Bowen Cheng

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Education

Northwestern University Evanston, IL

Bachelor of Science in Computer Science and Mathematics, GPA: 3.98/4.0 *Expected: June 2026*

Coursework: OS, Machine Learning, Computer Security Systems, Scalable Software Architecture, Network Systems, Database Systems, Probability and Stochastic Processes, Data Structure and Algorithms, Systems Programming

Experience

Northwestern Institute on Complex Systems Evanston, IL

Undergraduate Research Assistant *December 2024 - Present*

- Engineered a low-latency LED control system in C to study coupled oscillators in firefly populations, integrating a laptop, Raspberry Pi, and addressable LEDs to enable precise, real-time dynamic lighting sequences
- Designed a data pipeline from laptop to Raspberry Pi via UDP over an Ethernet cable, achieving sub-5ms latency
- Developed simulations to replicate firefly flashing patterns, enabling experiments such as mirrored firefly behavior

GHY Impact Capital Chicago, IL

Software Engineering Intern *July 2024 – September 2024*

- Designed AI-powered chatbot using GPT models and Retrieval-Augmented Generation to answer customer FAQs
- Created an automated, AI-based version control summary system, simplifying workflows for software developers
- Wrote a script to perform hourly checks for AWS RDS backups, utilizing GitHub Actions for automation

Northwestern IMEC Lab Evanston, IL

Undergraduate Research Assistant *January 2024 – March 2024*

- Engineered a microphone system integrating a camera to filter background noise using lip movement detection
- Preprocessed and cleaned dataset of lip movements to train a machine learning model for speech detection

Projects

Pokefantasia | *AWS, Docker, HTML/CSS, Javascript* December 2024

- Built a full-stack web application with serverless backend architecture, enabling users to upload JPEG images for Pokémon type classification, type transformations, or style transformation, generating customized outputs
- Trained and deployed a custom Vision Transformer model on Google Colab to AWS for image classification
- Deployed API endpoints using AWS API Gateway to handle user requests, leveraging Lambda for distributed computation, S3 for image storage, RDS for managing user data, and ECR for dependency management

Network Security Audit Tool | *Python* November 2024

- Programmed a Python-based network auditing tool to streamline security assessments, featuring domain resolution, TLS analysis, HTTP/HTTPS protocol evaluation, geolocation, reverse DNS lookups, and RTT measurements
- Implemented automated report generation using Texttable to produce user-friendly tabular reports, summarizing network analysis results with metrics like RTT ranges, root certificate occurrences, and supported network features

RustyDB | *Rust* October 2024

- Built a high-performance database engine in Rust, optimizing buffer pool management with an LRU-K replacement policy to dynamically prioritize frequently accessed pages, reducing I/O overhead and improving memory efficiency
- Implemented core SQL execution features, including filtering, projection, joins, and aggregation functions

SmartBrain | *React, Node.js, Express.js, PostgreSQL* June 2024

- Developed a full-stack application that processes user-submitted image URLs to perform facial detection
- Created React frontend with dynamic state management and real-time rendering of facial detection results
- Programmed backend using Express.js, integrating bcrypt for password hashing and Knex.js for database queries

Technical Skills

Languages: Python, C, C++, Java, SQL, HTML/CSS, Racket, TypeScript, Rust
Frameworks: React, Node.js, pandas, NumPy, Matplotlib, OpenCV, Tailwind CSS
Developer Tools: Git, AWS, VS Code, GitHub Actions, Docker