Game Ai- Project #3

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BONN

Connect four on a large board

- The original board-size 6*7
- New experiment with board-size 19*19
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BONN

Connect four on a large board (first strategy)

- Pick the cell with the largest number of winning directions
- Observations
  - ➔ Increased the running time
  - ➔ Scores vs random player almost similar

| Board size	Depth 1 Win rate	Depth 2 Win rate
6 * 7	0.997	1.0
19 * 19	0.997	1.0

BONN

Connect four on a large board (second strategy)

- Pick the cell with the highest number of adjacent disks with the same color
- Observations
  - ➔ Running time is not increased much
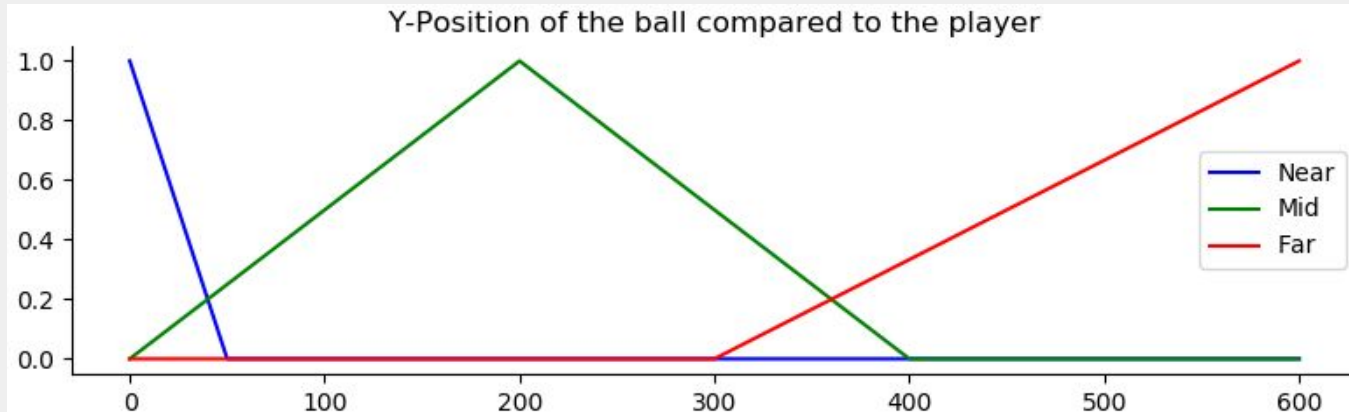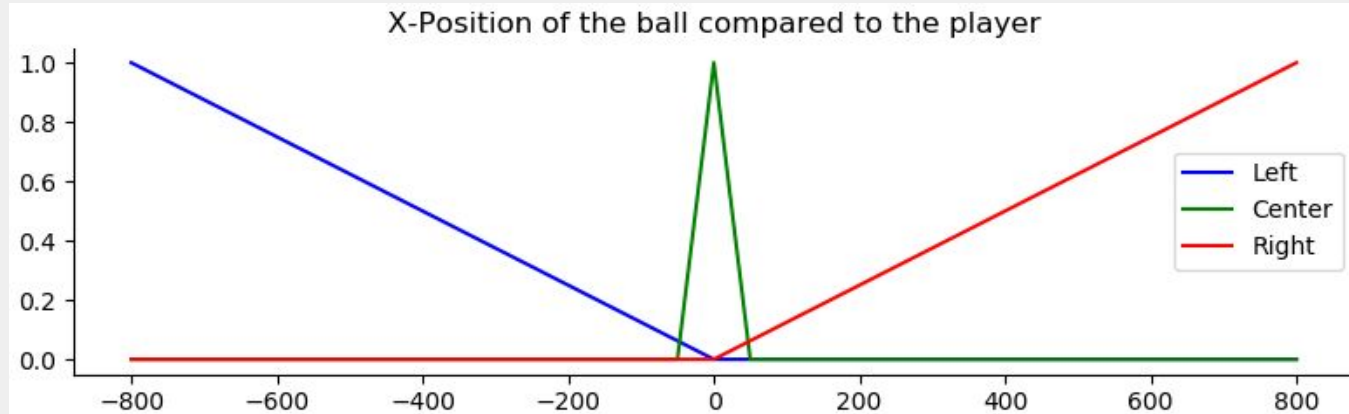 - ➔ Better scores in larger board

