protection.
- Enhanced user engagement with interactive features (likes, comments, hashtags), a dynamic trivia system (Neo4j integration, single/multiplayer modes), and a prediction system featuring an Analytical Credibility Score. Integrated a notification system to drive engagement through alerts about game invites, debate outcomes, and prediction results.

16-bit MIPS CPU | *Assembly, Python, Verilog, Quartus Prime, FPGA, MIPS Architecture, VGA*   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.
- Developed debugging tools and a user interface with manual clock control, reset, and real-time monitoring to improve developer workflow.
- Authored comprehensive documentation on CPU architecture, instruction set, and assembler usage. Outlined future enhancements (pipelining, game/text editor development) to guide project evolution.

Othello Agent AI | *Python*   May 2020
- Developed Python-based Othello (Reversi) AI agents using Minimax, Node Ordering Heuristics, Alpha-Beta Pruning, Depth Limiting, and State Caching; achieved near-perfect solutions within a reasonable timeframe and 10x runtime efficiency improvement on a 6x6 board.

From Concept to App Store | *Python, C#, Swift, Xcode, Unity3D, Unity Ads*   January 2018
- TruthTable2: Developed a paid robust boolean equation parser in Swift, streamlining complex logic evaluations for efficiency.
- MeowDozer: Built a free 'coin-dozer' game in Unity3D (C#), integrated Unity Ads, and achieved 2.9k downloads, demonstrating both development and monetization skills.

Hobbies: 3d Modeling, Animation and VFX | *Blender, Gravity Sketch, Procreate*   2017
- Portfolio Link: https://twitter.com/KylSong
- Engaged in diverse 3D art disciplines including portrait modeling, pixel-style animation, motion and camera tracking, physics simulation, 3D modeling (Unity & Gravity Sketch in VR), and 3D printing.
- Utilized Blender for advanced techniques including backface culling, custom toon shaders, and rotational constraints.

RELEVANT COURSEWORK (4.0/4.0 GPA)

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

TECHNICAL SKILLS

Languages: JavaScript, TypeScript, Python, SQL, C, C++, C#, HLSL, Solidity, Rust, Ruby, Circom, Swift, Golang, Cython, Cron, Java, Verilog, Assembly, HTML/CSS, Haskell, LaTeX, Markdown, sh, Bash, Zsh

Developer Tools: Docker, GitHub Actions, Jenkins, Maven, Selenium, qTest, JUnit, Ant, Jira, IBM HTTP Server, GitHub, Quartus Prime, Xcode, VS Code, Eclipse, Google Cloud Platform, Android Studio, Ansible, Operator SDK, OpenZeppelin

Technologies/Frameworks: React, Node.js, Express.js, Cypress, Chai, Mocha, Waffle, Axios, Hardhat, Unity3D, Blender, Gravity Sketch, Procreate, Jest, Sentry, Sumo Logic, MongoDB, Mongoose, Neo4j, Gin, JWT, ERC Standards(ERC-20, ERC-721), pytest, Linux, IBM Cloudant, Watson AI, Kubernetes, OpenShift, Red Hat OpenShift, DB2, OpenGL, Vulkan, IBM ZD&T, Wazi Sandbox, Cloud Modernization Stack, Twilio, scikit-learn, NumPy, SciPy, Stripe, libigl, Eigen, Ethers.js, Metamask, Material UI, Flask, Unity Ads, MVC Architecture, Agile SCRUM, SAFe Agile methodology, Dagger2, Java Spring Boot, zOS, Google Cloud, Cloudflare, Heroku, Netlify, Cloudinary, DigitalOcean, AWS, WordPress