

# ChessCooker v4.0

By Brandon Dinh, Christopher Dao, Miguel Vidal, Ryan Lockie

Affiliation: The Chefs

Team7 - The Chefs



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# Glossary

## **Bishop**

Piece that can move diagonally across the board until it reaches the end or a different piece. Captures in the same way it moves.

## **Black**

One set of pieces is black, these always make the second move.

## **Capture**

Removing an opponent's piece from the chessboard

## **Castling**

A move in which the king is shifted two squares towards a rook on the same rank, placing the rook in the square crossed by the king. This is only possible when neither the king or rook have moved, the space between the two pieces is empty, and the king isn't passing through or finishing on a square that can be attacked by an enemy piece.

## **Check**

If the king is under check, it means that if the king isn't moved in the next turn, the king will be captured. If the king is under check, the only legal moves left are ones that remove the king from check.

## **Checkmate**

If the king is under check and the player has no options to prevent him from being captured the next turn. This is the win condition of chess.

## **Chessboard**

The chessboard is an 8x8 grid, made up of ranks and files.

## **En Passant**

A move in which a pawn can capture another pawn that just moved two tiles out of its initial position, by moving in front of the enemy pawn, rather than on top of it. This must be done right after the pawn being attacked moved to spaces out of its initial position, or it is considered to be an invalid move.

## **File**

A file is a vertical column on the board. There are 8 files, labeled a-h.

## **King**

Piece that can move diagonally, vertically, and horizontally, but only one space in the chosen direction. Captures in the same way it moves. Can come under check and if checkmated, the player loses.

**Knight**

Piece that can move eight different squares which are two steps forward plus one step sideways from its position. Capture the space it lands on.

**Pawn**

Piece that can move vertically up the board one space or two spaces when moving from the starting rank. Capture one space diagonally in front of it, or if available alternatively perform the en passant move. Pawns are also the only pieces that can be promoted.

**Promotion**

If a pawn reaches the other side's starting rank, they can be turned into any other piece besides a king

**Piece**

It is either a king, queen, pawn, rook, bishop, or a knight.

**Stalemate**

Occurs when a King is not in check and on move, but has no legal moves that can be made. This results in the game being over and a draw.

**Queen**

Piece that can move diagonally, vertically, and horizontally. Spaces that can be moved by this piece are only limited by the board and other pieces being in the way. Captures in the same way it moves.

**Rank**

A rank is a horizontal row on the board. There are 8 ranks, labeled 1-8.

