AI Games course

Certificate 1, session 3

“What does the data say?”

AIgaming.com

Strategy so far

- In the *target mode*, search through the space around the wounded piece of ship.
- In the *hunt mode*, aim randomly.

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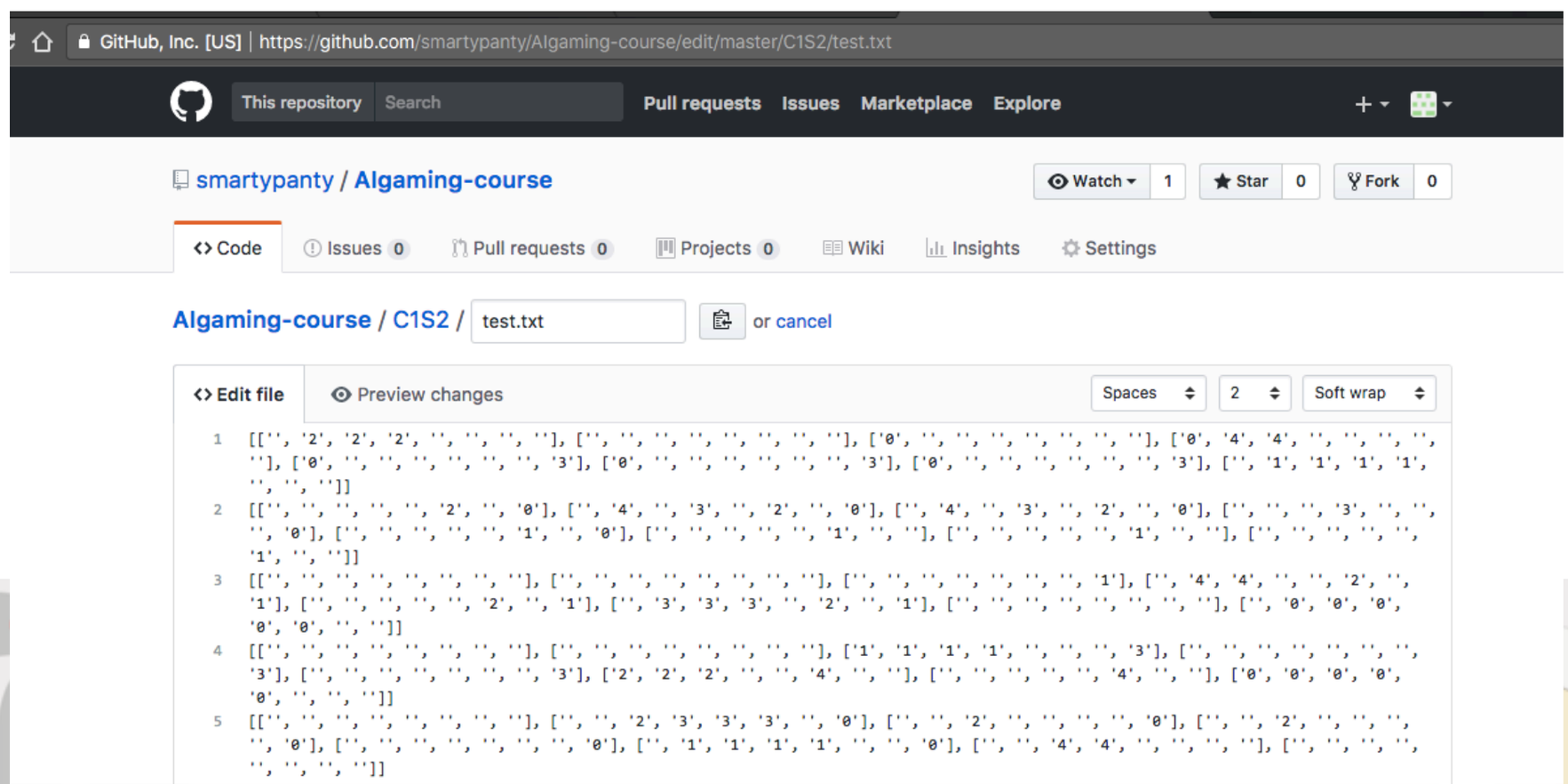
Let's improve on that!