Board size	Win rate
6 * 7	0.887
19 * 19	0.966

Breakout

- Input

  → PositionX: (Left, Center, Right)
  → PositionY: (Near, Middle, Far)

- Output

  → MovingSpeedAndDirection:
   (FastLeft, SlowLeft, NoMove, SlowRight, FastRight)
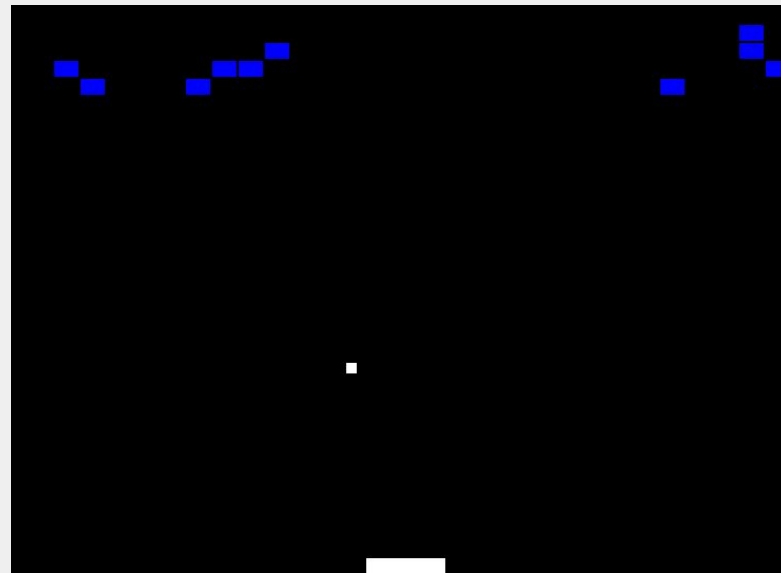
Breakout: Fuzzy Set

Breakout: Fuzzy Control

	Antecedent			Consequent
Rules	**PositionX**		**PositionY**	**PlayerMove**
Rule 1	Left	*AND*	Middle	**MoveFastToLeft()**
Rule 2	Left	*AND*	Near	**MoveSlowToLeft()**
Rule 3	Center	*OR*	Far	**NoMove()**
Rule 4	Right	*AND*	Near	**MoveSlowToRight()**
Rule 5	Right	*AND*	Middle	**MoveFastToRight()**

BONN

Breakout: Fuzzy Control
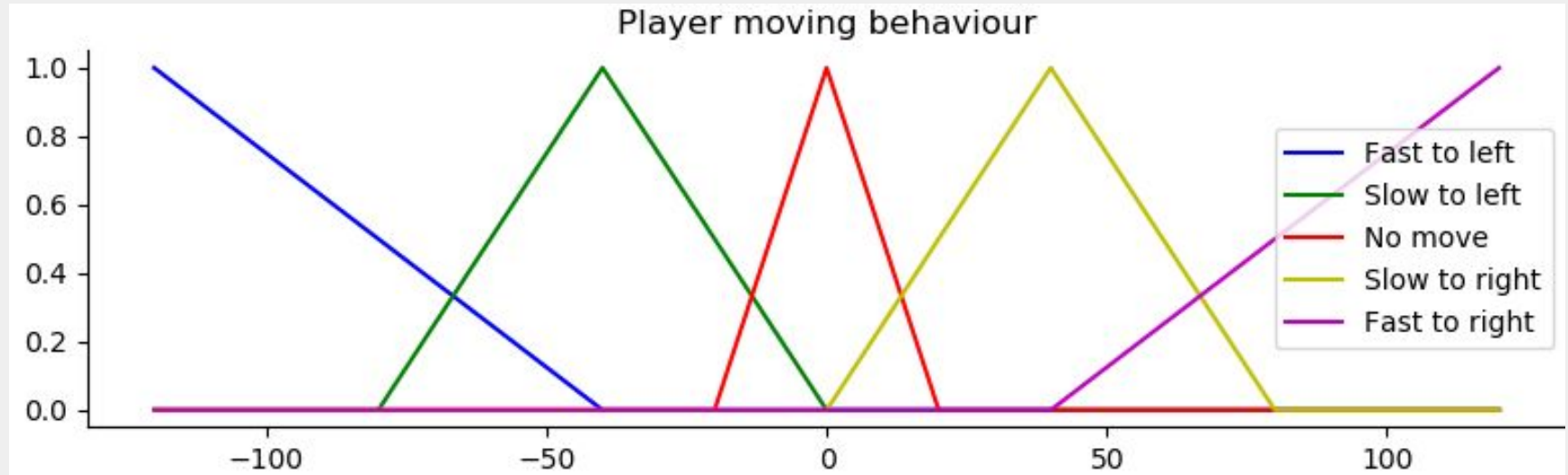
Breakout: Defuzzification