**Rook**

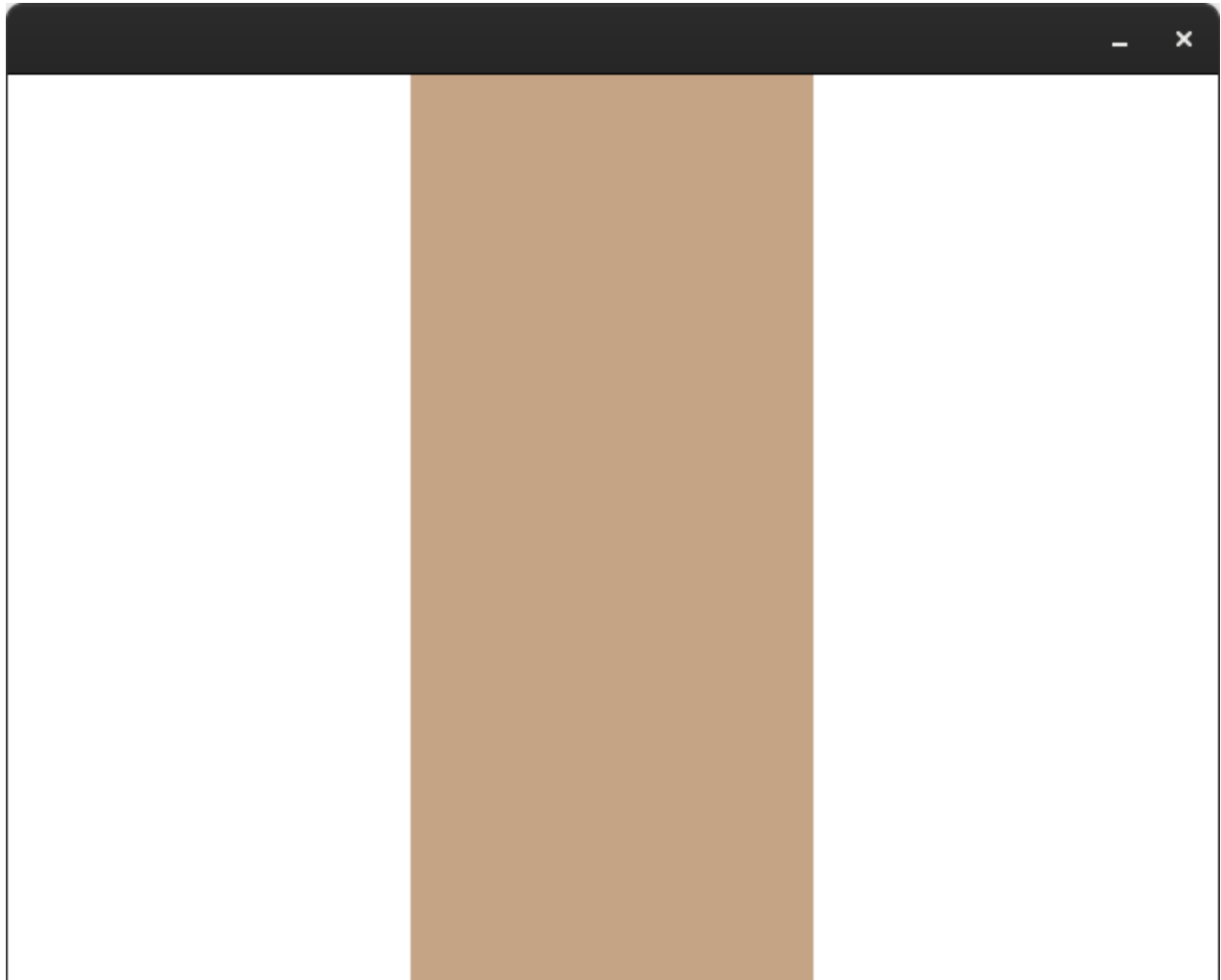
Piece that can move vertically, and horizontally across the board until it reaches the end or a different piece. Capture in the same way it moves.

