

Design document:

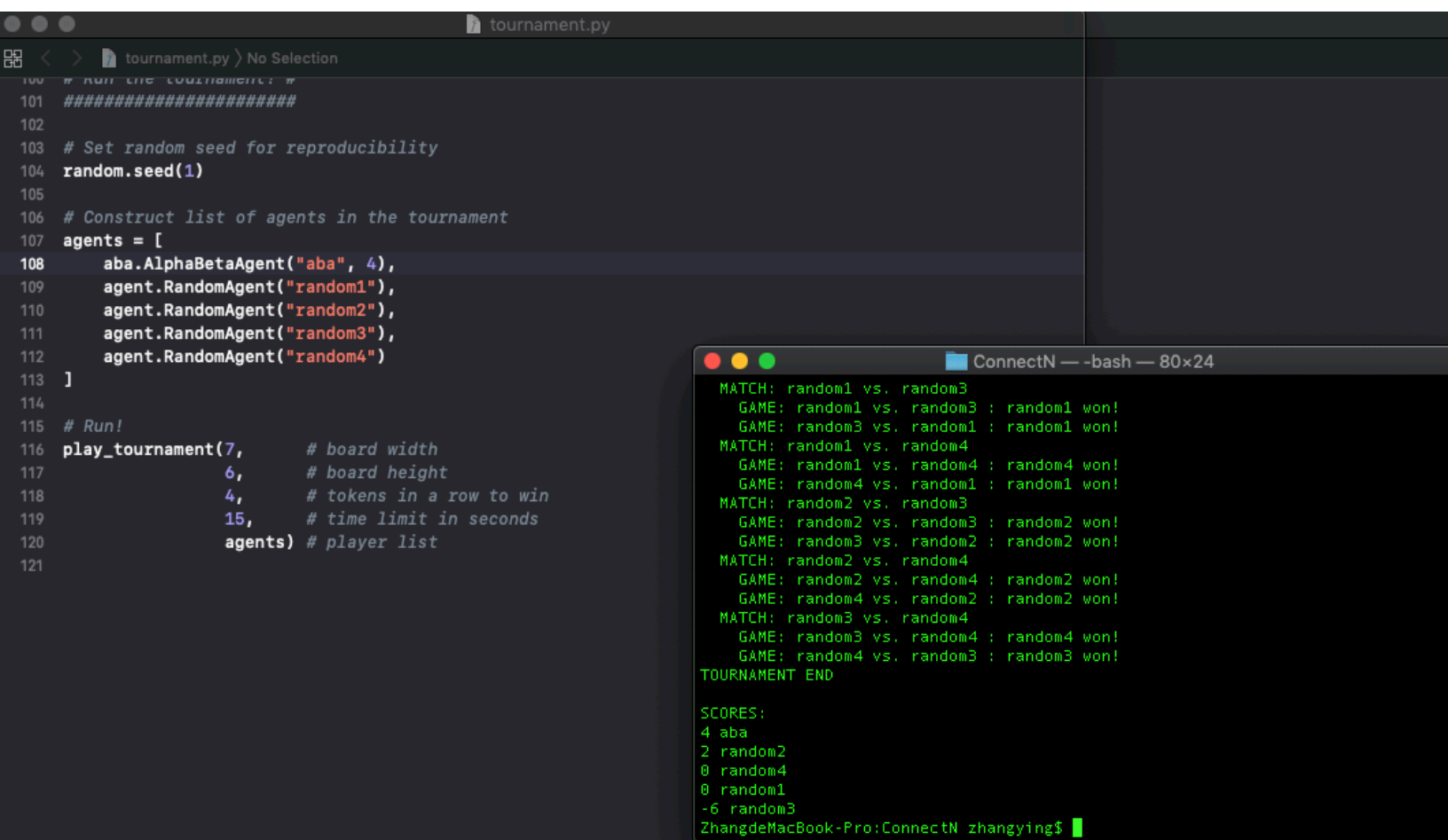
Several heuristics were tried based on what planned in hw2:

1. Maximize the number of 2, 3 and 4 streaks in a row, for losing boards assigns a large negative value.
2. Limits the range of next move. Check for the closes seven positions, assign score for those with potential win. (planned in hw2)
3. Anticipate direct losing moves and block the direct wining moves of opponent, assigns a large negative value for losing boards.

The agent was tested with different depth: 2,4,6,8,10

It turns out more depth led to better performance(takes longer time) and combines of offense and defense heuristics works better.

For a 7* 6 board, I use a depth of 4, which generate following result



The image shows a code editor window titled 'tournament.py' and a terminal window titled 'ConnectN — -bash — 80x24'.

The code editor shows the following Python code:

