

# CHESS PROGRAM

Version 1.0



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# Glossary of Chess Terms

## Units

**Pawn** ♙ : can move 2 forward from starting position, 1 otherwise. However it captures diagonally

**Knight** ♞ : can move in L pattern (3 in cardinal directions, then 1 perpendicular to original move)

**Bishop** ♗ : can move diagonally with no limit

**Rook** ♖ : can move cardinally in any direction with no limit

**Queen** ♕ : can move any number of squares in any direction - horizontal, vertical or diagonal - if her path is not blocked.

**King** ♔ : can move in any direction 1 space, cannot move into danger (check)

## Other Terminology

**Castling**: a special move in chess that uses both a rook and the king. In castling, the king is moved two squares toward the rook, and the rook moves past the king to the square right next to where the king has moved.

**En Passant**: a special pawn capture that can only occur immediately after a pawn makes a move of two squares from its starting square, and it could have been captured by an enemy pawn had it advanced only one square. The opponent captures the just-moved pawn "as it passes" through the first square. The result is the same as if the pawn had advanced only one square and the enemy pawn had captured it normally.

**Check**: a condition where the king is under threat of being captured, but there are moves in which the king can escape.

**Checkmate**: a condition where the king is under threat of being captured, and there are no legal moves for the king to escape.

# 1. Computer Chess

In this section, there are three subsections which will show the usage scenario, the goals of the chess program and the features that are implemented in the program.

## 1.1 Usage Scenario

While in this computer chess game, users will be presented with a chess board as seen in figure 1. The chess game supports the rules of chess. Human users may play against an AI or another player. Players will continue to make moves (Figure 4) until one side wins with a checkmate shown in figure 7. The chess game may also end with a stalemate like in figure 8.

8	bR	bN	bB	bQ	bK	bB	bN	bR
7	bP	bP	bP	bP	bP	bP	bP	bP
6								
5								
4								
3								
2	wP	wP	wP	wP	wP	wP	wP	wP
1	wR	wN	wB	wQ	wK	wB	wN	wR
	A	B	C	D	E	F	G	H

*Figure 1: Chess Board*

Figure 1 displays the layout of the chess board in game with the chess pieces in its initial positions.

```

Psssst... try      G2,G4.
White - Please choose your move(or "exit" to exit current game): B2B4

  +---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
  +---+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
  +---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
4 |   | wP |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
2 | wP |   | wP | wP | wP | wP | wP | wP |
  +---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
  +---+---+---+---+---+---+---+---+
  A   B   C   D   E   F   G   H

Psssst... try      C7,C6.
Black - Please choose your move(or "exit" to exit current game):

```

*Figure 2: Player Inputting Move*

Once a user inputs a move, the board will be printed according to the coordinates the user desires.

## 1.2 Goals

- The chess program goal is to create a platform where people can learn how to play chess.
- In order to win the game, you must checkmate the opponent's king.

## 1.3 Features

- The program is text based input and output where the user can use letter A-H as column and 1-8 as rows for their chosen unit and move spot. The board will be printed after each move.
- The game provided the features where the user can choose black side or white side as an indication of who will be the first player.
- Game log that outputs the moves played in a match
- Supports player being black side or white side
- Supports a computer/AI player

- The user may input "exit" when in game to quit the current game and return to the main game menu with its options
- A suggested move will be shown before a user inputs (figure 3)

```

Psssst... try      C7,C6.
Black - Please choose your move(or "exit" to exit current game): C7C6

  +---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
  +---+---+---+---+---+---+---+---+
7 | bP | bP |   | bP | bP | bP | bP | bP |
  +---+---+---+---+---+---+---+---+
6 |   |   | bP |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
4 |   | wP |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
2 | wP |   | wP | wP | wP | wP | wP | wP |
  +---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
  +---+---+---+---+---+---+---+---+
  A   B   C   D   E   F   G   H

```

*Figure 3: Suggested Move*

The figure above shows that there is a hint or move suggestion for the player before inputting a move.