**White**

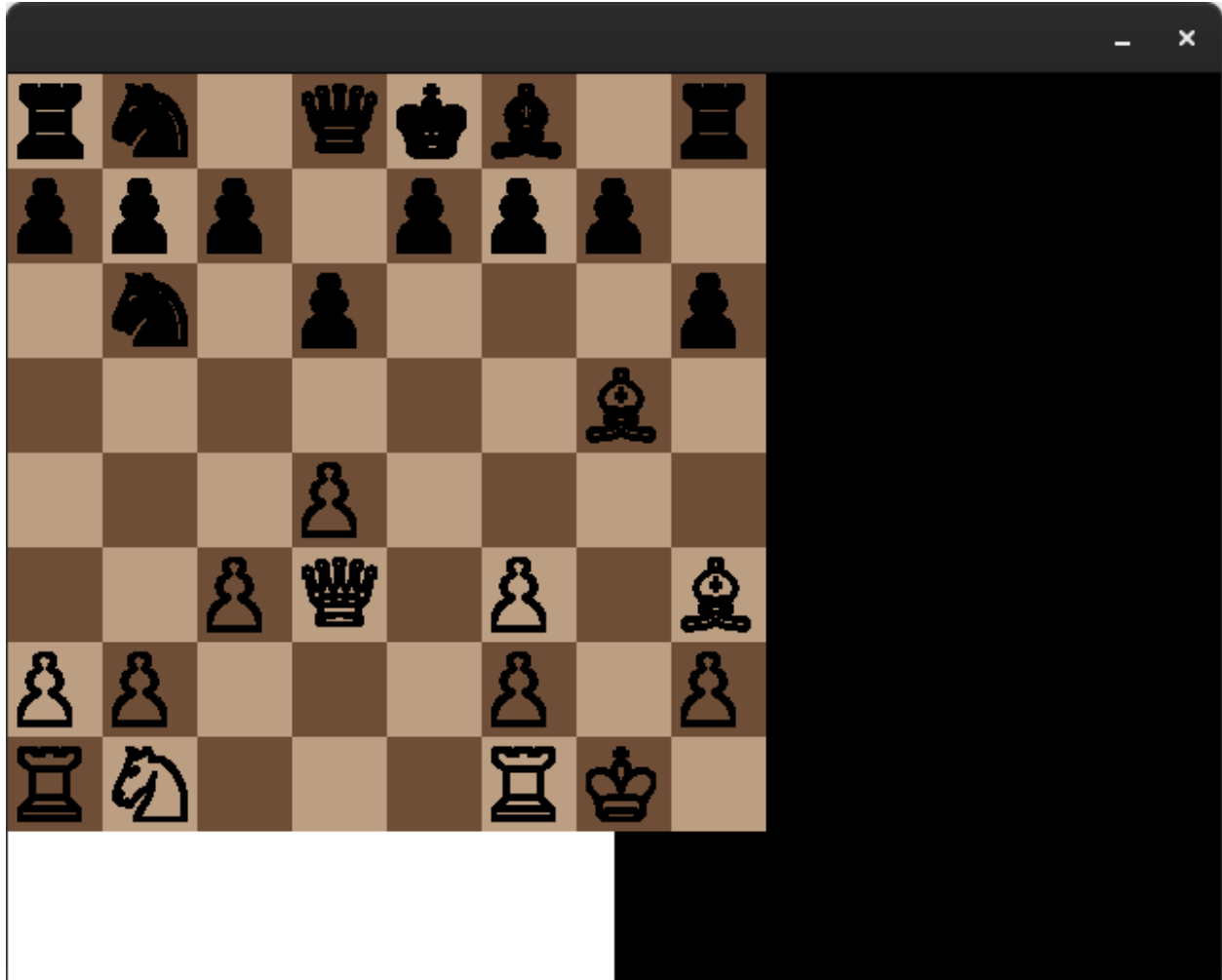
One set of pieces is white, these always move first.

# 1 Computer Chess

## 1.1 Usage Scenario







The chess program begins by displaying a menu that provides the options: human vs human (left side of display), human vs computer(middle of display), and computer vs computer(right side of display). After which, the player is prompted for the color they want. In this scenario, the color chosen is white. So, the human player is white. Pieces are moved by clicking on that piece and then clicking a valid position to move to. After a series of moves, the result is the board shown above.

## 1.2 Goals

1. Expert level chess algorithm to win the tournament.
2. Rotating the board to the current player's turn when the mode is player vs player.
3. Timers are provided on the GUI for both players.
4. Computer can support different levels of difficulty: beginner, intermediate, expert.
5. Possible moves are recommended to the player.
6. Visual cues for when the user is in check, achieves checkmate, achieves stalemate, and loses the game.

## 1.3 Features

1. The game follows the official rules of chess.
2. The program shows a game interface where the player can see the game board and make moves.
3. The program supports an interactive player (human user) and an automatic player (computer).
4. The human user chooses the side to play (white or black).
5. The program keeps a human readable log of all the moves (in a text file).
6. The computer player makes its moves in reasonable time (less than 1 minute per move).
7. The program supports human user vs human user gamemode.
8. The program supports computer vs computer gamemode.
9. Graphical User Interface (GUI) to play computer chess.
10. Shows the player the possible pieces the pawn can upgrade to when the pawn reaches the other end.



# 2 Installation

## 2.1 System Requirements

- PC with x86\_64 server
- Linux OS (CentOS-7-x86\_64)

## 2.2 Setup configuration

- Configure settings to support X11 forwarding
- Need to have an Xming server open
- Download ChessCooker code (Chess\_V1.0.tar.gz) to any empty folder
- After Chess\_v1.0.tar.gz is in the folder, use the command “gtar xvzf Chess\_V1.0.tar.gz”
- Next, “cd Chess\_v1.0”
- Then, “cd bin”
- Lastly, to run “./ChessCooker”

## 2.3 Uninstalling

- Remove file containing ChessCooker code using Linux command, “rm Chess\_V1.0.tar.gz” and “rm Chess\_V1.0”

