



# Pacman Project 3

# Multi-Agent Pacman

---

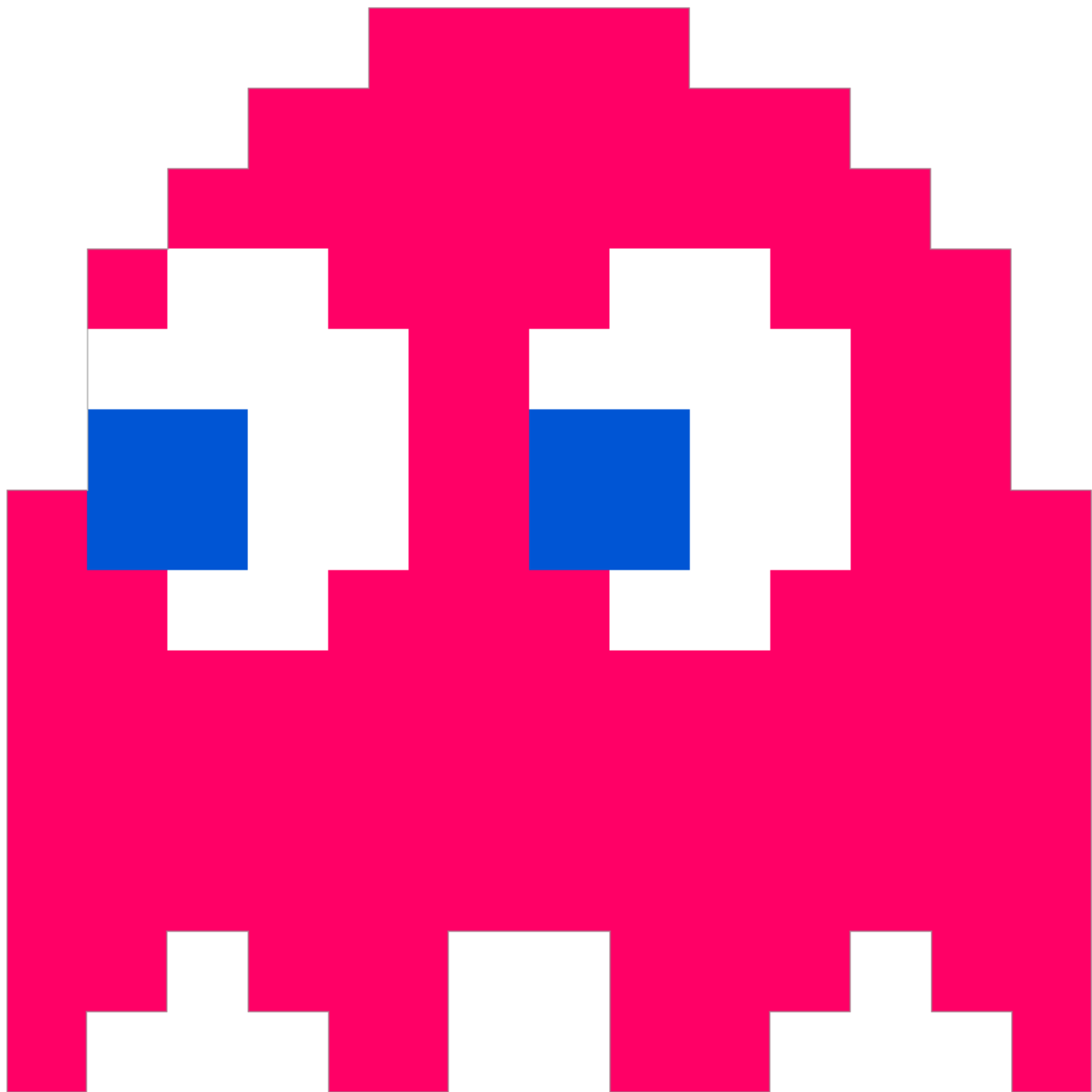
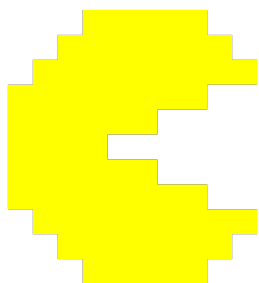
【人工智慧概論】

