Hannan, Michael
CSCI 2114: Tashfeen's Data Structures
November 6, 2025

Homework 5

Est genus in totidem tenui ratione redactum
scriptula, quot menses lubricus annus habet;
Parua tabella capit ternos utrimque lapillos,
in qua uicisse est continuasse suos.

There is another game divided into as many parts
as there are months in the year;
A small board has three pieces on either side,
the winner must get all the pieces in a straight line.
—Ovid (Ars Amatoria III, lines 365-369)

Question 1. Read Chapter 5, Sections 5.1 and 5.2 (pg. 161–167) of "Stuart Russell and Peter Norvig. *Artificial Intelligence A Modern Approach* 3rd edition. (2010)." There is a copy at the library. No–seriously, *read ith*!

Question 2. Implement the Minimax algorithm for adversarial search in the Tic-tac-toe game tree.

Start by downloading and reading the starter code. You need to only edit the `Minimax.java` by implementing the unfinished Java methods. Upon successfully implementing all of the API, you may run `javac Game.java` and `java Game`. You'll be presented to make the first move. Click at the appropriate place to start the game.

Run `Test.java` and see if all the tests pass. It verifies the mathematical properties of the tree model you wrote.

Question 3. Once your game is functional and your `Minimax.java` class contains a game tree. You should start another Java class like this,

```
public class Investigate {
    public static void main(String[] args) {
        Minimax model = new Minimax(3);
        System.out.println(model.root);
    }
}
```

Write appropriate code in this file to answer the following questions,

1) How many tree-leaves result in a draw? Draws: 46080
2) How many of these leaves win for the first (max) player? Max Wins: 131184
3) How many of these leaves win for the second (min) player? Min Wins: 77904

Question 4. Ask two non-CS professors to play your implementation on your computer. Before they play, ask them if they think they can win and and after that how do they think the "AI" maybe picking its moves. State which professors (and their department) you interviewed and summarise their responses.

Submission Instructions

1) Turn in a PDF containing any plots, figures and/or answers from the homework.
2) Turn in your, `Minimax.java` and `Investigate.java`.