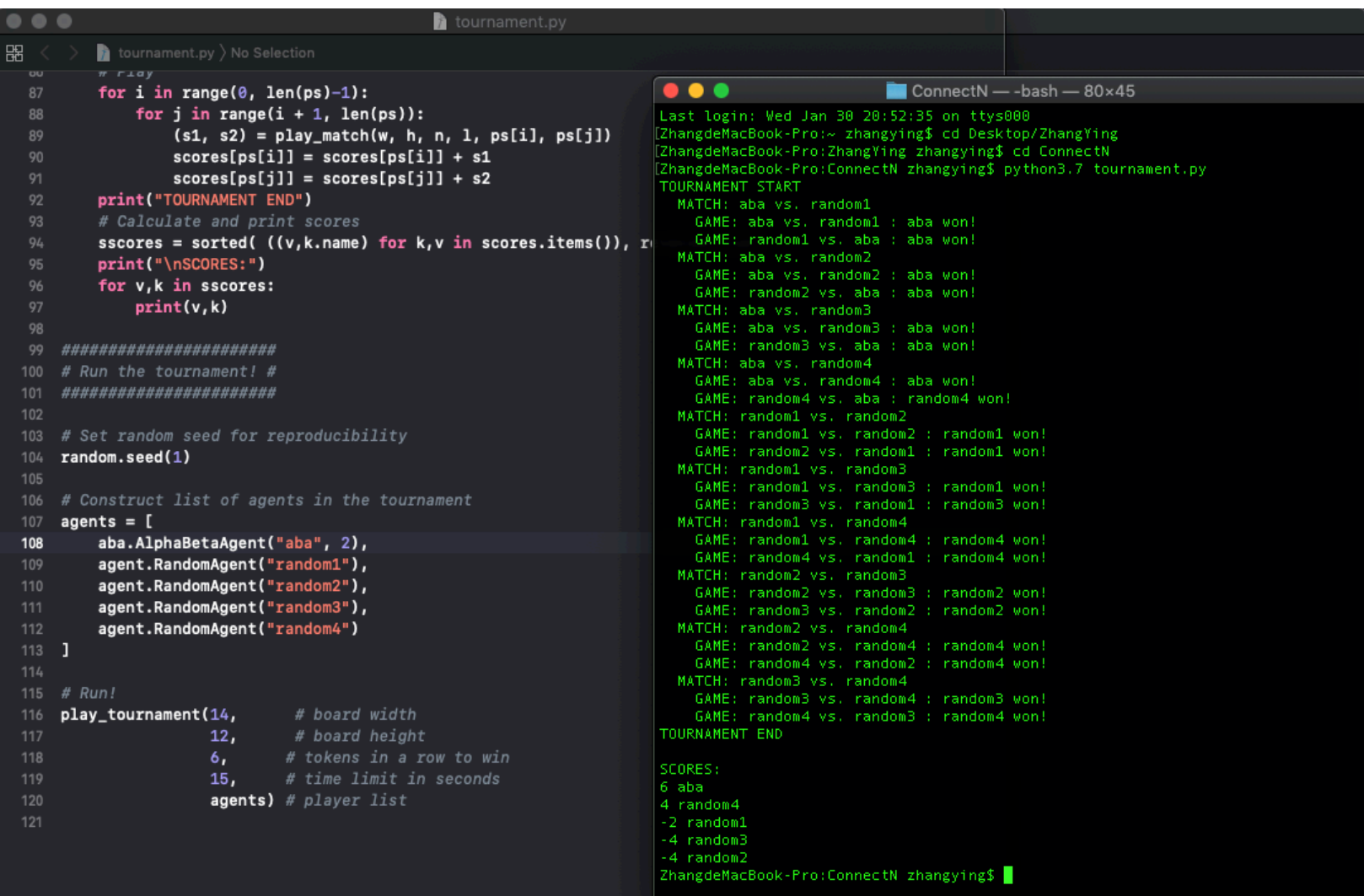
```
100 # Run the tournament: #
101 #####
102
103 # Set random seed for reproducibility
104 random.seed(1)
105
106 # Construct list of agents in the tournament
107 agents = [
108     aba.AlphaBetaAgent("aba", 4),
109     agent.RandomAgent("random1"),
110     agent.RandomAgent("random2"),
111     agent.RandomAgent("random3"),
112     agent.RandomAgent("random4")
113 ]
114
115 # Run!
116 play_tournament(7, # board width
117                6, # board height
118                4, # tokens in a row to win
119                15, # time limit in seconds
120                agents) # player list
121
```

The terminal window shows the following output:

```
MATCH: random1 vs. random3
GAME: random1 vs. random3 : random1 won!
GAME: random3 vs. random1 : random1 won!
MATCH: random1 vs. random4
GAME: random1 vs. random4 : random4 won!
GAME: random4 vs. random1 : random1 won!
MATCH: random2 vs. random3
GAME: random2 vs. random3 : random2 won!
GAME: random3 vs. random2 : random2 won!
MATCH: random2 vs. random4
GAME: random2 vs. random4 : random2 won!
GAME: random4 vs. random2 : random2 won!
MATCH: random3 vs. random4
GAME: random3 vs. random4 : random4 won!
GAME: random4 vs. random3 : random3 won!
TOURNAMENT END

SCORES:
4 aba
2 random2
0 random4
0 random1
-6 random3
ZhangdeMacBook-Pro:ConnectN zhangying$
```

For 14*12 board, use a depth of 2, which take about 5 minutes to generate following result



```
 tournament.py
 tournament.py > No Selection
87     for i in range(0, len(ps)-1):
88         for j in range(i + 1, len(ps)):
89             (s1, s2) = play_match(w, h, n, l, ps[i], ps[j])
90             scores[ps[i]] = scores[ps[i]] + s1
91             scores[ps[j]] = scores[ps[j]] + s2
92     print("TOURNAMENT END")
93     # Calculate and print scores
94     sscores = sorted( ((v,k.name) for k,v in scores.items()), r
95     print("\nSCORES:")
96     for v,k in sscores:
97         print(v,k)
98
99 #####
100 # Run the tournament! #
101 #####
102
103 # Set random seed for reproducibility
104 random.seed(1)
105
106 # Construct list of agents in the tournament
107 agents = [
108     aba.AlphaBetaAgent("aba", 2),
109     agent.RandomAgent("random1"),
110     agent.RandomAgent("random2"),
111     agent.RandomAgent("random3"),
112     agent.RandomAgent("random4")
113 ]
114
115 # Run!
116 play_tournament(14,      # board width
117                 12,      # board height
118                 6,       # tokens in a row to win
119                 15,      # time limit in seconds
120                 agents) # player list
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