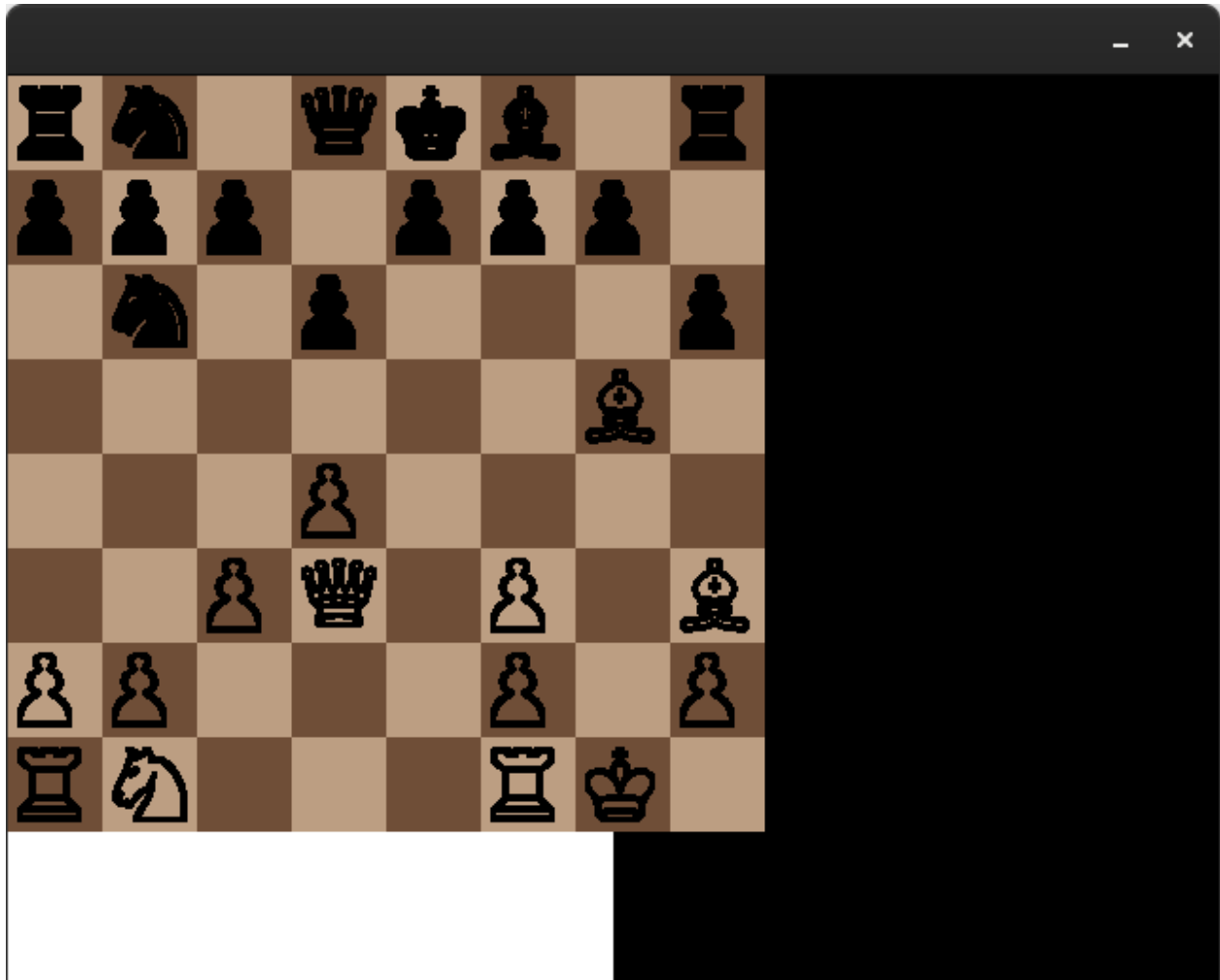
# 3 Chess Program Functions and Features

## 3.1 Graphical User Interactive Chessboard

**Description:** There will be a graphically interactive board displayed to the user, including all of the pieces. If they are on the board, they will be displayed. If they have been captured, they will not be displayed.