授課教師 / 孫春在

助教 / 蔣承翰、黃柏皓、呂學昱、  
陳沛亘、呂冠霆

日期 / 2016.03.31

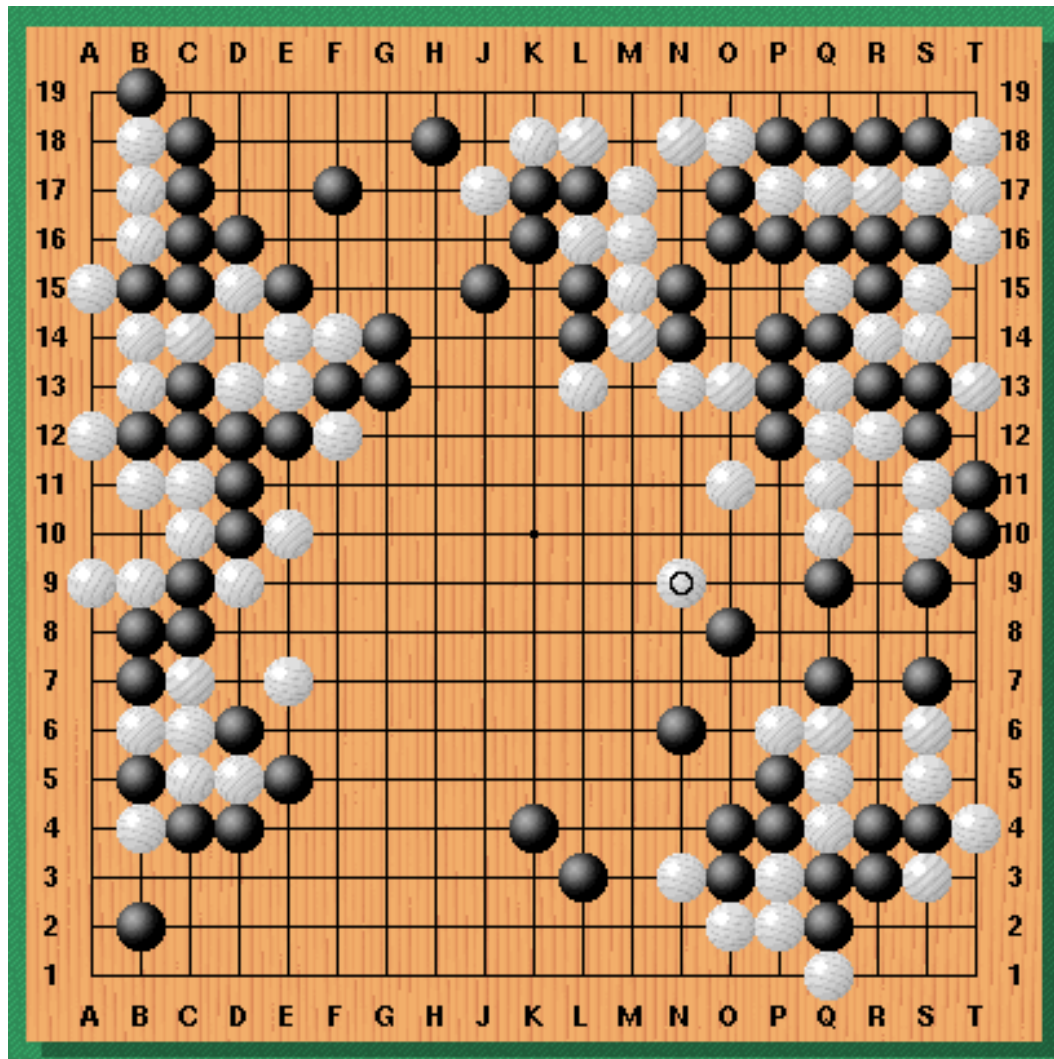






- **Evaluation Function**
- **Adversarial Search**
  - **Minimax**
  - **Alpha-Beta Pruning**
- **Objectives**