Example for output activity membership for every rule at **(PositionX = 10.6, PositionY = 311)**.
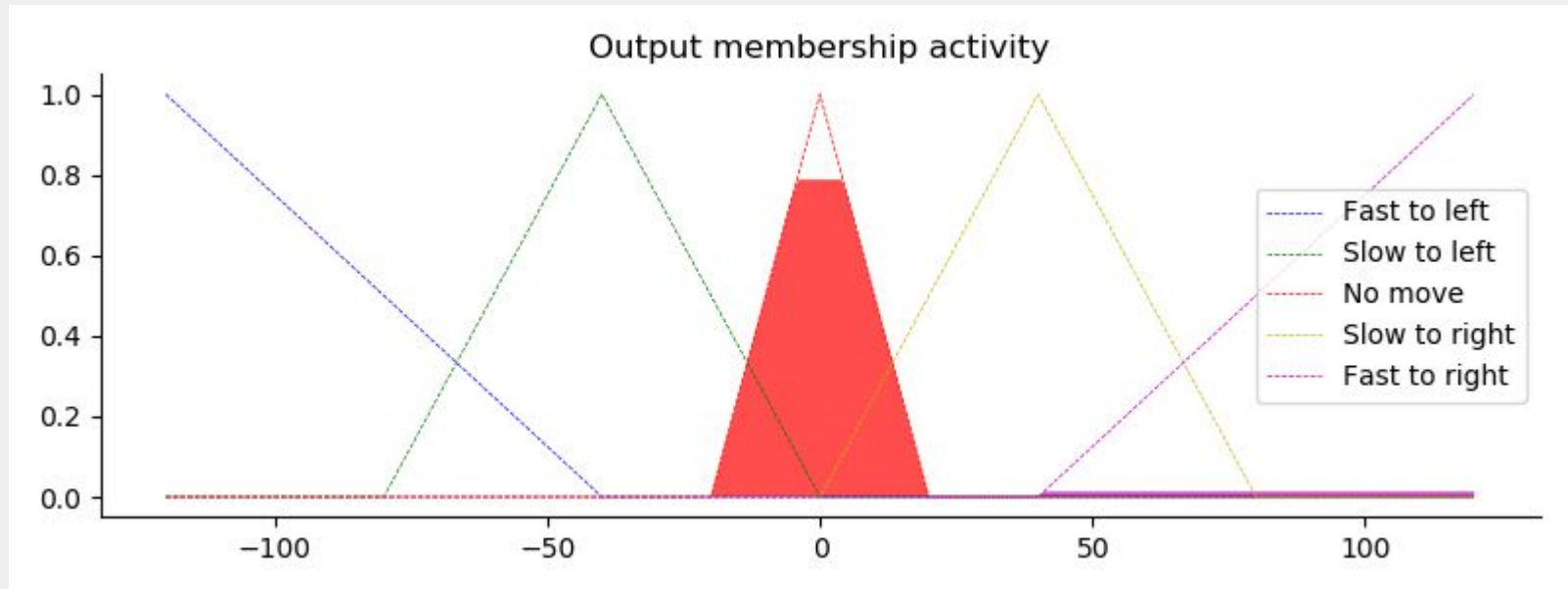
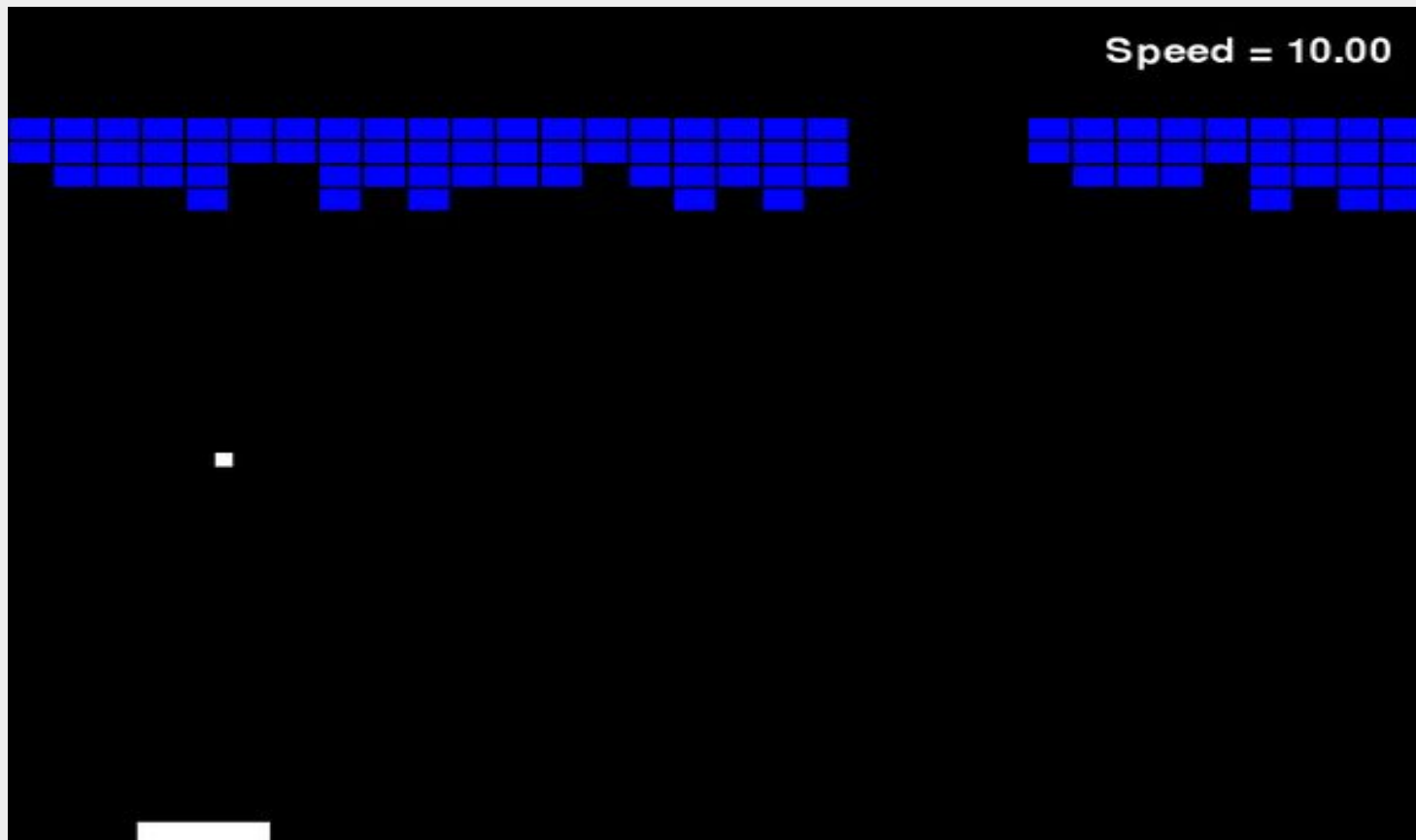# Breakout: Defuzzification