Learning from data

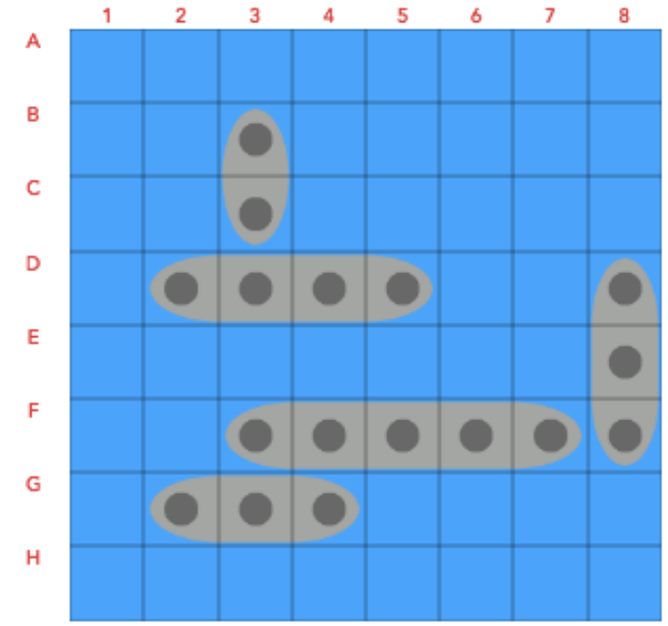
- **Idea**: instead of randomly searching for a ship, let's *predict* where it *probably* is.
- there may be a pattern in how a user arranges ships, e.g.:
  - all ships stacked in one place, or
  - all ships in corners, etc.
- given what you already know about the opponent's board, hit the cell that is *most likely* to contain a ship, *based on the data.*

User logs

- download *boards.txt*
- https://github.com/smartypanty/AIgaming-course/blob/master/C1S2/boards.txt
- 60000+ real board arrangements generated by the users (only 179 default arrangements)



User logs



- download *boards.txt*

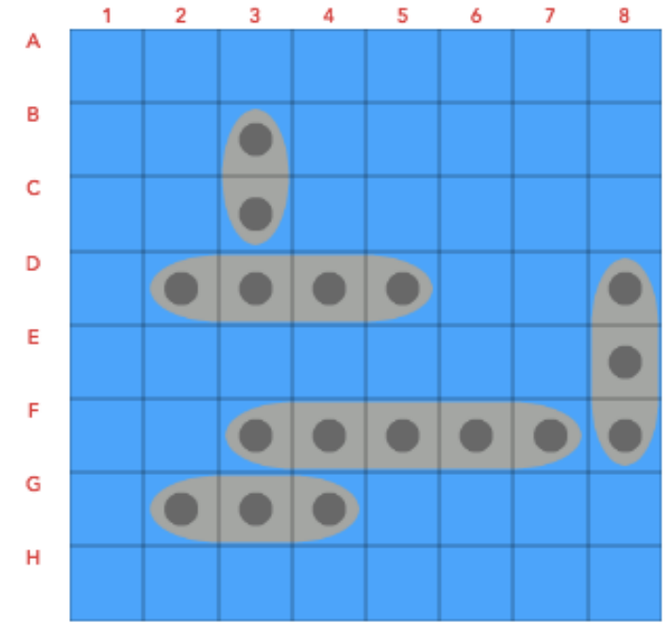
```
...
[['', '', '', '', '', '2', '', '0'], ['', '4', '', '3', '', '2', '', '0'], ['', '4', '', '3', '', '2', '', '0'], ['', '', '', '3', '', '', '', '0'], ['', '',
'', '', '', '1', '', '0'], ['', '', '', '', '', '1', '', ''], ['', '', '', '', '', '1', '', ''], ['', '', '', '', '', '1', '', '']]
[['', '', '', '', '', '', '', ''], ['', '', '', '', '', '', '', ''], ['', '', '', '', '', '', '', '1'], ['', '4', '4', '', '', '2', '', '1'], ['', '', '', '', '',
'2', '', '1'], ['', '3', '3', '3', '', '2', '', '1'], ['', '', '', '', '', '', '', ''], ['', '0', '0', '0', '0', '0', '', '']]
[['', '', '', '', '', '', '', ''], ['', '', '', '', '', '', '', ''], ['1', '1', '1', '1', '', '', '', '3'], ['', '', '', '', '', '', '', '3'], ['', '', '', '', '',
'', '', '3'], ['2', '2', '2', '', '', '4', '', ''], ['', '', '', '', '', '4', '', ''], ['0', '0', '0', '0', '0', '', '', `']]
...
```