## 2. Installation

### 2.1 System Requirements

- Operating System: Linux
- Storage Requirements: 10mb

### 2.2 Setup and Configuration

1. Download the release tarball from <https://github.uci.edu/EECS-22L-S-21-Team-Projects/Team03>
2. Navigate to the bin folder using “cd bin”
3. Run the game **./chessgame**

### 2.3 Uninstalling

1. Navigate to the folder containing the chess game folder
2. Run the delete command **rm -rf chessgame**

## 3. Chess Program Functions and Features

### 3.1 Player vs. Player Match

Select '1' in the game menu and you will be taken to the player vs. player chess match. The game begins when the white player enters a move. See Figure 4. When it is one player's turn, enter a move. For example, you can input the coordinates 'B2B4' like in figure 4 with capital letters in chess notation. After inputting the two coordinates with a chess unit on it, the chess board will be updated and printed. A suggested move will also be printed each time before inputting a move as well as seen in figure 3. In order to castle, you have to move the king to its location - like E1G1 for a white king's side castle; the king will move along with the rook. Each player will go through this process until either side's kings are checkmated or if there is a stalemate or draw like in figure 7 and figure 8 respectively. At any point in the game, you may input "exit," and you will be taken back to the main menu options as seen in figure 5.

```
Welcome to Player vs Player Chess Game!

  +---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
  +---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
  +---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+
2 | wP | wP | wP | wP | wP | wP | wP | wP |
  +---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
  +---+---+---+---+---+---+---+
  A   B   C   D   E   F   G   H

Psssst... try      G2,G4.
White - Please choose your move(or "exit" to exit current game): B2B4

  +---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
  +---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
  +---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+
4 |   | wP |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+
2 | wP |   | wP | wP | wP | wP | wP | wP |
  +---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
  +---+---+---+---+---+---+---+
  A   B   C   D   E   F   G   H

Psssst... try      C7,C6.
Black - Please choose your move(or "exit" to exit current game): C7C6
```



*Figure 4: Move Selection*

Figure 3 above displays the process of selecting a move. The input will be two coordinates in chess notations with capital letters. The image specifically shows how the beginning of a Player vs. Player match may start.

```

Welcome to Player vs Player Chess Game!

  +---+---+---+---+---+---+---+---+
8  | bR | bN | bB | bQ | bK | bB | bN | bR |
  +---+---+---+---+---+---+---+---+
7  | bP | bP | bP | bP | bP | bP | bP | bP |
  +---+---+---+---+---+---+---+---+
6  |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
5  |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
4  |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
3  |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
2  | wP | wP | wP | wP | wP | wP | wP | wP |
  +---+---+---+---+---+---+---+---+
1  | wR | wN | wB | wQ | wK | wB | wN | wR |
  +---+---+---+---+---+---+---+---+
    A   B   C   D   E   F   G   H
White - Please choose your move(or "exit" to exit current game): exit

-----
1: Player vs player
2: Player vs AI
3: Exit Program

-----
Please make your choice: |

```

*Figure 5: Exit Input*

At any time during a match of player vs. player or player vs. AI, you may input "exit" and the current game will be quitted and the program will return to the main menu.

## 3.2 Player vs. AI Match

Select '2' in the game menu and you will be taken to the player vs. AI chess match. The game begins when you choose the side you want to play - white or black - by inputting 'w' for white and 'b' for black (Figure 6). When it comes your turn, enter a move. Figure 4 shows a move selection. For example, you input two coordinates in chess notation like 'B2B4' with capital letters. After inputting the coordinates with a chess unit on it, the chess board will be updated and printed. In order to castle, you have to move the king to its location - like E1G1 for a white king's side castle; the king will move along with the rook. A suggested move will also be printed each time before inputting a move as well as seen in figure 4. When it is the computer's turn, the move will be made automatically followed by an updated printed chess board of the current game. This process continues until either side's kings are checkmated or if there is a stalemate in figure 7 and 8 respectively. At any point in the game, you may input "exit," and you will be taken back to the main menu options as seen in figure 5.

```
Welcome to Player vs AI chess game!
Choose White('w') or Black('b'): w

 8  +---+---+---+---+---+---+---+---+
    | bR | bN | bB | bQ | bK | bB | bN | bR |
 7  +---+---+---+---+---+---+---+---+
    | bP | bP | bP | bP | bP | bP | bP | bP |
 6  +---+---+---+---+---+---+---+---+
    |   |   |   |   |   |   |   |   |
 5  +---+---+---+---+---+---+---+---+
    |   |   |   |   |   |   |   |   |
 4  +---+---+---+---+---+---+---+---+
    |   |   |   |   |   |   |   |   |
 3  +---+---+---+---+---+---+---+---+
    |   |   |   |   |   |   |   |   |
 2  +---+---+---+---+---+---+---+---+
    | wP | wP | wP | wP | wP | wP | wP | wP |
 1  +---+---+---+---+---+---+---+---+
    | wR | wN | wB | wQ | wK | wB | wN | wR |
    +---+---+---+---+---+---+---+---+
      A   B   C   D   E   F   G   H

Psssst... try      E2,E4.
White - Please choose your move(or "exit" to exit current game): |
```

*Figure 6: White or Black Selection*

Right at the beginning of the Player vs. AI match, the user is to choose between having the white or black side.

