

UIUC Statement of Purpose

By September 2021, I was ready to move on from my job as a music instructor. I had been teaching a wide range of students one-on-one for over two years – now over four. In that time, I've discovered I enjoy teaching immensely. I love the challenge of demonstrating musical concepts in a variety of ways until each student understands. Though I've enjoyed this work, I started wondering for how long I wanted to do it. After exploring new career paths, I decided to look into Computer Science.

I enrolled in *CS50x: Introduction to Computer Science*. Although the course was designed to take 12 weeks minimum to complete, I took advantage of its self-paced format and extended the subject matter with independent study. For instance, Week 1 and 2 covered the C language: I lingered on that topic for over a month, enrolling in another course exclusively focused on C, before returning to begin Week 3. I did the same thing with Week 3 on Algorithms and Week 5 on Data Structures. In this way, the course was both a great foundation and a valuable organizing tool for all of my studying.

In my work as a music instructor, I keep track of 60+ students and their progress every week. I'd been using spreadsheets to organize this information. It worked alright, but I didn't like the incessant copy-pasting, mouse usage, and scrolling to find each entry for one particular student. I decided to build a CLI application in C, which I called Student Log. I built four versions of the application over the course of nine months, steadily improving it. For the first version, I used binary files to save information created in the app, reading and writing to these files with basic file manipulation in C. Later, I tightened things up with SQLite3. With a few keystrokes, I could access, update, create, and delete information for any student.

Week 6 of CS50x was on Python, which I didn't care for at first. I thought its dynamic typing was ambiguous, and I was accustomed to the design patterns of C. With time, my feelings changed and now it is a primary language for my projects, the first of which was the final project for this course.

Several years ago, I had a job as the manager of a coffee shop. While employed there, I made a simple inventory ordering and tracking system using spreadsheets. It worked fine, but it was sort of hacked together. For my CS50x final project, I built an Inventory Manager web application to replace the old system. I used Django, Python, and Bootstrap to build it, and by the time I was done, I had a strong grasp on Python and its capabilities. Even better, the coffee shop decided to use the application.

CS50x completed, I started honing my interests. I began learning C++ with the help of a Data Structures and Algorithms course; worked through the book *Bare Metal C*, which taught me the basics of Embedded Systems programming using an STM32 Nucleo board along with STM32's system workbench IDE; and I built a synthesizer in C++ that supports several types of waves forms (Square, Sine) and tunings (Just Intonation, Equal Temperament). With my interest in embedded systems, I was drawn to UIUC's course *Internet of Things* (CS 437).

Around that time, I became aware of the latest developments in AI. With the release of ChatGPT in November 2022, I initially felt concerned that my new skills would become obsolete in short order. I started feeling discouraged. However, I decided not to make AI into a

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bogeyman. I enrolled in CS50AI, a follow-up course to CS50x that with Python explores the landscape of AI. I learned about the MiniMax Algorithm; Bayesian Networks; Markov Models; Hill-Climbing Algorithms; Constraint-Satisfaction Problems; Nearest-Neighbor Classification; Support Vector Machines; and Convolutional Neural Networks. My favorite project was building a Bayesian Network to predict the likelihood of gene transference and mutation. The project was simple, but it got me exploring the nexus of machine learning and healthcare. For this reason, UIUC's *Deep Learning for Healthcare* (CS 598) and *Advanced Bayesian Modeling* (CS 598) stood out to me as I explored Online Master's degrees. I'm very keen to help solve pressing problems.

After CS50AI, I started the course *Practical Deep Learning for Coders* by Fast.ai. With the profound advances of CNNs in the last several years, I was excited to learn more in this course, which I'm working on right now. I'm impressed by its depth and top-down approach to learning, where we build projects first and foremost, only stopping to get deeper theoretical insight where it is needed.

My first project was an image classifier that can detect legato techniques on guitar by taking in audio clips, converting them to spectrograms, and training a neural network on them. I've experimented with several other applications since then, but by far my favorite was working on a classifier that uses images from the *Sentinel* satellites to detect *Harmful Algal Blooms* on the Pacific Northwest coastline. I'm still working out the details of this project. It's mainly a learning opportunity, but it speaks to my interest in building applications and tools that help solve critical problems. In fact, my research into HABs brought to my attention an IoT device called *AlgaeTracker*, a small floating measurement tool that transmits water analysis data every several minutes. This discovery spoke to my interest in embedded systems. Once again, these interests helped bring UIUC's courses to my attention – specifically *Applied Machine Learning* (CS 441) and, once again, *Internet of Things* (CS 437).

With the knowledge and skills I've acquired over the past two years, and with the projects I've been able to build, I'm prepared to enter the next stage of my learning by pursuing UIUC's Online Masters in Computer Science. I want to expand my interests and capabilities and I believe this is the program to do it. Thank you for reading.