Isaac Hu

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Education

Boston University Boston, MA
Combined B.A./M.S. in Computer Science *Sep 2021 – May 2025*
Activities: All-Campus Orchestra, Undergraduate History Association, UPE (CS Honor Society)
Relevant Coursework: Embedded Systems, Distributed Systems, Machine Learning, Artificial Intelligence, Data Mining, Natural Language Processing, Quantum Computing, Software Engineering, Object-Oriented Design, Algorithms, Statistics, Computer Architecture, Data Structures, Data Science in R, Blockchain, Foundations of Data Science

National University of Singapore Singapore
Study Abroad *Fall 2023*
Coursework: Computer Graphics, Information Security, Programming Language Concepts

Technical Skills

- **Languages**: Python, Java, C++, C, Go, R, MATLAB, SQL, JavaScript/TypeScript, HTML/CSS, Dart (Flutter), VB.NET, Bash, Verilog
- **Machine Learning & AI**: Reinforcement Learning (Q-learning), Supervised/Unsupervised ML (Random Forest, CatBoost, K-means), Hyperparameter Optimization (Optuna), Information Cascade Analysis, IBM Model-1 Translation (EM, Kneser–Ney smoothing)
- **Embedded Systems**: Embedded C on microcontrollers (dsPIC33, Arduino), FreeRTOS task scheduling, UART/SPI/I2C, PID control, digital signal filtering (Butterworth), real-time control loops
- **Frameworks & Tools**: React, Node.js, Flask, Firebase, Discord.py, BeautifulSoup, NumPy, Pandas, Matplotlib, Power Automate, Power BI, Selenium, AWS (Lambda), Docker, Git/GitHub/GitLab, GitHub Actions (CI/CD), containerized test frameworks (pytest, Gradescope integration)
- **Software Engineering Practices**: Agile (Scrum), SOLID OOP, Design Patterns (Factory, Observer, Singleton), Test-Driven Development, Automated Testing (pytest, Selenium, C# scripts), RESTful API design, asynchronous event handling
- **Data Analysis & Visualization**: Statistical modeling in R and Python, geospatial analysis in R, ROC analysis, survey analytics, SAP data mining, Tableau/Power BI dashboarding

Work Experience

Church & Dwight | IT Analyst Intern Ewing, NJ *May 2024 – Dec 2024*

- Created an automated system for processing purchase-order requests using Power Automate and Python, routing dozens of special-format PDF contracts daily for signing and filling out
- Used K-means clustering in R to uncover consumer insights and desires from a laundry product survey, utilizing CRISP-DM methodology to help support data driven business decisions
- Authored Selenium automation test suites for 20 ServiceNow forms, checking for unintended behaviors

Carpenter Technology | Digital Technology Intern Reading, PA *May 2023 – Aug 2023*

- Analyzed iron-production process data in Python; applied receiver operating characteristic analysis on manufacturing dataset to find factors associated with coarse grain steel, using base model of random forest
- Mined SAP plant-maintenance data with Pandas, building algorithms to better inform spot-buys and reduce aging of inventory in warehouse; created analytical charts in Power BI for interactive view of data

Boston University | Teaching Assistant "Computer Architecture" Boston, MA *Sept 2024 – May 2025*

- Instruct two-hour weekly labs for 250 students on digital logic design, C, x86-64 assembly, cache hierarchies
- Built containerised autograder (Python + pytest) that compiles binaries, runs differential checks, and posts results to Gradescope; graded hundreds of submissions a semester with near-zero manual intervention.

Boston University | Course Assistant — CS 237 "Statistics" Boston, MA *Jan 2023 – May 2024*

- Helped design weekly labs and homework, teaching concepts of statistics through programmatic demonstrations
- Held office hours, graded 250+ assignments using autograder written in Python, and proctored exams

Boston University | Grader — CS 330 "Analysis of Algorithms" Boston, MA *Jan 2023 – May 2023*

- Graded algorithm design and analysis assignments for a 200-student upper-level CS course.
- Assisted professor in designing fair rubrics and identifying common pitfalls in student reasoning.

