Fnu 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 – December 2025*
- Relevant courses: Systems Programming, Digital Logic, Advanced Data Structures, Algorithms, Optimization, Probability, Stochastic Processes, Honors Graph Theory, Real Analysis, Signals and Systems, Machine Learning

EXPERIENCE

Software Engineering 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 utillity methods into the codebase for use in diverse projects
- Increased ingegration speed 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
- Read a paper about approximating added mass for fluid simulations and presented it to a reading group

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
- Reduced the dimensionality of temperature and salinity data by 93% while capturing 99.9% of the varaiance through calculating the empirical orthogonal functions of the data and performing an EOF decomposition
- 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 compress raw images with varying degrees of final image quality and to reduce the size of image files by up to 30x without a noticeable loss in fidelity
- Converted images to the YCbCr format and divided them into 8x8 chunks of pixels with careful memory allocation
- Applied the discrete cosine transform on each chunk 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
- Used Catch2 to incrementally test the program and make performance related decisions with benchmarks

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 on Shakespeare's *Hamlet* with lossless compression
- Implemented the compression algorithm to construct Huffman codes dynamically from the input file
- Designed and programmed the decompression tool to accurately reconstruct the original file from the compressed file using the stored Huffman codes, verifying perfect fidelity with the original file using file comparison tools

UCSD GPA Visualization | *Python, JavaScript*
- Developed a front-end web application using D3.js and other technologies 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
- Hosted the website on Github Pages and received over 1300 cumulative views

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 Provost Honors (Dean's List)