one row of the board

a ship “lying” horizontally

one board

User logs



- access *boards.txt*

```
import urllib.request

url = urllib.request.urlopen("https://raw.githubusercontent.com/smartypanty/
AIgaming-course/master/C1S2/test.txt")
s = url.read().decode()
boards = s.splitlines()

print(len(boards)) # 67174 boards
```

Predicting ship placement

- **def calculateMove:**

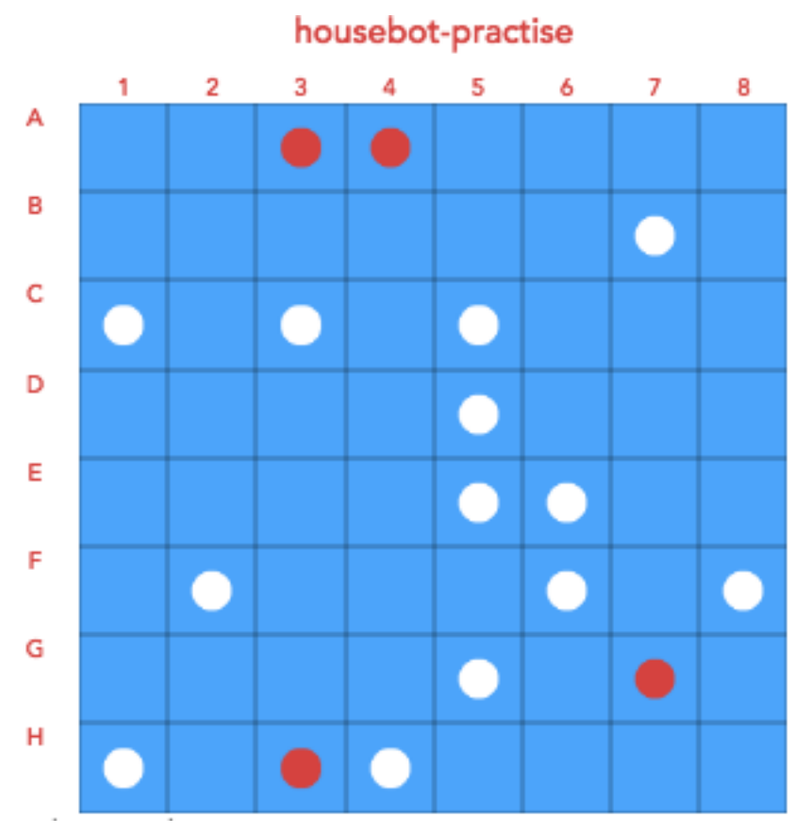
```
29 def calculateMove(gameState):
30     if "handCount" not in persistentData:
31         persistentData["handCount"] = 0
32     if gameState["Round"] == 0:
33         #move = exampleShipPlacement()  # Does not take land into account
34         move = deployRandomly(gameState)
35     else:
36         persistentData["handCount"] += 1
37         move = chooseRandomValidTarget(gameState)
38     print(str(persistentData["handCount"]) + '. MOVE: ' + str(move))
39     return move
40
```

Let's modify the *else*-statement to accommodate probabilities.