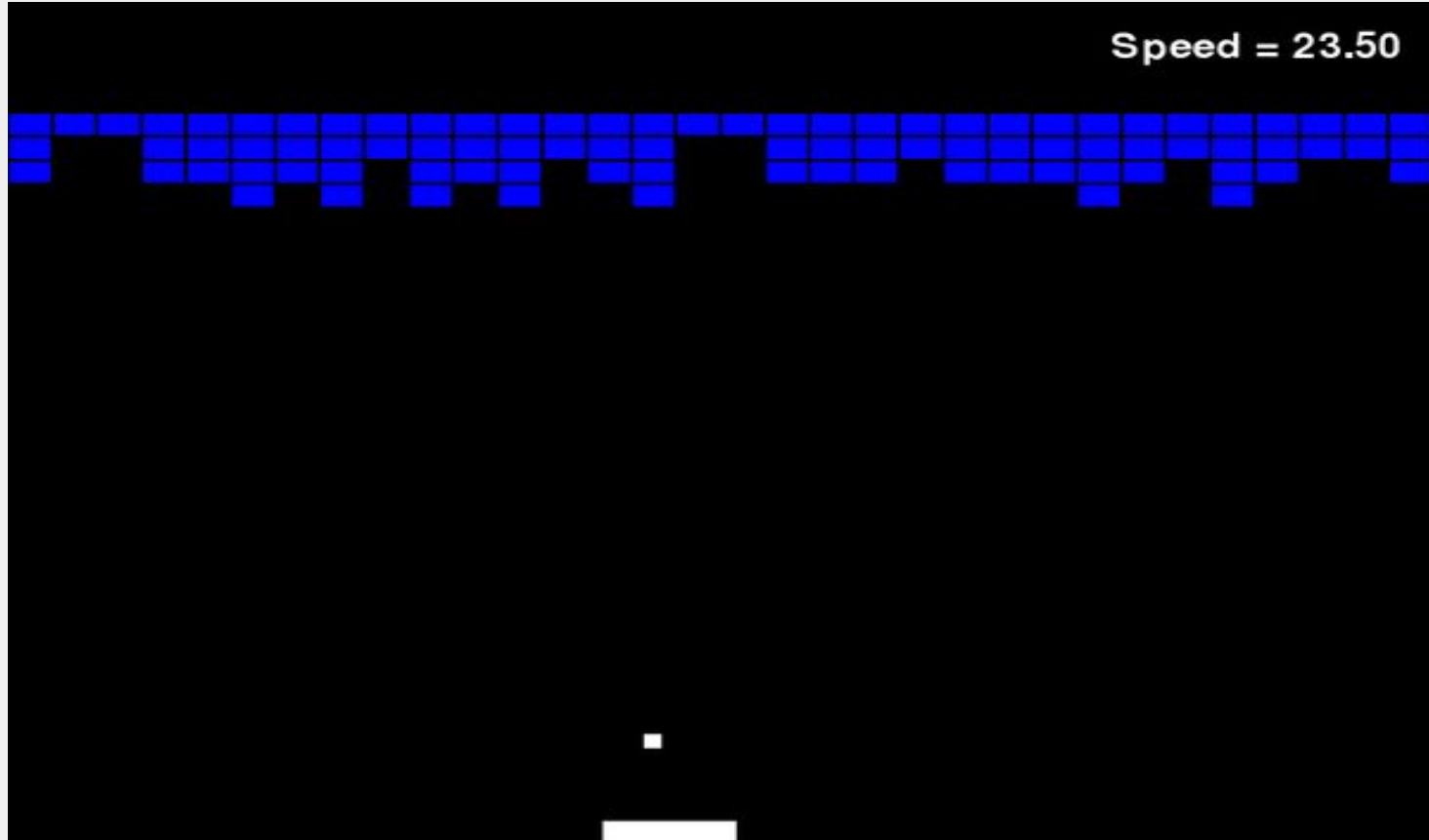Player should move with **(Velocity = 4.01)** after we defuzzify the output at **(PositionX = 10.6, PositionY = 311)**.
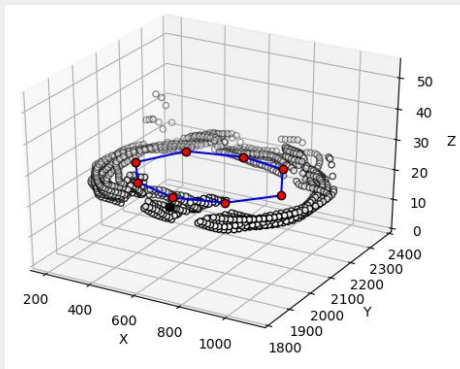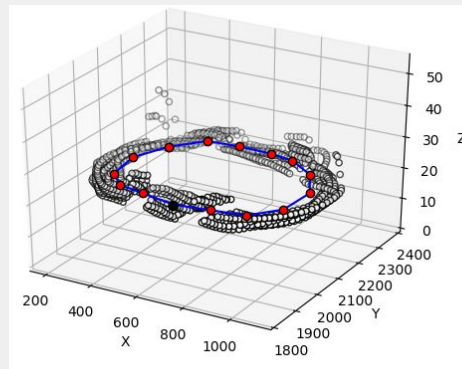

