Zachary Chan

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Experience

Simon Fraser University - USRA Research Assistant

Technologies Used: *P5.js, Javascript* May 2024 - Current

- Increased algorithm efficiency by optimizing the polygon packing algorithm by 1000%.
- Ensured project scalability and maintainability by designing modular code structure.
- Mentored a fellow research assistant by providing guidance on algorithm optimization and code debugging, leading to a 20% improvement in project efficiency and enhanced team collaboration.

Netflare.dev - Software Development Engineer Intern

Technologies Used: *React, Javascript, AWS, Cypress, Jest* January 2023 - April 2023

- Developed Pulse, a web monitoring tool, enabling websites to reach an up-time of 99.99% using regional pinging, content checks, performance tracking, false-positive eliminations and comprehensive logging
- Transformed user experience with a multi-dimensional heatmap, providing instant visual insights into API endpoint downtimes, reducing log analysis time by over 70%.
- Delivered a user analytics system capturing device usage, error reports, screen size, and efficiently logging 1000s of data points per week into AWS Timestream.

Projects

OctoBot: Repo Assistant **Website**

Technologies Used: *Flask, React, Node.js, Javascript, Python* September 2024

- Developed Octochat, a personal assistant tool designed to help developers navigate and understand large codebases quickly by answering questions about functions, implementations, and debugging processes.
- Implemented Flask-based backend to handle user requests and process interactions with the Voiceflow API for natural language understanding and responses.
- Collaborated on enhancing developer onboarding by designing a tool to reduce the average time for new developers to become productive in large repositories.

AI Need Help: Therapist App **Website**

Technologies Used: *MongoDB, Express, React, Node.js, Javascript, Machine Learning Models* May 2024

- Spearheaded the creation of "AI Need Help," an AI therapy assistant application designed to provide immediate emotional support to patients awaiting online consultations with human therapists.
- Successfully combined 4 machine learning models for emotion detection, speech-to-text conversion, a meta-learner for decision-making, and an automatic voice detector, creating a cohesive application.
- Reduced response latency by 25% using React for real-time audio and video processing in the frontend.

Statistical Analysis of SFU Computing Science Student Society Discord Server

Technologies Used: *Python, Pandas, Numpy, Matplotlib, Statistics, Data Science* April 2024

- Worked with a group to analyze messaging patterns to uncover social networks within a Discord server, utilizing ETL, data cleaning, clustering, and network modeling.
- Designed a data processing pipeline for multi-year chat data, normalized datasets for analysis, and utilized various algorithm to identify social clusters.
- Validated clustering with a qualitative and quantitative approach; Successfully identified diverse community structures, providing valuable insights into the community.

Peak Buddies: Speed Networking App **Website**

Technologies Used: *MongoDB, Express, React, Node.js, Javascript* Februrary 2024

- Designed and implemented the Express.js server; integrated LinkedIn API for profile imports; developed dynamic matchmaking logic and managed MongoDB operations for PeakBuddies.
- Facilitated seamless integration between server and frontend functionalities, ensuring robust user interactions and data management.
- Contributed to team's first-place victory at Mountain Madness 2024 by implementing critical backend features and fostering a cohesive development environment.

Algorithmic Trading with LSTM and Pytorch **Website**

Technologies Used: *Python, PyTorch, Pandas, NumPy* January 2024

- Utilized various Python scripts for data acquisition, cleaning, and feature engineering multiple sets of data totalling 7 GB.

- Executed paper trading over 1 month of unseen data to test the algorithm and compared it with a buy-and-hold strategy.
- Attained a Sharpe ratio of 0.0222, a maximum drawdown of -0.613% and a net profit of +1.89%, indicating efficient risk management and outperforming buying-and-holding.

Asynchronous, Multi-threaded C++ Server **Website**

Technologies Used: *C++, Boost, Networking* November 2023

- Utilized an advanced HTTP session management system, employing asynchronous read/write operations to significantly enhance server response times and efficiently manage thousands of concurrent connections.
- Achieved a 52% decrease in average latency and a 118% increase in requests per second, enhancing the user experience and server reliability under load.
- Implemented a load balancing mechanism to ensure efficient traffic management and resource utilization.

Custom Malloc and Free

Technologies Used: *C* November 2023

- Aimed to deepen understanding of memory management by implementing custom malloc and free functions.
- Engineered a custom allocator transitioning from a first-fit approach to an advanced system utilizing boundary tags, bitmaps, and deferred coalescing.
- Achieved amortized O(1) allocation and O(1) deallocation complexity, optimizing performance for varied allocation patterns.

Simple Chat Application

Technologies Used: *C, Posix Threads, TCP Socket* October 2023

- Designed and implemented a multi-threaded chat application in C, utilizing sockets for network communication and threads for concurrent message handling.
- Enabled secure, reliable network connectivity, facilitating seamless communication between users across different networks.
- Designed a multi-threaded architecture, segregating input, output, and network communication into separate threads. Achieving high responsiveness and real-time message exchange even under high loads.