# Evaluation Function

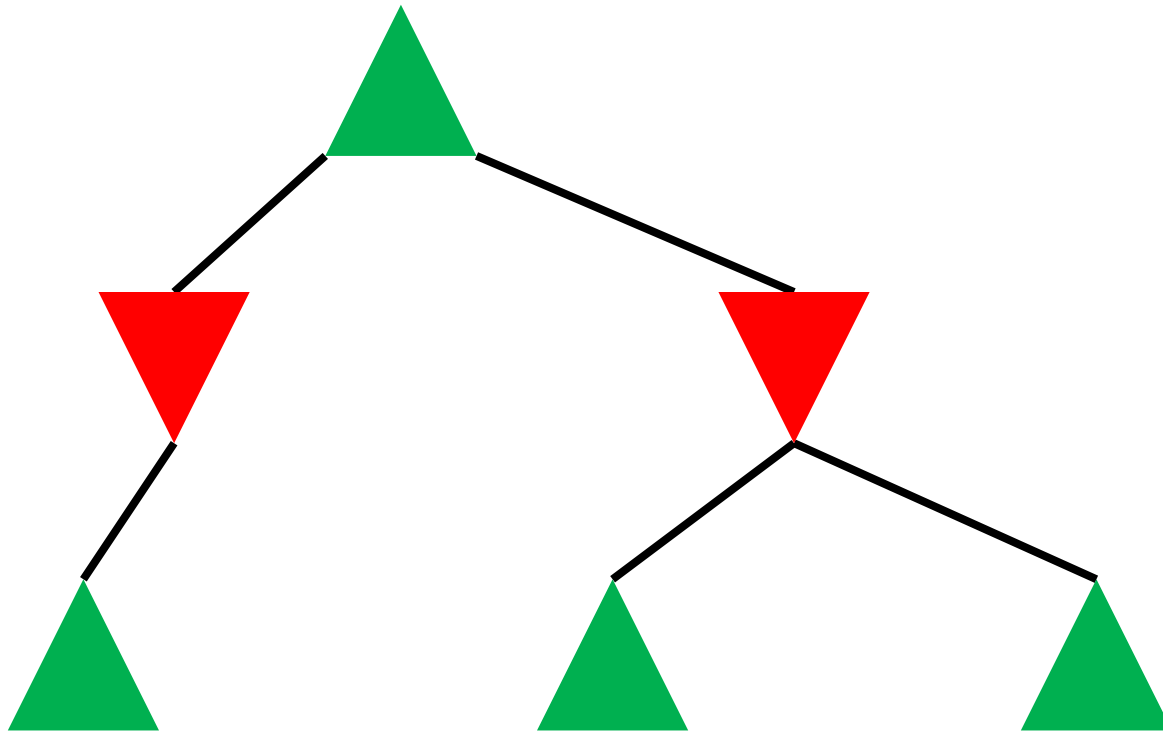


# Evaluation Function

---

$$\begin{aligned} \text{eval}(\text{state}) = & \text{Weight}_1 * \text{Feature}_1 \\ & + \text{Weight}_2 * \text{Feature}_2 \\ & + \text{Weight}_3 * \text{Feature}_3 + \dots \end{aligned}$$