Aggregated membership and defuzzifying (line)
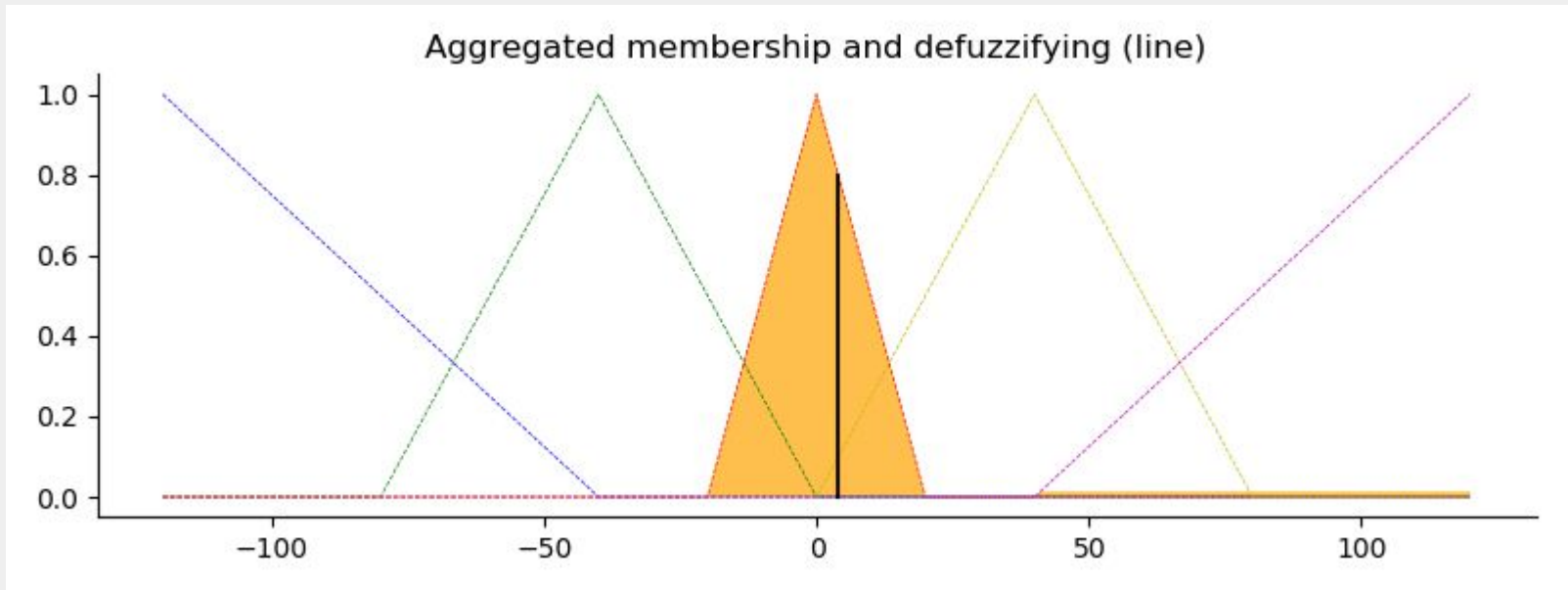
Breakout