**User Input:** Mouse clicks are used to interact with the chessboard. Only pieces can be clicked on and interacted with.

**Program Output:** Pieces move across the screen when legal moves are made.

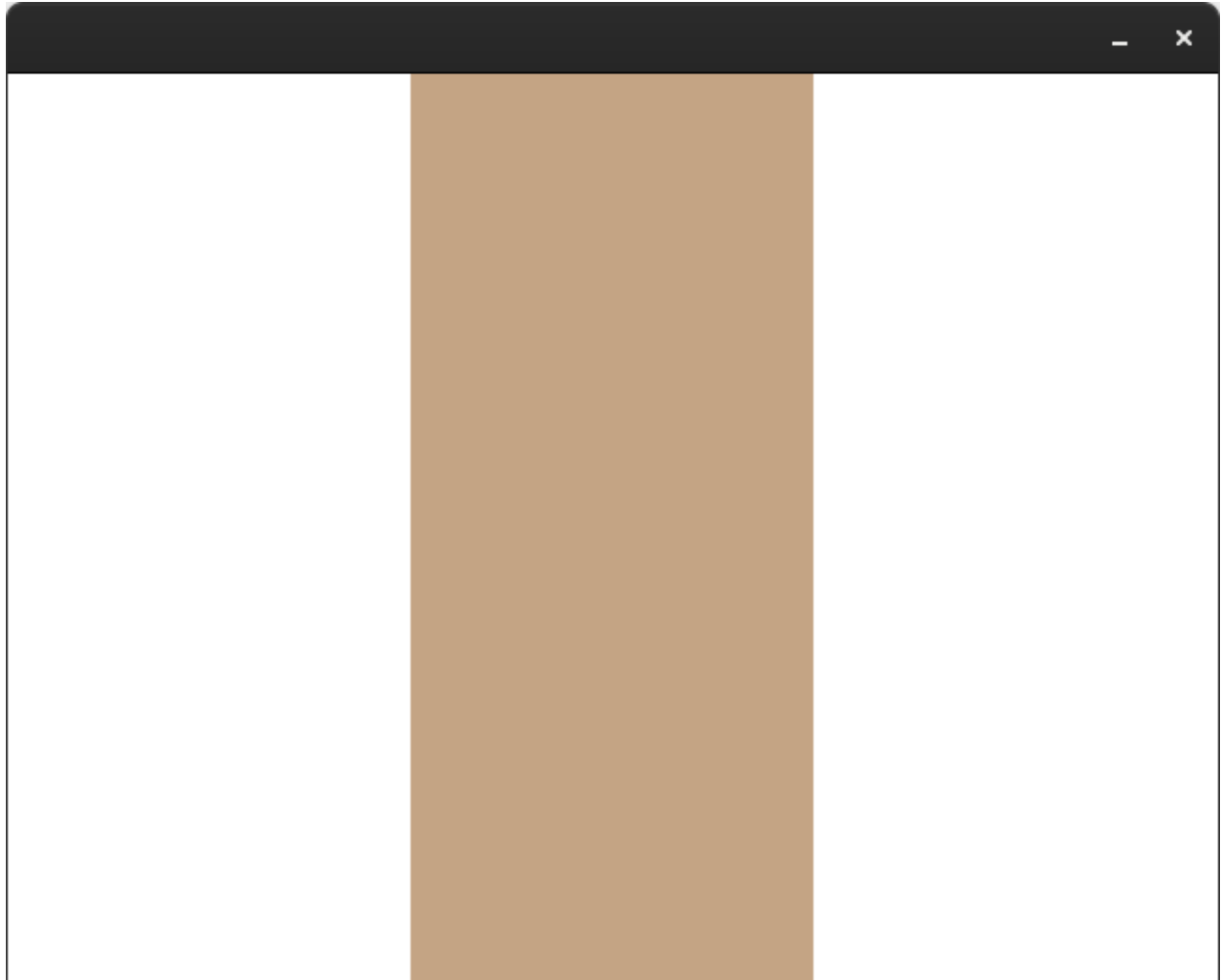


### 3.2 Menu Options - Gamemode

**Description:** This will show all the different game modes like human vs human, computer vs computer, human vs computer, and then the option to be black or white player. The user will first click on the desired gamemode and then click on white or black to choose color.

