

Lab_7 – main.py

Lab_7 main.py

Project main.py TwoPlayerGame.py Player.py

```
from easyAI import TwoPlayerGame, AI_Player, Negamax #Student_name: Khalid_Nimri
from easyAI.Player import Human_Player #Student_ID: [REDACTED]
```

Structure

Run: main

Bookmarks

Player 1 what do you play ?

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Lab_7 – main.py

Lab_7 main.py

Project main.py TwoPlayerGame.py Player.py

23
24 # Does the opponent have three in a line?
25 def loss_condition(self):
26 possible_combinations = [[1, 2, 3], [4, 5, 6], [7, 8, 9],
27 [1, 4, 7], [2, 5, 8], [3, 6, 9], [1, 5, 9], [3, 5, 7]]
28
29 return any([all([(self.board[i - 1] == self.nplayer)
30 for i in combination]) for combination in possible_combinations])
31
32 # Check if the game is over
33
34 def is_over(self):
35 return (self.possible_moves() == []) or self.loss_condition()
36
37 # Show current position
38 def show(self):
39 print('\n' + '\n'.join([''.join(['.', '0', 'X'][self.board[3 * j + i]]
40 for i in range(3)]) for j in range(3)]))
41
42 # Compute the score
43 def scoring(self):
44 return -100 if self.loss_condition() else 0
45

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Player 1 what do you play ?

Version Control Run TODO Problems Terminal Python Packages Python Console Services

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Notifications

Lab_7 – main.py

Lab_7 main.py

Project main.py TwoPlayerGame.py Player.py

Show current position
def show(self):
 print('\n' + '\n'.join([' '.join(['.', '0', 'X'][self.board[3 * j + i]]
 for i in range(3)]) for j in range(3)))

Compute the score
def scoring(self):
 return -100 if self.loss_condition() else 0

if __name__ == "__main__":
 # Define the algorithm
 algorithm = Negamax(7)

 # Start the game
 GameController([Human_Player(), AI_Player(algorithm)]).play()

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Bookmarks

Player 1 what do you play ?

Version Control Run TODO Problems Terminal Python Packages Python Console Services

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Lab_7 – ~/PycharmProjects/Lab_7/venv/lib/python3.11/site-packages/easyAI/TwoPlayerGame.py

Lab_7 > venv > lib > python3.11 > site-packages > easyAI > TwoPlayerGame.py

Project

main.py × TwoPlayerGame.py × Player.py ×

Reader Mode | Notifications

import ...

> Lab_7

> Extentions

> Python <

> TwoPlayerGame.py

> Player.py

> main.py

> Scratches

1 import ...

2

3

4

5 class TwoPlayerGame(ABC):

6 """

7 Base class for... wait for it... two-players games !

8

9 To define a new game, make a subclass of TwoPlayerGame, and define

10 the following methods:

11

12 - ``__init__(self, players, ...)`` : initialization of the game

13 - ``possible_moves(self)`` : returns of all moves allowed

14 - ``make_move(self, move)``: transforms the game according to the move

15 - ``is_over(self)``: check whether the game has ended

16

17 The following methods are optional:

18

19 - ``show(self)`` : prints/displays the game

20 - ``scoring``: gives a score to the current game (for the AI)

21 - ``unmake_move(self, move)``: how to unmake a move (speeds up the AI)

22 - ``ttentry(self)``: returns a string/tuple describing the game.

23 - ``ttrestore(self, entry)``: use string/tuple from ttentry to restore a game.

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Bookmarks

Player 1 what do you play ?

Version Control Run TODO Problems Terminal Python Packages Python Console Services

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Lab_7 – ~/PycharmProjects/Lab_7/venv/lib/python3.11/site-packages/easyAI/TwoPlayerGame.py

Lab_7 > venv > lib > python3.11 > site-packages > easyAI > TwoPlayerGame.py

Project main.py × TwoPlayerGame.py × Player.py ×

The `__init__` method ***must*** do the following actions:

- Store ``players`` (which **must** be a list of two `Players`) into `self.players`
- Tell which player plays first with ```self.current_player = 1 # or 2```

When defining ``possible_moves``, you must keep in mind that you are in the scope of the ***current player***. More precisely, a subclass of `TwoPlayerGame` has the following attributes that indicate whose turn it is. These methods can be used but should not be overwritten:

- ```self.player``` : the current player (e.g. ```Human_Player```)
- ```self.opponent``` : the current Player's opponent (`Player`).
- ```self.current_player```: the number (1 or 2) of the current player.
- ```self.opponent_index```: the number (1 or 2) of the opponent.
- ```self.nmove```: How many moves have been played so far ?

For more, see the examples in the dedicated folder.

Examples:

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Player 1 what do you play ?

Version Control Run TODO Problems Terminal Python Packages Python Console Services

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Lab_7 > venv > lib > python3.11 > site-packages > easyAI > TwoPlayerGame.py

Project main.py × TwoPlayerGame.py × Player.py × Reader Mode Notifications