Breakout: Adding acceleration

Self Organizing Maps

- Fit a labeled graph given trajectory data of player on a map.

- SOM Topology: Circular path with variable number of vertices:
  - ➔ 8 vertices

  - ➔ 15 vertices

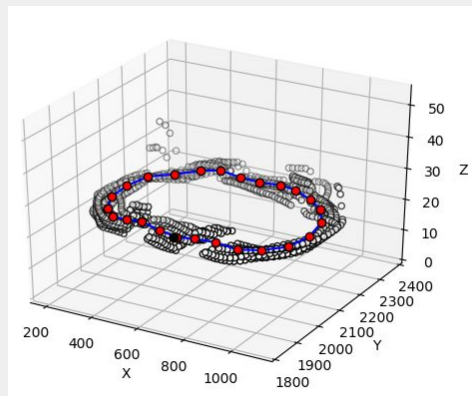 - ➔ 25 vertices

  - ➔ 50 vertices
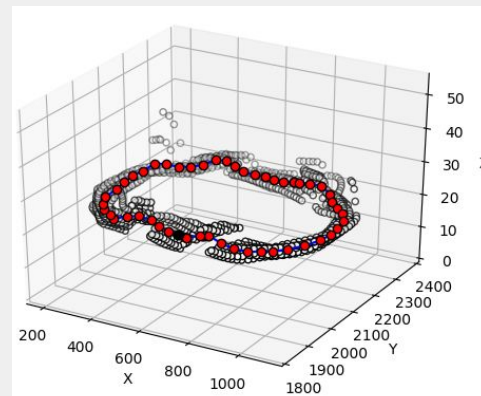
BONN

Self Organizing Maps: Path 1
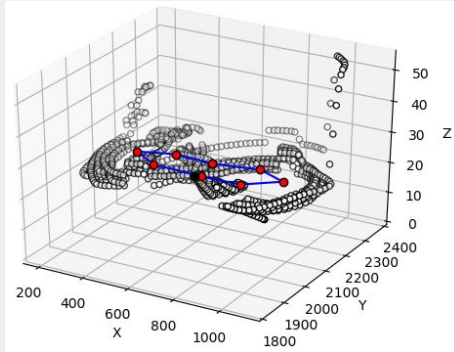

8 Vertices

15 Vertices

25 Vertices

50 Vertices