Gesture Genius: Real Time ASL-to-English Translator **Website**

Technologies Used: *Node.js, Javascript, Express, Teachable Machine, GCP* September 2023

- Collaboratively created an innovative ASL-to-English translation tool, at Canada's largest hackathon, demonstrating exceptional teamwork and swift development capabilities.
- Leveraged Teachable Machine and a comprehensive Kaggle dataset, iterating through four model versions to optimize ASL translations.
- Utilized Express and Node.js for text-to-speech conversion, enabling users to audibly receive real-time translations of ASL signs.

Sorting Algorithm Visualization Tool **Website**

Technologies Used: *Node.js, Javascript, React* August 2023

- Developed an interactive platform that visually represents sorting algorithms, leading to improved user comprehension of algorithmic principles.
- Streamlined the presentation by designing a system that generates visual guides for intricate algorithmic processes, step-by-step.
- Implemented 24 different algorithms covering a comprehensive range of simple and complex algorithms, enhancing the tool's versatility and depth.

Website that builds itself **Website**

Technologies Used: *Javascript, HTML, CSS* October 2022

- Developed an innovative self-assembling website offering a unique user experience.
- Applied advanced Javascript techniques and DOM manipulation to assemble the website live.
- Designed an interactive user interface, enabling users to customize and modify the website.

MCTS-based Chess Engine with Deep Neural Networks **Website**

Technologies Used: *Python, PyTorch, NumPy, Matplotlib* October 2022

- Developed a chess AI leveraging Monte Carlo Tree Search (MCTS) and deep learning technologies.
- Enhanced simulation efficiency by integrating UCT with MCTS and optimizing with NumPy, boosting iterations per second by 20 times.

- Automated the data pipeline for efficient training of the deep learning model, reducing the model training time by 30% and increasing the overall efficiency of the development process.

4-Key Rhythm Game **Website**

Technologies Used: *Javascript, HTML, CSS* February 2023

- Developed a dynamic rhythm game in JavaScript, incorporating interactive features such as song selection, and performance tracking. Implemented efficient game state management and audio controls to enhance user experience.
- Implemented a system to interpret and load different game levels and songs on-the-fly, while seamlessly transitioning and adjusting gameplay elements to enhance variety and replayability.
- Constructed an intuitive game interface complete with responsive key hints, dynamic scoreboards, and interactive control buttons, enhancing user engagement and ease of use.

Automated Crossword Puzzle Generator **Website**

Technologies Used: *Python* August 2022

- Developed an automated crossword puzzle generator, employing web scraping techniques to compile a comprehensive word bank and definitions for hints.
- Crafted a versatile page layout using Matplotlib and PIL, streamlining the puzzle creation process for enhanced efficiency.
- Implemented a robust unit testing suite, ensuring reliable and error-free performance of the crossword puzzle generator.

Chess Engine Tournament **Website**

Technologies Used: *JavaScript, C++* October 2022

- Successfully orchestrated a round-robin tournament featuring over 2,310 games, providing in-depth insights into AI strategy effectiveness.
- Engineered 22 unique AI chess engines, utilizing advanced concepts like Markov Chains, Minimax algorithms, and piece-square tables.
- Created Markov Chains and Opening Books from 13GB of high elo game data.

Automatic UPass Registration **Website**

Technologies Used: *Python, Selenium* October 2022

- Automated the monthly UPass registration for students using Python and Selenium, significantly enhancing efficiency and ensuring punctual submissions, and potentially saving students $3.15 per month
- Integrated advanced features to navigate multi-factor authentication and automatically link Compass cards, enhancing the tool's functionality and providing a solution for user forgetfulness.
- Implemented user prompts and persistent storage, ensuring a secure yet convenient reuse of session data and a consistently positive user experience.

Education

Simon Fraser University · 3.79 CGPA — **Bachelor of Science in Computer Science**
Burnaby, BC — 2022 Spring - Present

Langara College · 3.66 CGPA — **Associate in Computer Science**
Vancouver, BC — 2020 Fall - 2022 Spring

Technical Skills

Languages: C/C++, Python, JavaScript, HTML, CSS, SQL
Frameworks & Libraries: React, Node.js, Express, Material-UI, PyTorch, Pandas, NumPy, Matplotlib
Developer Tools: Git, AWS (API Gateway, DynamoDB, Lambda, S3, Scheduler, TimeStream), GCP
Soft Skills: Effective Communication, Problem-Solving, Team Collaboration, Adaptability, Creativity

Competitions and Hackathons

Mountain Madness 2024, Simon Fraser University - *1st Place*
A Strange Programming Contest 2023, Simon Fraser University - *2nd Place*
A Strange Programming Contest 2022, Simon Fraser University - *5th Place*
New Year's MASH Programming Contest 2022, Simon Fraser University - *8th Place*
ICPC Pacific NorthWest Regional Programming Contest 2022, Division 2 - *Placed 16th out of 61 teams*
ICPC Pacific NorthWest Regional Programming Contest 2023, Division 2 - *Placed 17th out of 76 teams*
Advent of Code 2023, Online - *Placed 122nd out of 316,118 global participants*
Advent of Code 2022, Online - *Completed*

Hack The North 2024, University of Waterloo - *Participant*
Hack The North 2023, University of Waterloo - *Participant*
Storm Hacks 2024, Simon Fraser University - *Participant*
Fall Hacks 2022, Simon Fraser University - *Participant*