Gravic, Inc. | Programming Intern Malvern, PA *May 2022 – Jul 2022*

- Collaborated with sales team to create data visualizations for 5 million rows of login history through Microsoft Power BI, utilized by sales to plan out marketing strategy
- Software development in Visual Basic to fill out fields in an OMR form uniformly randomly for testing the efficacy of a ballot scanning software

Selected Projects & Research

Personal Website (JavaScript, HTML, CSS) 2025

- Built responsive, animated portfolio site with modular JavaScript components, enabling independent updates
- Applied design patterns like Factory Method for dynamically instantiating section canvases, Observer for event-driven animations, Singleton for shared configuration state.
- Developed unit tests with Jest for hit-box collision detection, easing functions, and responsive layout scaling

Real-Time Ball-Balancing Platform (dsPIC33, C, PID, UART) 2025

- Designed and programmed dual-axis closed-loop controller to keep a ball centered on a servo-actuated platform, integrating two analog tilt sensors, dual servo motors, and an LCD display.
- Implemented 2nd-order Butterworth low-pass filter in C to attenuate ADC noise; tuned PID gains to minimize overshoot and settling time while meeting real-time update deadlines.

Airbnb Price-Prediction Challenge (Python, CatBoost, Optuna, SQL) 2025

- Created a model using random forest CatBoost for deducing the price of Airbnb rentals for Kaggle competition, utilizing hyper-parameter optimization, feature engineering, and filtering to achieve error rate of 13.8%

Information-Cascade Analysis (Python, NumPy) 2025

- Investigated information-cascade theory applied to Wikipedia hyperlinks, seeing if articles being linked together created effects analogous to the idea of "sharing" on social media
- Processed and built trees using BeautifulSoup and Python from hyperlink connections, studying activation probabilities and propagation of information; compared with Monte-Carlo randomization to determine correlation

Tetris Playing Autonomous Agent (Java, Reinforcement Learning, Q-learning) 2024

- Developed an autonomous Tetris agent in Java using Q-learning with a heuristic prioritizing minimization of gaps between blocks and total stack height.
- Trained the agent for 2,000 trials over 48 hours, after which it learned to sustain indefinite play without loss.
- Implemented feature extraction and reward shaping to guide the agent toward stable, long-term survival strategies in a stochastic environment.

Boston Building Permits and Urban Development Analysis (R) 2024

- Pooled multi-source data to study the rate of building permit approvals in Boston; used geospatial analysis and scatterplots in R to reveal structural disparities in the number of new building permits granted in minority neighborhoods

IBM Model-1 Machine Translation (NumPy) 2024

- Implemented IBM Model-1 machine translator with expectation maximization and Kneser-Ney Smoothing to translate Mandarin edition of *Star Wars: Revenge of the Sith* back into English, achieved 51% F1 accuracy

Minimax Chess Engine (Java, SEPIA Framework) 2024

- Built a minimax algotithm chess bot, tuning heuristics and leveraging alpha-beta pruning to produce a model that achieved 68% winrate against the baseline AI

Intelligent Scheduling Assistant (Flutter,Firebase,iOS) 2023

- Worked with agile development team building an app that ingests Google Calendar, learns user prep-time via past behavior, and auto-schedules events with dynamic transit buffers, coupled with Firebase authentication

- Integrated Google Maps API; uses constrained shortest-path algorithm to suggest pit stops (food, gas)

Dining-Hall Menu Web App (React, NodeJS, PostgreSQL, AWS Lambda) 2023

- Built full-stack site using React and NodeJS for searching through University dining-hall menus, allowing for searching for specific food items, or planning diets with caloric and nutritional information
- Injested new data from dining hall website each night with script triggered by AWS Lambda

Autonomous Arduino Robot (Arduino, C/C++, FreeRTOS) 2022

- Designed and assembled a mobile robot from the ground up, integrating infrared and ultrasonic proximity sensors, a DC motor, a speaker, LEDs that could roll around, detect people, and greet them
- Programmed collision avoidance using FreeRTOS to schedule varying-priority tasks for motor control, sensor polling, and LED display updates, ensuring deterministic response times without blocking delays

Discord Multi-Function Bot (Python, Discord.py, FuzzyWuzzy, BeautifulSoup) 2022

- Built and deployed a feature-rich Discord bot with commands for tracking server word usage, analyzing emoji statistics, and recommending previously posted YouTube videos.
- Implemented dining-hall menu scraper using BeautifulSoup and string matching to query BU Dining menus in real-time, returning protein content, meal times, and dining hall location.
- Designed an AI-inspired "talk-to" module that generated responses mimicking individual server members, trained on their historical messages with fuzzy string matching for conversational similarity.
- Integrated asynchronous event handling and task scheduling via `discord.py`, handling dynamic server interactions, custom reactions, and automated moderation.