**User Input:** Mouse click on one of the desired game modes that are displayed.

**Program Output:** Once a gamemode is chosen, the menu options for what color the user wants to be is shown.

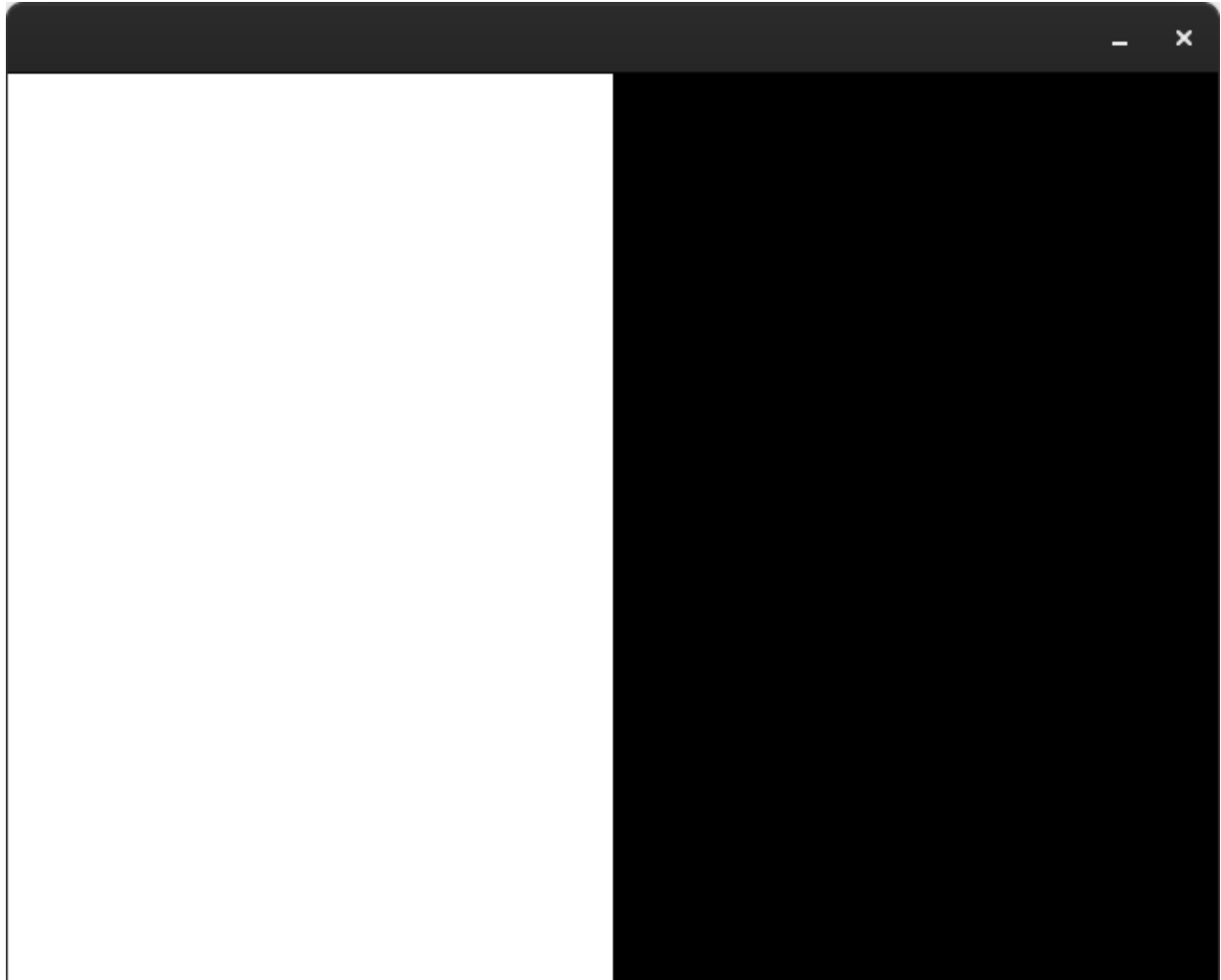


### 3.3 Menu Options - Choosing Player

**Description:** This will show all the different game modes like human vs human, computer vs computer, human vs computer, and then the option to be black or white player. The user will first click on the desired gamemode and then click on white or black to choose color.

