PIA: Week 4 Deliverable

Two Woman four men

May 2025

1 Model simulation

During the fourth week, we focused on running simulations in our Rummikub program, modifying the inputs and analyzing the output data. Below, we present these results.

In the simulation shown in Figure 1, we started with the following data:

• Player Rack:

- Red 1, Blue 1, Black 1, Orange 1, Black 2,
- Black 3, Orange 3, Red 5, Blue 5, Orange 5
- Red 7, Blue 7, Blue 12, Red 13, JOKER

• Table:

- Run 1: Red 4, Blue 4, Black 4
- Run 2: Black 7, Black 8, Black 9
- Run 3: Orange 10, Orange 11, Orange 12

The simulation yielded the following output data, representing the optimal moves performed by the player:

• Final Player Rack:

- Orange 3
- Blue 12
- Red 13

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Player's Rack:
red 1 blue 1 black 1 orange 1 black 2 black 3 orange 3 red 5 blue 5 orange 5 red 7 blue 7 blue 12 red 13 JOKER
Table Tiles: red 4 blue 4 black 4 black 7 black 8 black 9 orange 10 orange 11 orange 12
Status: OPTIMAL
Tiles placed: 68.0
Formed Sets:
 Formed Sets:
- Set 2: ['red 1', 'blue 1', 'orange 1']
- Set 64: ['red 4', 'blue 4', 'black 4']
- Set 86: ['red 5', 'blue 5', 'orange 5']
- Set 127: ['red 7', 'blue 7', 'black 7']
- Set 724: ['black 1', 'black 2', 'black 3']
- Set 752: ['black 8', 'black 9', 'JOKER']
- Set 988: ['orange 10', 'orange 11', 'orange 12']
Kept Sets (unchanged):
--- After ILP Move ---
Table after move (formed + kept sets):
  Set 2: red 1 blue 1 orange 1
  Set 64: red 4 blue 4 black 4
  Set 86: red 5 blue 5 orange 5
  Set 127: red 7 blue 7 black 7
  Set 724: black 1 black 2 black 3
  Set 752: black 8 black 9 JOKER
  Set 988: orange 10 orange 11 orange 12
Player's rack after move:
orange 3 blue 12 red 13
```

Figure 1: First simulation

The second simulation started with the following data

• Initial Player Rack:

- Red 1, Black 1, Orange 1, Blue 2, Black 2
- Black 3, Orange 3, Red 5, Orange 5, Blue 6
- Red 7, Blue 7, Blue 12, Red 13, JOKER

• Initial Table:

- Run 1: Red 4, Blue 4, Black 4
- Run 2: Black 7, Black 8, Black 9
- Run 3: Orange 10, Orange 11, Orange 12

• Final Player Rack:

- Red 1, Orange 1, Blue 2
- Orange 3, Red 5, Orange 5
- Blue 6, Blue 12, Red 13

Figure 2: Second simulation

The third simulation started with the following data

• Initial Player Rack:

- Red 1, Blue 1, Black 1, Blue 2, Black 2
- Red 5, Black 5, Orange 5, Blue 6, Orange 6
- Red 7, Orange 7, Red 12, Orange 12, JOKER

• Initial Table:

- Run 1: Red 3, Blue 3, Orange 3
- Run 2: Black 7, Black 8, Black 9
- Run 3: Blue 9, Blue 10, Blue 11

• Final Player Rack:

- Blue 2, Black 2
- Red 5, Black 5
- Blue 6, Red 7

```
Player's Rack:
red 1 blue 1 black 1 blue 2 black 2 red 5 black 5 orange 5 blue 6 orange 6 red 7 orange 7 red 12 orange 12 JOKER
Table Tiles:
red 3 blue 3 orange 3 black 7 black 8 blue 9 black 9 blue 10 blue 11

Status: OPTIMU.
Tiles placed: 75.0

Tiles Played (from rack):
    - red 1
    - black 1
    - orange 6
    - orange 6
    - orange 7
    - red 12
    - orange 7
    - red 12
    - set 14: ['red 12', 'blue 11', 'black 11']
    - set 44: ['red 3', 'blue 3', 'orange 3']
    - set 45: ['red 12', 'red 12', 'blue 10', 'blue 11']
    - set 534: ['blue 7', 'blue 80', 'blue 11']
    - set 548: ['red 32', 'blue 80', 'blue 11']
    - set 549: ['blue 80', 'blue 80', 'blue 11']
    - set 78: ['blue 7', 'blue 80', 'blue 11']
    - set 968: ['orange 5', 'orange 6']
    - - After ILP Move ---

Table after move (formed + kept sets):
    set 1: red 1 blue 1 black 1
    set 44: red 3 blue 3 orange 3
    set 238: red 12 orange 12 JOKER
    set 534: blue 9 blue 10 blue 11
    set 751: black 7 black 8 black 9
    set 968: orange 5 orange 6 orange 7

Player's rack after move:
    blue 2 black 2 red 5 black 5 blue 6 red 7
```

Figure 3: Third simulation