CS 40800
Team 10: Project Charter
Project Title: LogicAI

Team Members: Indhu Meena Ramanathan, Richard Hansen, Steven Dellamore, Columbus Holt

Problem Statement:

In the world of game-playing, there are a myriad of approaches that could be taken in order to play the game, either with other players or with an agent based on artificial intelligence. These agents are able to play against any number of different players, all with different strategies and approaches, and yet, the agent is able to play a competitive match. Our goal for this project is to develop an artificial intelligence agent to play a fractured line-matching game. The goal of the game is to enclose a shape by selecting the edges of the shape on the board, with the player and AI alternating turns, and winning points when completing a shape. This will provide players with a challenging competition against a well-trained AI, that they are free to access whenever they want to. This gives players the ability to improve their competitive and problem-solving skills through an interactive challenge game. The uniqueness lies in the creation of an agent that will be playing with various levels of difficulty in the game.

Project Objectives:

1. Build a game interface that will allow users to choose actions to take on the game board by selecting edges of a shape
2. Create and train an AI agent that will be able to choose moves to take on the game board based on reinforcement learning
3. Allow a human player to play against an AI agent and show the moves of both the human player and the AI on the game board
4. Provide an interface to the player to view and reset the game state
5. Create a scoring mechanism that will indicate players' results and winning players
6. Create automated tests to ensure the functionality of creating the game board and playing the game works as expected by using Mocha, Go Test, and Python unittest

Stakeholders:

- **Project Owners:** Steven Dellamore, Richard Hansen, Indhu Meena Ramanathan, and Columbus Holt
- **Software Developers:** Steven Dellamore, Richard Hansen, Indhu Meena Ramanathan, and Columbus Holt
- **Users:** Game enthusiasts, people interested in learning more about game-playing AI agents
- **Project Coordinator:** TBD

Deliverables:

- P5.js user interface that allows users to play the game by completing the game board.
    - Playing the game encompasses of selecting edges in order to have completed shapes. A completed shape is one that is considered to have all of its edges chosen. Completed shapes are denoted on the game board. The goal would be to have the most number of points determined from the completed shapes.
    - A scoring functionality to indicate the score of each of the players, for both the player and the AI.
    - A reset functionality to reset the game state after the game has been completed.
- GoLang backend that will serve network requests and transfer game states to and from the AI agent. We decided to use GoLang because of the built-in package testing suite that GoLang offers.
    - Main package that will spin the server up and start serving network requests.
    - Routes package that will contain all the routes exposed to the frontend.
- Python based AI game playing system that uses reinforcement learning
    - Using reinforcement learning, we will create and train an AI agent to play a competitive match against real players. The goal of the AI will be to maximize the reward in the situations from what it had learned through reinforcement learning.
    - Multiple AI models will be presented to the player to choose from, each with varying levels of difficulty so that the player will be given the chance to play different trained agents
- MySQL database that manages metadata, such as the information related to the instances
- Hosted on DigitalOcean, as it is an elegant and user-friendly hosting service

With our product, we will have a user-friendly UI that will allow users to easily play competitive matches against a trained AI agent to not only challenge their own game-playing abilities but also experience AI game-playing first-hand.