**User Input:** Mouse click on desired color.

**Program Output:** Once a color is chosen, the chessboard will be loaded up according to the user chosen parameters and the game will begin.

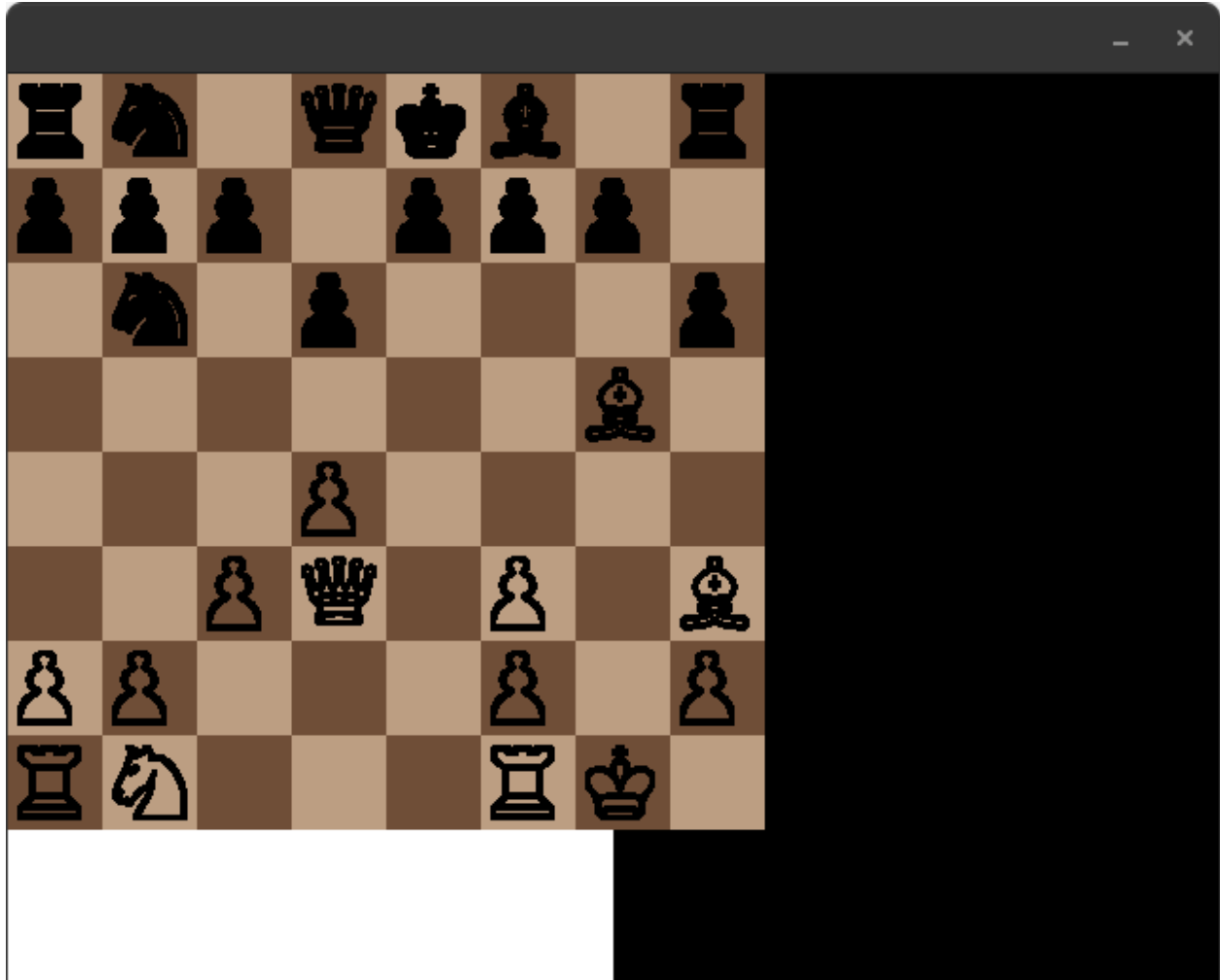


### 3.4 Moving a Piece

**Description:** The user will click on the piece they want to move on the GUI. To finish moving the piece, the user presses the desired square they want to move to and the piece will move there.

