Tic Tac Toe AI

Computational Methods in Neuroscience

1 Introduction

As we do neuroscience research we start to realize how much of the computation done is actually a form of artificial intelligence. AI is simply just an umbrella term to describe computers performing the same tasks as humans that don't require a set of discrete repeated instructions. Machine learning falls under AI since as the computer collects more data it changes its outcome, seemingly "learning" from prior data. In this exercise you will be required to write a single method in a Tic Tac Toe game to check if either the computer or the player has achieved a valid Tic Tac Toe.

2 Matrix Representation

Your job is to complete the check method. The check method goes as follows:

```
def check(matrix):
  # Implement your code here
  return False
```

The variable matrix refers to a 3x3 matrix that has a 1 where the given player has a move and a 0 where it doesn't. The player can be either the actual player or the computer, but for all intents and purposes it does not matter. For instance, the computer's first move that always places its move in the middle would give you a matrix as such.

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

3 The Magic Square

The Magic Square refers to a 3x3 matrix in which a valid Tic Tac Toe can be summed up to 15. Here are some examples of Magic Squares.

$$\begin{bmatrix} 4 & 9 & 2 \\ 3 & 5 & 7 \\ 8 & 1 & 6 \end{bmatrix}$$

$$\begin{bmatrix} 6 & 7 & 2 \\ 1 & 5 & 9 \\ 8 & 3 & 4 \end{bmatrix}$$

Test out various possible Tic Tac Toe solutions to confirm.

4 Solution

You will find the following libraries imported for you at the top of the following file that contains the method you will have to implement.

```
# check.py

from itertools import combinations
import numpy as np
import matrixify
```

The first two libraries are Python libraries that we will cover in class, which the "matrixifiy" library is one created in this project for you. This library will not be covered in class and you will be expected to understand its functionality by looking at the code for it in the matrixify.py file. You are not required to use all these libraries and you can use any other libraries you may please.