Predicting ship placement

1) From *gameState*, parse the current state of the opponent's board:

'OppBoard': [['', '', 'H', 'H', '', '', '', ''], ['', '', '', '', '', '', 'M', ''], ['M', '', 'M', '', 'M', '', '', ''], ['', '', '', '', 'M', '', '', ''], ['', '', '', '', 'M', 'M', '', ''], ['', 'M', '', '', '', 'M', '', 'M'], ['', '', '', '', 'M', '', 'H', ''], ['M', '', 'H', 'M', '', '', '', '']]

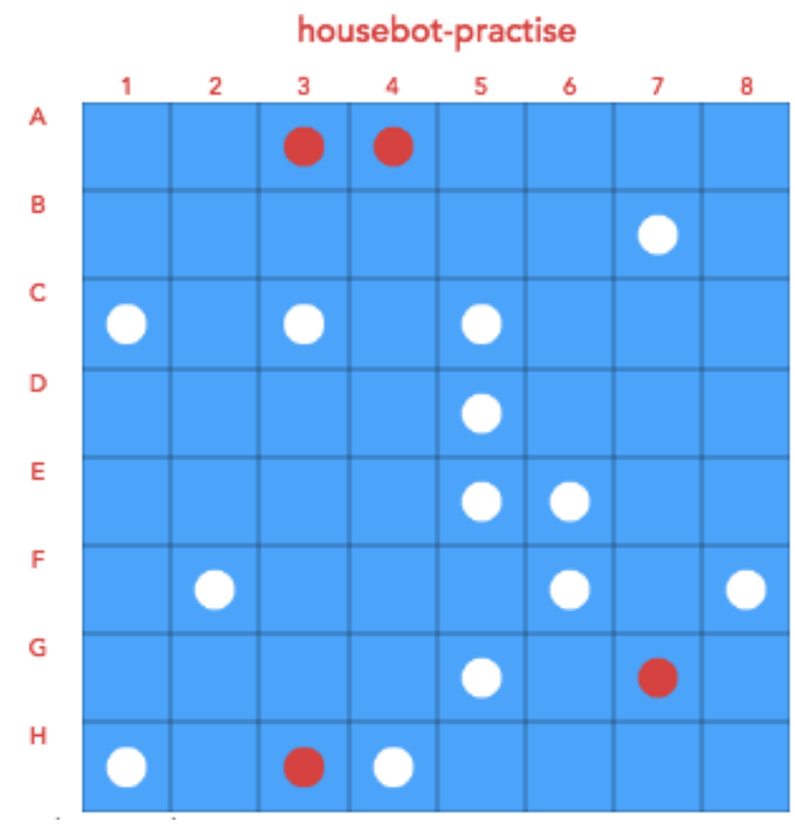



```
oppBoard = gameState['OppBoard']
```

Predicting ship placement

2) in *boards.txt*, find those boards that coincide with *OppBoard* on the known cells:

E.g., [['0', '0', '0', '0', '0', '', '', '3'], ['', '', '', '', '', '', '', '3'], ['', '', '', '', '', '', '', '3'], ['2', '2', '2', '2', '', '', '', ''], ['', '', '', '', '', '', '1', ''], ['', '', '', '', '', '', '1', ''], ['', '', '', '', '', '', '1', ''], ['', '4', '4', '', '', '', '1', '']]