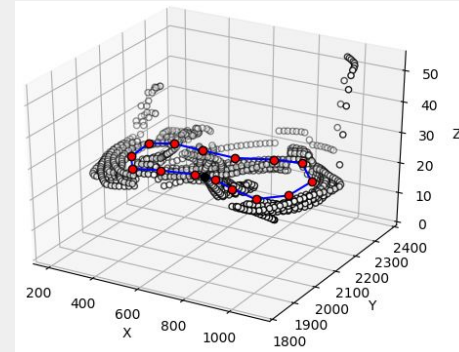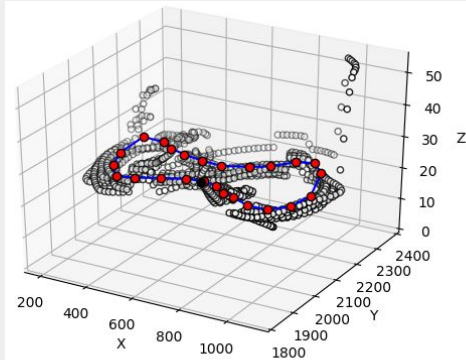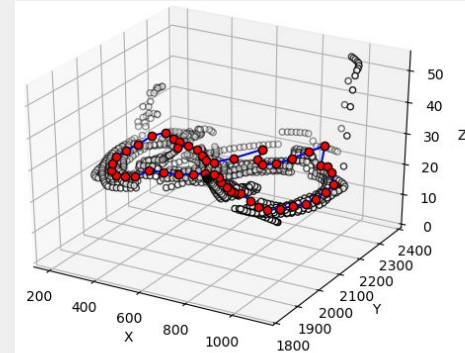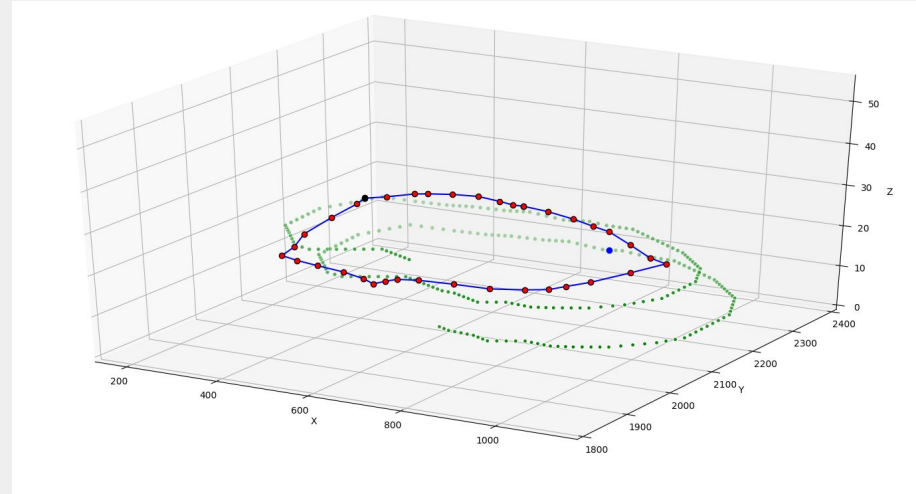# Self Organizing Maps: Path 2

8 Vertices

15 Vertices

25 Vertices

50 Vertices

Bayesian Imitation Learning

➔ Trajectory of an random point of path1

$$a_t = x_{t+1} - x_t.$$

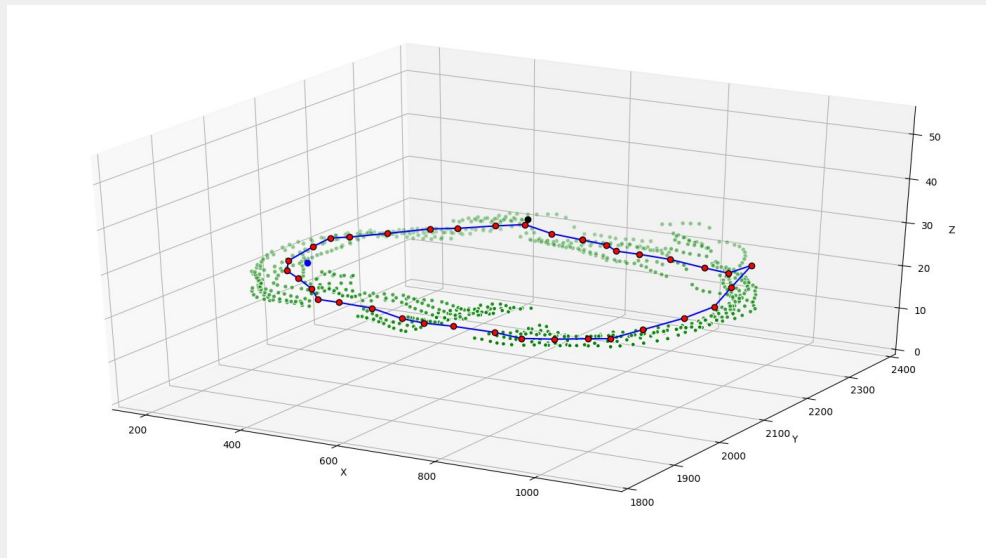$$a_t = \underset{r_j}{\operatorname{argmax}} \, p(r_j \mid s_i)$$

Bayesian Imitation Learning

- Corrected trajectory of path1

Our implementation   NetworkX implementation

Thank you for your attention.

Questions?