```
from easyAI import TwoPlayerGame, Human_Player

class Sticks( TwoPlayerGame ):
    ''' In turn, the players remove one, two or three sticks from
        a pile. The player who removes the last stick loses '''

    def __init__(self, players):
        self.players = players
        self.pile = 20 # start with 20 sticks
        self.current_player = 1 # player 1 starts
    def possible_moves(self): return ['1','2','3']
    def make_move(self,move): self.pile -= int(move)
    def is_over(self): return self.pile <= 0

    p
game = Sticks( [Human_Player(), Human_Player()] )
game.play()
```

Run: main ×

Bookmarks

Player 1 what do you play ?

Version Control Run TODO Problems Terminal Python Packages Python Console Services

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Project main.py × TwoPlayerGame.py × Player.py × Reader Mode Notifications

```
71 @abstractmethod
72     def possible_moves(self):
73         pass
74
75     @abstractmethod
76     def make_move(self, move):
77         pass
78
79     @abstractmethod
80     def is_over(self):
81         pass
82
83     def play(self, nmoves=1000, verbose=True):
84         """
85             Method for starting the play of a game to completion. If one of the
86             players is a Human_Player, then the interaction with the human is via
87             the text terminal.
88
89             Parameters
90             -----
91
92             nmoves:
```

Run: main ×

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Player 1 what do you play ?

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Lab_7 > venv > lib > python3.11 > site-packages > easyAI > TwoPlayerGame.py

Project main.py × TwoPlayerGame.py × Player.py × Reader Mode Notifications

```
91
92     nmoves:
93         The limit of how many moves (plies) to play unless the game ends on
94             it's own first.
95
96     verbose:
97         Setting verbose=True displays additional text messages.
98 """
99
100 history = []
101
102 if verbose:
103     self.show()
104
105 for self.nmove in range(1, nmoves + 1):
106
107     if self.is_over():
108         break
109
110     move = self.player.ask_move(self)
111     history.append((deepcopy(self), move))
112     self.make_move(move)
113
```

Run: main ×

Bookmarks

Player 1 what do you play ?

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Lab_7 > venv > lib > python3.11 > site-packages > easyAI > TwoPlayerGame.py

Project main.py × TwoPlayerGame.py × Player.py × Reader Mode Notifications

```
if verbose:
    print(
        "\nMove #{}: player {} plays {}".format(self.nmove, self.nplayer, str(move)))
    self.show()

    self.switch_player()

history.append(deepcopy(self))

return history

@property
def opponent_index(self):
    return 2 if (self.nplayer == 1) else 1

@property
def player(self):
    return self.players[self.nplayer - 1]

@property
```

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Bookmarks

Player 1 what do you play ?

Version Control Run TODO Problems Terminal Python Packages Python Console Services

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Lab_7 > venv > lib > python3.11 > site-packages > easyAI > TwoPlayerGame.py

Project main.py TwoPlayerGame.py Player.py

Reader Mode Notifications

```
135 @property
136     def opponent(self):
137         return self.players[self.opponent_index - 1]
138
139     def switch_player(self):
140         self.nplayer = self.opponent_index
141
142     def copy(self):
143         return deepcopy(self)
144
145     def get_move(self):
146         """
147             Method for getting a move from the current player. If the player is an
148             AI_Player, then this method will invoke the AI algorithm to choose the
149             move. If the player is a Human_Player, then the interaction with the
150             human is via the text terminal.
151         """
152         return self.player.ask_move(self)
153
154     def play_move(self, move):
155         """
156             Method for playing one move with the current player. After making the move,
```

Run: main

Bookmarks

Player 1 what do you play ?

Version Control Run TODO Problems Terminal Python Packages Python Console Services

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Lab_7 > venv > lib > python3.11 > site-packages > easyAI > TwoPlayerGame.py

Project

main.py × TwoPlayerGame.py × Player.py ×

Reader Mode | Notifications

```
152     return self.player.ask_move(self)
153
154 def play_move(self, move):
155     """
156     Method for playing one move with the current player. After making the move,
157     the current player will change to the next player.
158
159     Parameters
160     -----
161
162     move:
163         The move to be played. ``move`` should match an entry in the ``.possible_moves()`` list.
164     """
165     result = self.make_move(move)
166     self.switch_player()
167     return result
168
```

Run: main ×

Bookmarks

Player 1 what do you play ?

Version Control Run TODO Problems Terminal Python Packages Python Console Services

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Lab_7 – ~/PycharmProjects/Lab_7/venv/lib/python3.11/site-packages/easyAI/Player.py

Lab_7 > venv > lib > python3.11 > site-packages > easyAI > Player.py

Project main.py TwoPlayerGame.py Player.py

Reader Mode Notifications