8	bR	bN	bB	bQ	bK	bB	bN	bR	
7		bP	bP	bP		wQ	bP	bP	
6									
5					bP				
4	bP		wB		wP				
3	wP								
2		wP	wP	wP		wP	wP	wP	
1	wR	wN	wB		wK		wN	wR	
	A	B	C	D	E	F	G	H	
White - check									
White - Checkmate!									

*Figure 7: Checkmate*

Figure 6 shows an example game of when the white side checkmates the black side.

8									
7									
6									
5									
4									
3					bK				
2					bP				
1					wK				
	A	B	C	D	E	F	G	H	
White's king stalemate! Draw									

*Figure 8: Stalemate*

Figure 7 shows an example of a white's king stalemate.

### 3.3 Game Log

There will be a game log that keeps track of all legal moves made during the match. At the end of every chess game, you may choose to create an output text file in the root directory of the game. It will contain the file information, player information - whether the player was an AI or human - and the list of all the moves in the chess game.

### 3.4 Suggested Move

The game will suggest a move for the player.

```

      +---+---+---+---+---+---+---+
8  | bR | bN | bB | bQ | bK | bB | bN | bR |
   +---+---+---+---+---+---+---+
7  | bP |   |   |   | bP |   |   |   |
   +---+---+---+---+---+---+---+
6  |   | bP |   | bP |   | bP |   | bP |
   +---+---+---+---+---+---+---+
5  |   |   | bP |   | wP |   | bP |   |
   +---+---+---+---+---+---+---+
4  |   | wP | wP | wP |   | wP | wP | wP |
   +---+---+---+---+---+---+---+
3  |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+
2  | wP |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+
1  | wR | wN | wB | wQ | wK | wB | wN | wR |
   +---+---+---+---+---+---+---+
      A   B   C   D   E   F   G   H

Psssst... try      H4,G5.
White - Please choose your move(or "exit" to exit current game): H4G5

```

Example of a suggested move

## Back Matter

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### Error Messages

- Input illegal character in game menu

```

-----
1: Player vs player
2: Player vs AI
3: Exit Program
-----
Please make your choice: 4
Invalid option!
-----
1: Player vs player
2: Player vs AI
3: Exit Program
-----
Please make your choice: |

```

*Figure 9: Illegal Menu Option*

When inputting any other character from the menu options, there will be an error message and the user has to input again. The game menu will be printed again.

- Input illegal characters other than 'w' or 'b' in the beginning of Player vs. AI match

```

Welcome to Player vs AI chess game!
Choose White('w') or Black('b'): 6
Invalid color. White('w') or Black('b'): g
Invalid color. White('w') or Black('b'): b

  +---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
  +---+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
  +---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
2 | wP | wP | wP | wP | wP | wP | wP | wP |
  +---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
  +---+---+---+---+---+---+---+---+
  A   B   C   D   E   F   G   H

```

*Figure 10: Illegal Side Color*

At the start of the Player vs. AI game, the program will ask if you want to have the white or black side of the chess board.

- Input illegal move in chess game board for any chess piece

```

White - Please choose your move(or "exit" to exit current game): B2B4
  +---+---+---+---+---+---+---+---+
 8 | bR | bN | bB | bQ | bK | bB | bN | bR |
  +---+---+---+---+---+---+---+---+
 7 | bP | bP | bP | bP | bP | bP | bP | bP |
  +---+---+---+---+---+---+---+---+
 6 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
 5 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
 4 |   | wP |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
 3 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
 2 | wP |   | wP | wP | wP | wP | wP | wP |
  +---+---+---+---+---+---+---+---+
 1 | wR | wN | wB | wQ | wK | wB | wN | wR |
  +---+---+---+---+---+---+---+---+
    A  B  C  D  E  F  G  H
Black - Please choose your move(or "exit" to exit current game): H7H4
Invalid move. Please enter again(or "exit" to exit current game): ext
Invalid move. Please enter again(or "exit" to exit current game): |

```

*Figure 11: Illegal Move*

During any game, if you input incorrect coordinates as a player, the program will give you an invalid move message, and you have to enter a valid move again. Spelling “exit” incorrectly will also give an error message.

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