**User Input:** Mouse click on starting position then mouse click on target location.

**Program Output:** Assuming the move is valid, the targeted piece will be moved to the selected location, and if there was already a piece there, it will be considered captured.



### 3.5 Readable Log of Chess Moves

**Description:** This is a log of all the moves played by both sides. Will indicate what piece is being moved and where it moved from its last position. Also will tell whether a piece has been captured.

**User Input:** There is no direct input to complete this action, but in order to access the log, go into the bin directory (cd bin) and then open the log file in a text editor.

**Program Output:** A text file will be output which lists all of the previous moves using chess notation, from the entirety of the game.

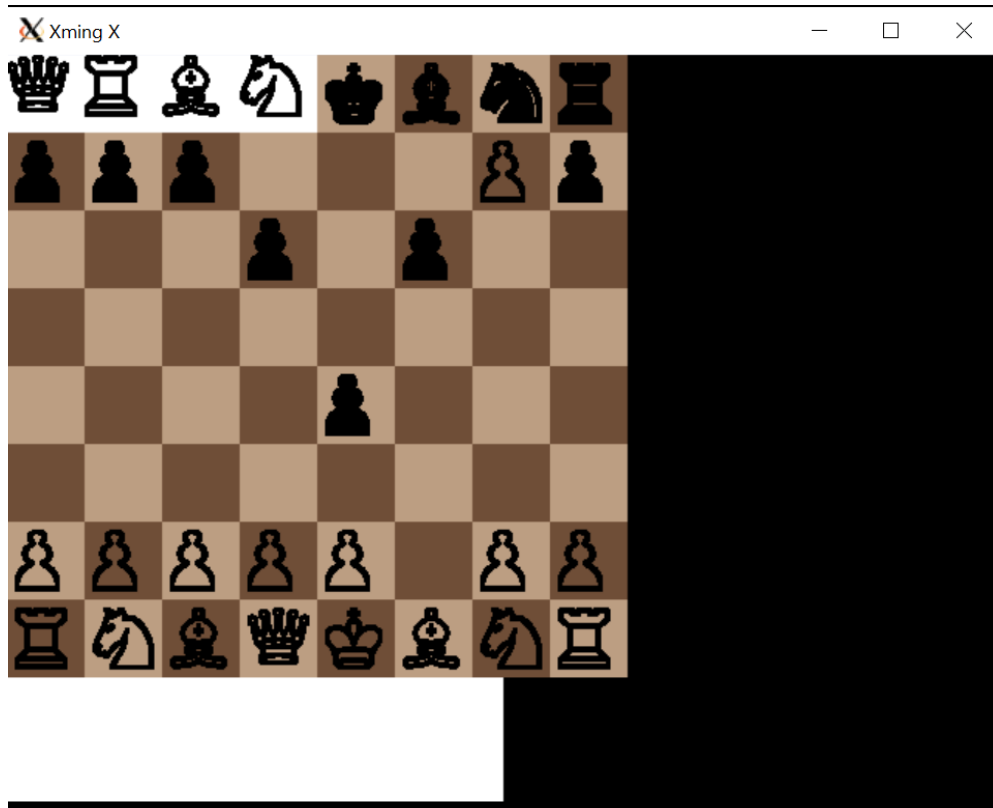
```
team7@bondibin
f2f4 d7d5
g2g3 Nb8a6
d2d4 Ra8b8
b2b4 Na6b4
a2a3 Nb4a6
a3a4 b7b6
Ra1a3 e7e6
Ra3b3 Rb8b7
g2e3
```

### 3.9 Pawn Promotion

**Description:** When a pawn reaches the end of the board it will be able to promote to any piece the user chooses which are the queen, rooks, bishop, or knight.

**User Input:** Mouse click on pieces that are being displayed.

**Program Output:** Promotes the pawn to the given piece type selected by the user.



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