

# CS365 Lab B - Part 1 Report

## Representation Scheme

To model the “Breakthrough” game environment, we use a 2D list (matrix) representation of the board. Each element in this list represents a square on the board and stores a character that indicates the presence of a piece or an empty space.

## Board Representation:

- The board is represented as an `R x C` grid, where `R` is the number of rows and `C` is the number of columns.
- Each cell in the grid can hold one of the following values:
  - X → Represents a black piece (top player).
  - O → Represents a white piece (bottom player).
  - '.' → Represents an empty square.

For example, an 8x8 board with 2 starting rows of pieces is represented as follows:

```

. . .
XXXXXXX
XXXXXXX
. . . . .
. . . . .
. . . . .
. . . . .
OOOOOOO
OOOOOOO
. . .
```

## **Justification**

- Simplicity: A 2D list is an intuitive way to represent a board game, as it directly maps to a grid layout.
- Efficiency: The board state can be accessed and updated in constant time  $O(1)$ .
- Flexibility: This structure allows easy modifications for different board sizes (e.g., 7x8, 5x5).

## **Transition Function Considerations**

- The board state should be immutable in functions that generate new states.
- Moves are performed by copying the board and updating the positions.
- Actions must respect the game rules, allowing forward moves and diagonal captures only.

This representation ensures that the Breakthrough AI can efficiently process and evaluate game states. Future implementations will leverage this structure for move generation, AI strategy, and game evaluation.