In School

May 2, 2023 10:50 AM - 11:31
Day #16
Nick and Donovan
Donovan worked on solving the errors for pyttsx3, searching through the documentation to develop a more thorough comprehension of the variables and functions. Donovan figured out the errors had nothing to do with the code itself. Nick continued to work on his conversion function after researching how multiplying matrices in numpy works. Even though he was starting to understand how it worked he still ran into many problems with actually creating the function the way he wanted too because he did not fully understand how matrices worked.

May 3, 2023 10:50 AM - 11:31
Day #17
Nick and Donovan
Donovan found a potential fix by uninstalling the libraries needed on the main file and only using the libraries on the virtual machine; this was a working fix for the problems. The Voice AI worked but it was slow as it went through the ChatGPT server. Nick was taking the AP Lit exam.

May 4, 2023 10:50 AM - 11:31
Day #18
Nick and Donovan
Nick and Donovan were taking the AP Stats exam.

May 5, 2023 10:50 AM - 11:31
Day #19
Donovan and Nick
Donovan researched different AI models that would allow him to replicate the voice in order to make a more realistic text to speech bot. At the end of the day, Donovan decided to use Eleven Labs. Nick continued to work on the same function but his progress was very slow because it had been a few days since he worked on it. However, by the end of class, he was able to finish a function that would generate a matrix that represented a certain side.

May 8, 2023 10:50 AM - 11:31
Day #20
Donovan
Donovan downloaded MP4 of Mr. Cuomo and Mr. Eisner then converted them into MP3s to train the Eleven Labs AI on. Donovan learned how to find the correct range of stability and clarity for an accurate voice.

May 9, 2023 10:50 AM - 11:31
Day #21
Nick and Donovan
Donovan looked for similar projects on YouTube finding a creator that used Eleven Labs voice for a stock advisor, another that used OpenAI's ChatGPT with Gradio to create an AI chatbot website, along with another that used OpenAI's Whisper. Donovan then looked through the code of individual projects deciding to use the code he found to create the project. Now that Nick could generate a board matrix for each side, he began working on a function that would generate an input for his neural network. This would consist of matrices of both sides of the board as well as some other important details such as whose turn it was and the history of the board.

May 10, 2023 10:50 AM - 11:31
Day #22
Nick and Donovan
Donovan began to take apart the different projects examining the different lines of code and what they did, he started by taking out the configurations that the original creators had used, as the project wouldn't be catered in the same manner. Nick continued to work on his input function. Today he was able to create a matrix out of the board matrix for black and white at a given turn.

May 11, 2023 10:50 AM - 11:31
Day #23
Nick and Donovan
Donovan was out because of the AP World Exam. Nick finished up his input function by adding the move history for the last eight moves to the input matrix. This move history was detailed in the alphaZero paper which helps the model make better decisions.

May 12, 2023 10:50 AM - 11:31
Day #24
Nick and Donovan
Donovan was able to solve the errors on voice not working through researching the OpenAI Whisper errors on the Open AI Documentation, Reddit, StackOverflow, and Github. The audio could be written down by the chatbot and answered but not verbally. Nick was failing the AP Physics exam.

May 15, 2023 10:50 AM - 11:31
Day #25
Nick and Donovan
Donovan figured out that the essential error after removing coding was that ffmpeg and ffprobe were not installed to the root of the system. As Donovan was using the school computer he began to realize that he would not be able to finish the project on the school computer. Nick finished up implementing the move history in his function and then began working on creating

his MCTS program. He first began with researching a bit about MCTS where he looked at a few samples of MCTS for other games.

May 16, 2023 10:50 AM - 11:31
Day #26
Nick and Donovan
Donovan had to make a decision between switching to his home computer to finish the project or finding out why the mac refused to work. Donovan found out that the Mac had an alternative documentation and began to peruse it for information. Nick mostly researched tree data structures. He was able to get a relative understanding of them but he didn't understand what information needed to be passed down to child nodes or backpropagated up a branch when expanding the tree.

May 17, 2023 10:50 AM - 11:31
Day #27
Nick and Donovan
Having imported the project to his Mac, Donovan began to encounter new problems as the new mac visual studio version had several alterations to the original. Donovan finished solving errors that had arised for duplicating the project. Nick began working on creating a tree data structure with all of the necessary information. He first began with creating a node class so that node objects could be created in the field.

May 18, 2023 10:50 AM - 11:31
Day #28
Donovan
As Donovan knew that time was running out, he decided to work on simply having a chatbot work with Gradio. At the end of the day, Donovan had the chatbot working on a website so there would be something to show that everyone could interact with.

May 19, 2023 10:50 AM - 11:31
Day #29
Nick and Donovan
Donovan determined that the issue with the Mac was that the new Apple CPU was unable to convert the 16 bit audio files to 32 bit, this was an issue from sending the audio to the machine to process. Nick was taking the AP Calc exam.

May 22, 2023 10:50 AM - 11:31
Day #30
Nick and Donovan
Donovan researched different online IDEs, first Donovan looked into Replit. Unfortunately, Replit wouldn't be powerful enough to run the program even if it was split into separate files. Donovan started researching Google Collab. Nick somewhat finished his node class and began working on an action class. This would represent the information that was necessary for each move to

be represented in the tree. He was able to finish it but he was unsure whether he had all of the information he needed in the class.