```
1  """
2      This module implements the Player (Human or AI), which is basically an
3          object with an ``ask_move(game)`` method
4      """
5
6      try:
7          input = raw_input
8      except NameError:
9          pass
10
11     class Human_Player:
12         """
13             Class for a human player, which gets asked by text what moves
14             she wants to play. She can type ``show moves`` to display a list of
15             moves, or ``quit`` to quit the game.
16         """
17
18         def __init__(self, name="Human"):
19             self.name = name
20
21         def ask_move(self, game):
22             possible_moves = game.possible_moves()
```

Run: main

Bookmarks

Player 1 what do you play ?

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Lab_7 > venv > lib > python3.11 > site-packages > easyAI > Player.py

Project main.py TwoPlayerGame.py Player.py

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```
def ask_move(self, game):
    possible_moves = game.possible_moves()
    # The str version of every move for comparison with the user input:
    possible_moves_str = list(map(str, game.possible_moves()))
    move = "NO_MOVE_DECIDED_YET"
    while True:
        move = input("\nPlayer %s what do you play ? " % (game.nplayer))
        if move == "show moves":
            print(
                "Possible moves:\n"
                + "\n".join(
                    ["%d: %s" % (i + 1, m) for i, m in enumerate(possible_moves)])
            )
            + "\nType a move or type 'move #move_number' to play."
        )
        elif move == "quit":
            raise KeyboardInterrupt
        elif move.startswith("move #"):
            # Fetch the corresponding move and return.
            move = possible_moves[int(move[6:]) - 1]
```

Run: main

Bookmarks

Player 1 what do you play ?

Version Control Run TODO Problems Terminal Python Packages Python Console Services

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Lab_7 > venv > lib > python3.11 > site-packages > easyAI > Player.py

Project main.py TwoPlayerGame.py Player.py

Reader Mode Notifications

```
elif move.startswith("move #"):
    # Fetch the corresponding move and return.
    move = possible_moves[int(move[6:]) - 1]
    return move

elif str(move) in possible_moves_str:
    # Transform the move into its real type (integer, etc. and return).
    move = possible_moves[possible_moves_str.index(str(move))]
    return move

class AI_Player:
    """
    Class for an AI player. This class must be initialized with an
    AI algorithm, like ``AI_Player( Negamax(9) )``
    """

    def __init__(self, AI_algo, name="AI"):
        self.AI_algo = AI_algo
        self.name = name
        self.move = {}
```

Run: main

Bookmarks

Player 1 what do you play ?

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Lab_7 > venv > lib > python3.11 > site-packages > easyAI > Player.py

Project main.py TwoPlayerGame.py Player.py

Reader Mode Notifications

```
move = possible_moves[possible_moves_set : index(move)]  
return move  
  
class AI_Player:  
    """  
    Class for an AI player. This class must be initialized with an  
    AI algorithm, like ``AI_Player( Negamax(9) )``  
    """  
  
    def __init__(self, AI_algo, name="AI"):  
        self.AI_algo = AI_algo  
        self.name = name  
        self.move = []  
  
    def ask_move(self, game):  
        return self.AI_algo(game)  
64
```

Structure Bookmarks

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Player 1 what do you play ?

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Lab_7 – main.py

Lab_7 main.py

Project: Lab_7

main.py TwoPlayerGame.py Player.py

```
# Show current position
def show(self):
    print('\n' + '\n'.join([' '.join(['.', '0', 'X'][self.board[3 * j + i]]
                           for i in range(3)]) for j in range(3)]))
```

Run: main

```
/Users/klnimri/PycharmProjects/Lab_7/venv/bin/python /Users/klnimri/PycharmProjects/Lab_7/main.py
```

Player 1 what do you play ? 5

Move #1: player 1 plays 5 :

...

. 0 .

...

Move #2: player 2 plays 1 :

X . .

. 0 .

...

Player 1 what do you play ? 3

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Lab_7 – main.py

Lab_7 > main.py

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```
# Show current position
def show(self):
    print('\n' + '\n'.join([' '.join(['.', '0', 'X'][self.board[3 * j + i]]
                           for i in range(3)]) for j in range(3)]))
```

Run: main

```
Move #2: player 2 plays 1 :

X . .
. 0 .
. . .

Player 1 what do you play ? 7

Move #3: player 1 plays 7 :

X . .
. 0 .
0 . .

Move #4: player 2 plays 2 :

X X .
. 0 .
0 . .
```

Structure Bookmarks

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Lab_7 – main.py

Project: Lab_7 | main.py | TwoPlayerGame.py | Player.py

```
# Show current position
def show(self):
    print('\n' + '\n'.join([' '.join(['.', '0', 'X'][self.board[3 * j + i]] for i in range(3)]) for j in range(3)]))
```

Run: main

Move #4: player 2 plays 2 :

X X .
. 0 .
0 . .

Player 1 what do you play ? 9

Move #5: player 1 plays 9 :

X X .
. 0 .
0 . 0

Move #6: player 2 plays 4 :

X X .
X 0 .
0 . 0

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Lab_7 > main.py

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```
# Show current position
def show(self):
    print('\n' + '\n'.join([' '.join(['.', '0', 'X'][self.board[3 * j + i]] for i in range(3)]) for j in range(3)]))
```

Run: main

Move #6: player 2 plays 4 :

X X .
X 0 .
0 . 0

Player 1 what do you play ? 8

Move #7: player 1 plays 8 :

X X .
X 0 .
0 0 0

Move #8: player 2 plays 3 :

X X X
X 0 .
0 0 0

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