# Adversarial Search



# Adversarial Search

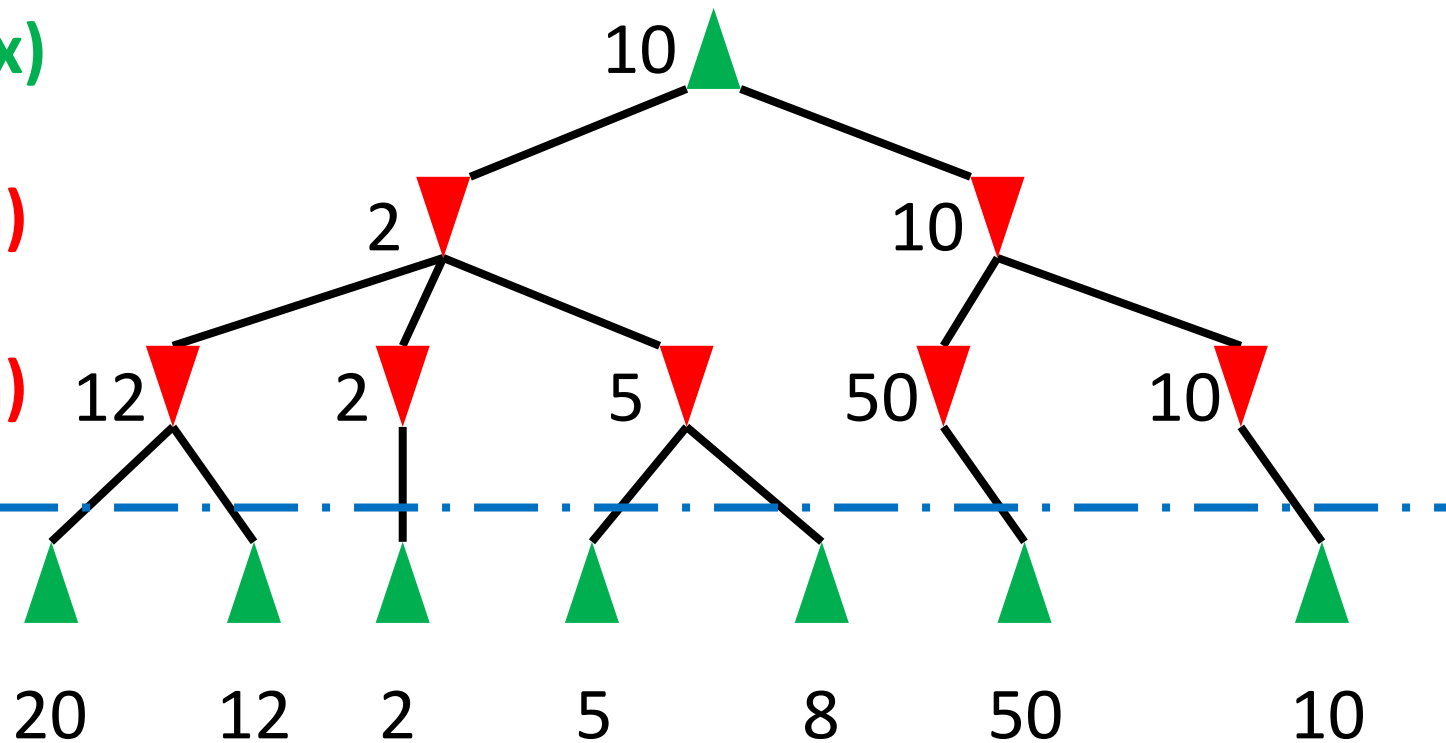
## Minimax

Pacman (max)

Ghost 1 (min)

