

# **Final Reflection on My Summer 2024 Enrichment Experience at the Harvard Pre-Summer Camp**

*By Bill Xu*

Over the past two weeks, I had the incredible opportunity to attend the Harvard Pre-Summer Camp, where I participated in the "Mathematical Elements of AI" course. This program provided me with a comprehensive understanding of both the theoretical and practical aspects of artificial intelligence, making it a truly transformative experience.

Our class sessions were held Monday through Friday, where we delved into the foundational concepts of AI. We began with linear algebra, covering essential topics such as matrices, vectors, and eigenvalues. This strong mathematical foundation was crucial for understanding more complex AI topics. We then moved on to neural networks, learning about their architecture, activation functions, and the importance of weights and biases. A significant portion of our learning was dedicated to backpropagation, the algorithm that enables neural networks to learn and improve by minimizing prediction errors through weight adjustments. Throughout the course, we explored advanced techniques like batch normalization and dropout.

For the final project we were split into groups of five. The actual project consisted of three main parts. We first worked with the standard MNIST dataset to classify handwritten digits, which helped us understand the basic principles of image classification. The second part involved the CIFAR-10 dataset, a more complex dataset requiring the classification of images of various objects. This part challenged us to apply advanced techniques and strategies. The third part focused on the Fashion MNIST dataset, where we evaluated and fine-tuned our model to achieve optimal accuracy. We experimented with different architectures, hyperparameters, and training strategies. Our efforts culminated in a final presentation where we showcased our findings and results.

Living in the dorms was an enriching experience. Sharing a suite with five other students, we quickly formed strong bonds. Our common room became a hub for study sessions and relaxation. Social activities were a highlight, with memorable events like a movie night featuring "The Karate Kid" and a fun trip to an amusement park, where we raced to see who could speed down the waterslides faster. Additionally, we explored Boston, visiting historical sites and learning about the city's rich history.

Harvard's campus added a unique charm to the experience. The blend of historic and modern architecture provided a stunning backdrop for our daily activities. Walking to classes and exploring the campus grounds was always a delight, whether it was passing by the iconic Harvard Yard or enjoying the serene atmosphere around the various libraries and study areas. The campus's rich history and vibrant student life made it an inspiring place to learn and grow.

Overall, my time at the Harvard Pre-Summer Camp has been both productive and enjoyable. The rigorous academic curriculum, combined with engaging social activities, created a well-rounded and memorable experience. I gained valuable knowledge and skills in AI, formed lasting friendships, and enjoyed numerous fun and educational activities. This experience has not only deepened my understanding of artificial intelligence but also inspired me to pursue further studies and opportunities in this exciting field.

I am grateful to the Garwin Family Foundation for supporting me throughout this journey. Their generosity made this incredible experience possible, and I cannot thank them enough for their unwavering support.