We will call them *similar boards.*

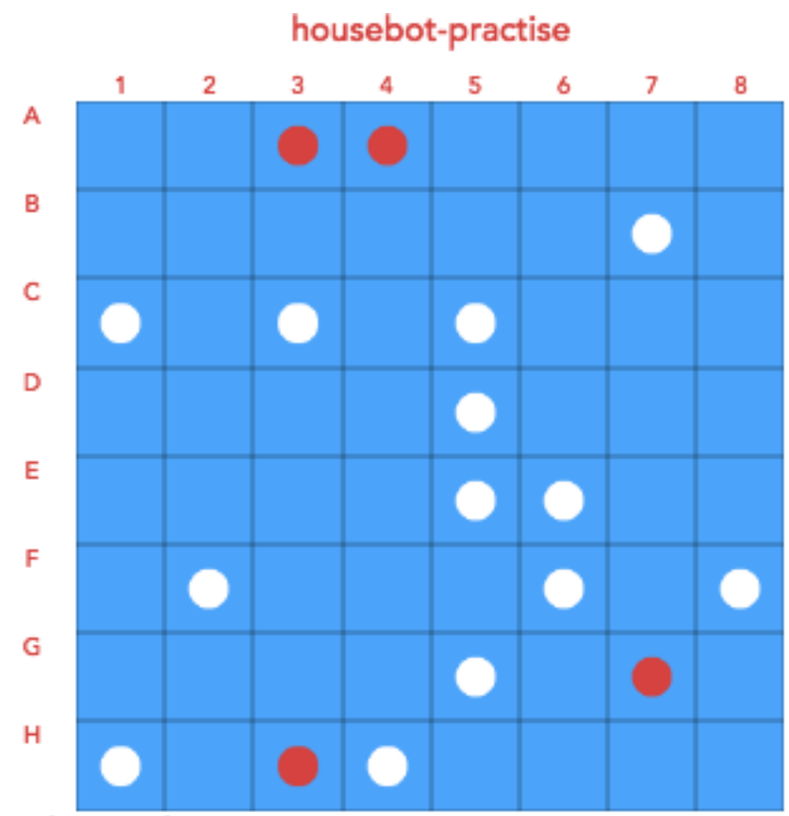
..

Predicting ship placement

3) find cells on similar boards that:

- are not yet opened on *OppBoard*, and

- contain ships in the maximum number of similar boards.



E.g.: [['', '', 'H', 'H', '', '', '', ''], ['', '', '', '', '', '', 'M', ''], ['M', '', 'M', '', 'M', '', '', ''], ['', '', '', '', 'M', '', '', ''], ['', '', '', '', 'M', 'M', '', ''], ['', 'M', '', '', '', 'M', '', 'M'], ['', '', '', '', 'M', '', 'H', ''], ['M', '', 'H', 'M', '', '', '', '']]

Predicting ship placement

for every unopened cell on *OppBoard*:

cell_score := # of similar boards that contain ship in that cell;

pick the cell with the highest score.

Handling data sparsity

- 60,000 boards is not that much data to learn from!
- what if you cannot find similar boards?

  Ex 1: round 3, thousands of similar boards that do not contain a ship in (row B, column 7)

  ‘OppBoard': [['', '', '', '', '', '', '', ''], ['', '', '', '', '', '', 'M', ''], ['', '', '', '', '', '', '', ‘’], ['', '', '', '', '', '', '', ‘’], ['', '', '', '', '', '', '', ‘’], ['', '', '', '', '', '', '', ‘’],['', '', '', '', '', '', '', ‘’], ['', '', '', '', '', '', '', ‘’]]

  Ex 2: round 30+, possibly no similar boards with the given ship arrangement

  E.g., [['H', 'H', 'H', 'H', 'M', '', '', 'H'], ['M', 'M', '', 'M', '', '', '', 'H'], ['M', 'M', '', '', 'M', '', '', ''], [‘H', ‘M', 'M', 'H', 'M', '', 'M', ''], ['M', 'M', 'M', '', 'M', 'M', 'H', ''], ['M', '', 'M', 'M', '', ‘M', 'H', 'M'], [‘M', 'M', 'M', 'M', '', '', ‘H’, ''], [‘', 'H', 'M', '', '', 'M', 'H', ‘']]

Handling data sparsity

- in case there are no similar boards for a given OppBoard:
  - either revert to *deployRandomly(gamestate)*, or
  - make a *soft comparison* of boards, i.e., find boards that are most similar to OppBoard

Has the performance improved?

- In the hunt mode, we moved from a random guess to an *educated guess* which is based on data;
- In the target mode, we moved from a random guess to search;

Have we improved?

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Have we improved?

Try running your bot *n* times (10, 50, 100…), and then run the default random bot against the same opponent (e.g., housebot-practice) *n* times.

Has the win/lose ration changed? Tell us!