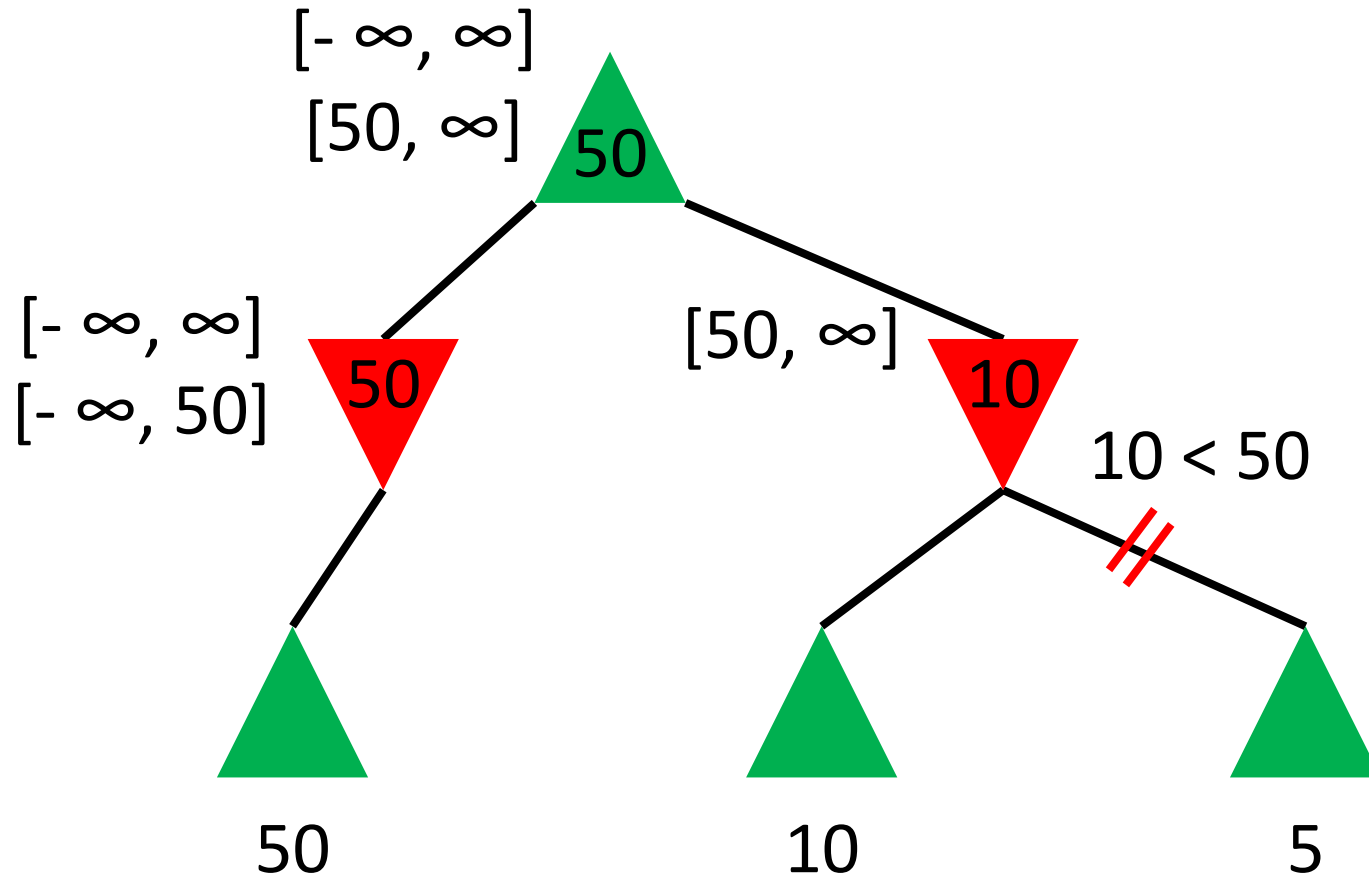
Ghost 2 (min)