May 23, 2023 10:50 AM - 11:31
Day #31
Nick and Donovan
Donovan started to work on collab due to its powerful CPU capabilities as a cloud based service, deciding to watch a tutorial on how google collab worked. Nick now used the node and action classes that he made to create a MCTS class. This was essentially just using the ideas that Nick saw in all of the papers he read now that the node and action classes were done.

Work at Home

May 4, 2023 11:00 pm - 1:00 am , 2:30 am - 4:00 am
Nick
Nick spent this time researching Numpy and matrices. Many of the concepts in the Numpy documentary require you to have taken higher math classes in order to understand them. Because of this, Nick had to do a lot of research about how matrices work because he had no prior knowledge on them even though they were very important for his program.

May 16, 2023 5:00 - 8:00 PM
Donovan
Donovan recreated the entire project on his macbook due to the school computer not being able to install ffmpeg to the root, it was not fun.

May 16, 2023 9:30 pm - 11:30 pm, 1:00 am - 4:00 am
Nick
Nick researched MCTS and how to actually implement it in chess. Certain values have to be Passed from nodes to their children and then backpropogated up the branch. This is used to approximate the value of certain action in a given state. He also looked at MCTS for other games and came across abstract classes in one example which made no sense to him.

May 23, 2023 7:00 - 10:30 PM
Donovan
Donovan recreated the entire project on Google Collab due to his macbook not being able to convert audio files from 16 bit to 32 bit, it was not fun.

Makeup Work

May 18, 2023 10:30 pm - 12:00 am, 1:00 am - 2:30 am
Nick finished creating his node class during this time. In this tree, a node will represent a board and certain information has to be passed down when expanding the tree. He finished the class by creating a function that would extend a node past its current state randomly if there are no predetermined values for the possible moves in that state.

Write Up

Goals: Nick wanted to continue his previous learning module by creating a Monte Carlo Tree Search program that would approximate the value of a move in a board state. This would in turn help the neural networks approximate values and therefore create somewhat better decisions. Donovan wanted to create a localized AI chatbot using OpenAI's API. First he would create a text to speech chat bot using OpenAI's API and PYTTSX3 then move on to create a text to speech AI chatbot with a real voice using OpenAI's API, Gradio, and Eleven Lab's API.

Accomplishments: Donovan was successfully able to create localized AI chatbot and text to speech AI chatbot with a real voice. The chatbot was able to recreate the voices of Mr. Cuomo and Mr. Eisner. Nick was able to convert a chess board into a series of matrices. He was also able to create a MCTS algorithm for chess that would approximate the value of a position and its moves.

Learned: Donovan learned how to use python in VScode. He hadn't used much python before but this learning module let him apply the skills he has learned in previous classes to use python. He also learned how to use libraries in python as they were essential to his project. Finally, he was able to make a voice AI using OpenAI's API, Gradio, and Eleven Lab's API. Nick learned a lot about Numpy when researching matrices because numpy had to be used to create and transform matrices. He also learned about tree data structures. A Tree had to be used in the MCTS program which consists of nodes, which represent board

Problems: Donvan had issues with getting python to work properly on both a cart laptop and his macbook. When trying to download python it would not install as there were administrative restrictions on using scripts with python with the school computer. Later when Donovan had to use ffmpeg and ffprobe they had to be used with the school computer's root which could not be done. Donovan knew he wanted to use OpenAI's Whisper with ffmpeg and ffprobe so he decided to redo the project on his Mac. When using the Mac, the Apple M1 didn't allow for converting 16 bit files to 32 bit files, because of this Donovan had to switch to a virtual environment/online IDE. Nick's main problem was not understanding how to properly use numpy and how matrices work. He hadn't learned any linear algebra so he could use the numpy documentation for help. He used math is fun to learn about matrices and fiddles around with numpy until worked for him. The next big problem he ran into was figuring out what information he needed to have in his node and action classes in his MCTS program. To resolve this he looked at examples of MCTS for other games and tried to figure out what information they used to approximate evaluations

Suggestions:

- Use Google Collab instead of Replit for larger scale online projects
    - (Replit can't process anything larger than a toaster)
- Use Gradio to create machine learning website UIs without CSS
- Learn how to use Numpy because it is very important for machine learning

    - Learned about matrices because they are essential and have to be use through numpy
- Learn how create and transform classes in python
- Fully research tree data structures before starting to code them because you will miss out on adding necessary information if you do not do so

Resources

First Davinci bot:
https://www.youtube.com/watch?v=jQFhtFMDz1s&t=547s
https://www.youtube.com/watch?v=k-ieXU3apBY&t=0s

Twitch stream creating voice chatbot:
https://www.twitch.tv/videos/1820717440

Ten part series using openAI:
https://www.youtube.com/watch?v=Lsn_OR9Fr3s

Chess resources:
AlphaZero Paper
Can Deep Reinforcement Learning Solve Chess?

MCTS resources:
https://www.geeksforgeeks.org/ml-monte-carlo-tree-search-mcts/
https://towardsdatascience.com/monte-carlo-tree-search-an-introduction-503d8c04e168

Matrices:
https://www.mathsisfun.com/algebra/matrix-multiplying.html