Kalkin Kalkin

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Education

University of California San Diego — La Jolla, CA

B.S. in Computer Engineering, Mathematics - 3.96 / 4.00 GPA — *September 2022 – June 2026*

- Relevant courses: Operating Systems, Digital Logic, Algorithms, Advanced Data Structures, Honors Graph Theory, Machine Learning, Deep Learning, Optimization, Probability, Stochastic Processes, Signals and Systems, Honors Abstract Algebra I/II, Honors Real Analysis I/II/III, Graduate Real Analysis I/II, Differential Geometry (Audited)

Experience

Software Engineer Intern — June 2024 - September 2024

Roblox — *San Mateo, CA*

- Contributed to the effort for simulating aerodynamics in Roblox through major optimizations and rigorous tests
- Compressed aerodynamic mesh objects to reduce their memory consumption by 50% while preserving 99.9% accuracy on force and torque calculations and making minimal impacts on runtime
- Introduced SIMD-compatible quantization utilility methods into the codebase for use in diverse projects
- Decreased integration time of the aerodynamic force model by 3-4x using SIMD instruction
- Reduced network traffic by quantizing mesh data before serialization, resulting in faster join and load times

Undergraduate Researcher — April 2023 – June 2024

University of California, San Diego — *La Jolla, CA*

- Created a neural net to predict trajectories of Argo floats and optimize the float distribution in order to to make the best use of the $70 million of annual U.S. government funding allocated towards this observing system
- Used EOFs to reduce the dimensionality of temp. and salinity data by 93% while capturing 99.9% of the variance
- Performed a detailed sensitivity analysis of the neural net over gridded boxes in the Southern Pacific Ocean to investigate which input parameters offer the most skill in different regions of the ocean
- Presented results at two conferences and secured funding through the competitive TRELS Scholarship twice

Projects

JPEG Image Compression | *C++*

- Implemented the JPEG Compression algorithm, allowing users to reduce the size of raw image files by up to 30x without a noticeable loss in fidelity and compress images with varying degrees of final image quality
- Applied the discrete cosine transform on 8x8 chunks of pixels and quantized the resulting coefficients, discarding small coefficients to reduce final file size while avoiding division and expensive FLOPS to minimize runtime
- Performed run length encoding on the quantized coefficients followed by Huffman coding, writing this data to a final output file and formatting it using the JFIF to have the final image be easily viewable across all platforms

Huffman Compression | *C++*

- Developed a file compression and decompression tool using Huffman coding to significantly reduce file size, achieving a 45% reduction in storage on Shakespeare's *Hamlet* with lossless compression
- Reconstructed the original file using stored Huffman codes and verified perfect fidelity using file comparison tools

UCSD GPA Visualization | *Python, JavaScript, HTML/CSS*

- Developed a front-end web application with 1300+ cumulative users using D3.js to display GPA and enrollment data for all courses at UCSD, including tooltips that show additional details for each course on hover
- Scraped and cleaned over 65k rows of data using Selenium and Pandas to make the bubble chart

Technical Skills

Languages: C++, Java, Python, C
Tools/Libraries: Catch2, JUnit, Git, Regex, Linux, LaTeX, Pandas, Numpy, PyTorch
Awards: AIME qualifier, USACO Silver, 2x TRELS Scholar, 2x Yearly Provost Honors (Dean's List)