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# Introduction

For my NEA I will create an artificial intelligence to play the game of chess to an Elo of at least 1500. Any achievements above 2500 will be an outstanding for me and my stakeholders. I am building this project for a friend who needs a digital opponent who can adapt to her style of play in a way a human would. I feel that this project is of a suitable difficulty for me as it will challenge me to work independently and search for creative solutions to problems that arise.

To make the project easier in the long run I will use an Object-Oriented language / framework as the basis to my project. This will allow the project to have more synergy and makes debugging easier as the code will be split into separate files in which only relevant code will inhabit. The languages that could be used for a project like this are Python, Java, SwiftUI, C# / ++ as they either have simple ways to make a readable user interface or strong machine learning library that are industry standards. I have the most knowledge in python however if I find that another language is a better suit then the project will be coded in that language.

## analysis of existing solutions

The most well know solution is [chess.com](https://www.chess.com/). a website with differing levels of opponents, online PvP, challenges and UI customisation . despite this my friend has stated that it needs to run locally on her laptop and not require an internet connection. The UI must be simple, and the program should run a game immediately upon startup.

Her laptop has a chess game built into the operating system however she has stated that the user experience isn’t pleasing, and the game can run slowly on occasion and requires the device to be internet connected to use certain features such as more advanced opponents.

Stockfish -

# 

# Objectives

1. Learn how to code an AI and the intricacies of one.
   1. Are there different varieties or options for AI
   2. Understand how the activation functions of a network work
      1. What is an activation function
      2. How do they apply to NN
      3. What is the math behind these functions
      4. Which is most applicable for my scenario
   3. TensorFlow Vs Pytorch
      1. What are they and their applications
      2. Which one is better suited for my project and uses
2. Discover the best language to code it in as well as frameworks .
   1. Languages could include Python, C, C++, Java
   2. Learn how to use the relevant libraries for the language.
   3. Is an API necessary for processing the data
3. Code a playable game of chess in which no errors occur that affect the gameplay.
   1. The game must contain all key moves and plays such as en passent and castling.
   2. Different themes / colours for the board
4. (Optional) Allow the game to accept industry standard game setup code.
   1. Understand the industry codes for generating chess games (FEN).
      1. How do I integrate this into my game
   2. Have the game output a useable FEN string.
   3. Have the game accept a FEN string.
5. The user interface should be intuitive and easy to navigate
   1. Alternatively, it can boot straight into the game negating the need for a UI to navigate through
   2. The difference between efficient UI and an easy and intuitive UX

1. Understand how to create / maintain a repository.
   1. understand common terminology for git.
   2. link my IDE to GitHub so that my friend can access the project as its being developed to give feedback if she wants to

# My view on the project

My view on the project

This project and objectives should challenge me to produce a high standard and quality of work in order. The project is different to anything I have attempted before but will allow me to pull on my current knowledge and experience whilst expanding it further in order to learn and develop as a person.

All changes and the full project is available in this GitHub repository:

https://github.com/English-Garfield/CompSciNEA\_IK/

My friend wants a Chess AI that she can play against. It should have and adjustable Elo along with being able to help her make the best next move should she want it to help her progress as a player. It also must have a user interface that is easy to navigate.

Languages adv + dis adv: Python, C++, Java, JS etc

State chosen lang and reason why

# Technical Solution

To start this project, I needed to establish a repository. A repository is a way of keeping track of edits, branches, and merges within the project. Since this project will be done only by me branches will only be used when I’m coding the AI. For the time being all commits will be to the ‘main’ branch. The link to the repository is bellow:

the initial commit contained the ‘main.py’ file on the 19/04/24 which held the base script that my IDE generates. A long way to print the string hello world (because what else would it be). The language I have chosen to make this project in is Python due to its machine learning basis and library called PyGame which allows you to make games in python.

To help simplify this project I started by doing it using Object Oriented programming (OOP). OOP is a way of coding using classes and methods and attributes. Classes proved a framework that can be reused multiple times in the project where instances of each class have to be established.

A computer screen shot of a code

Description automatically generatednew = New() new is a instance of the class New().

This is one of the classes I have used. It’s called piece with two methods ‘\_\_init\_\_ ‘ and ‘draw’.

The \_\_init\_\_ method initialised the attributes used in the class. The Draw method loads our pieces onto the board using the Pygame.image.load() method that exists inside of the PyGame library. The f string allows me to directly load variables into the string

I soon figured out that this approach isn’t viable due to the complexity of it and it being approached in a way that I am not familiar with, so I deleted it all and started again working from a new angle of which the classes are held in separate files and imported into one.

A screenshot of a computer

Description automatically generatedThe new projected started on 26/04/24 and involved creating four new files to fit this new model. The only file that doesn’t fit this new model of coding is const.py that contains values that will remain the same throughout the project such as the screen dimensions and the number of columns and rows.

At this point I started to follow the YouTube video in the bibliography as it was apparent I needed help to guide me through this element project as I have limited experience using PyGame and for me to integrate artificial intelligence later on the game had to be water tight .

# Bibliography

* PyGame tutorials
  + <https://medium.com/javarevisited/how-to-build-a-chess-game-with-pygame-in-python-9eb0a7591776>