Pacman



# Adversarial Search

## Alpha-Beta Pruning







# Adversarial Search

# Alpha-Beta Pruning

---

- Step by Step: Alpha Beta Pruning

<https://www.youtube.com/watch?v=xBXHtz4Gbdo>



# Objectives

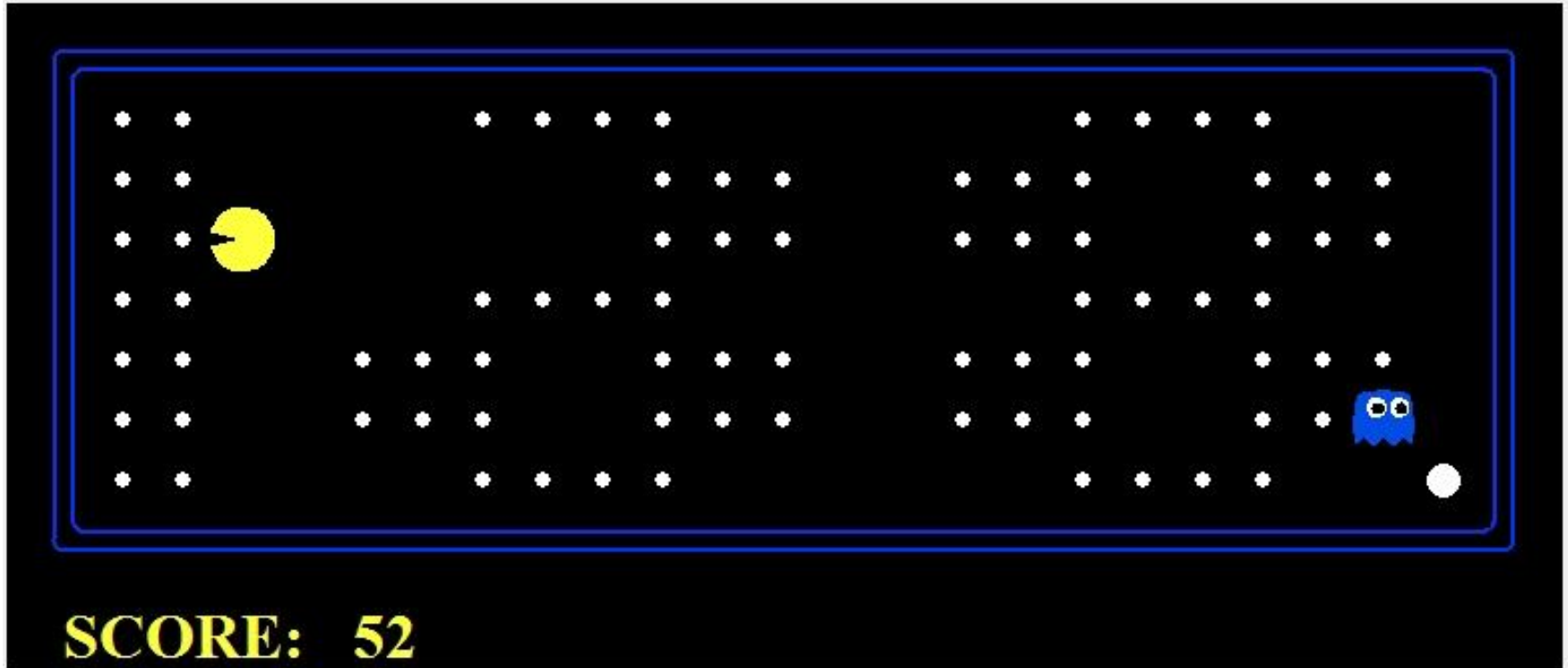
---

- P3-1 Reflex Agent (30%)
- P3-2 Minimax (25%)
- P3-3 Alpha-Beta Pruning (25%)
- P3-4 Better Evaluation (40%)

## Objectives (1/4)

# Reflex Agent

- `pacman.py -p ReflexAgent -l openClassic`



## Objectives (1/4)

# Reflex Agent

---

- Simple evaluation
  - $\text{eval}(\text{state}, \text{action}) = w_1 f_1 + w_2 f_2 + \dots$
- Grading (30%)
  - openClassic, 10 times
    - 5/10: +20
    - 10/10: +10

## Objectives (2/4)

# Minimax

- `pacman.py -p MinimaxAgent`  
-l `minimaxClassic` -a `depth=4`



## Objectives (2/4)

# Minimax

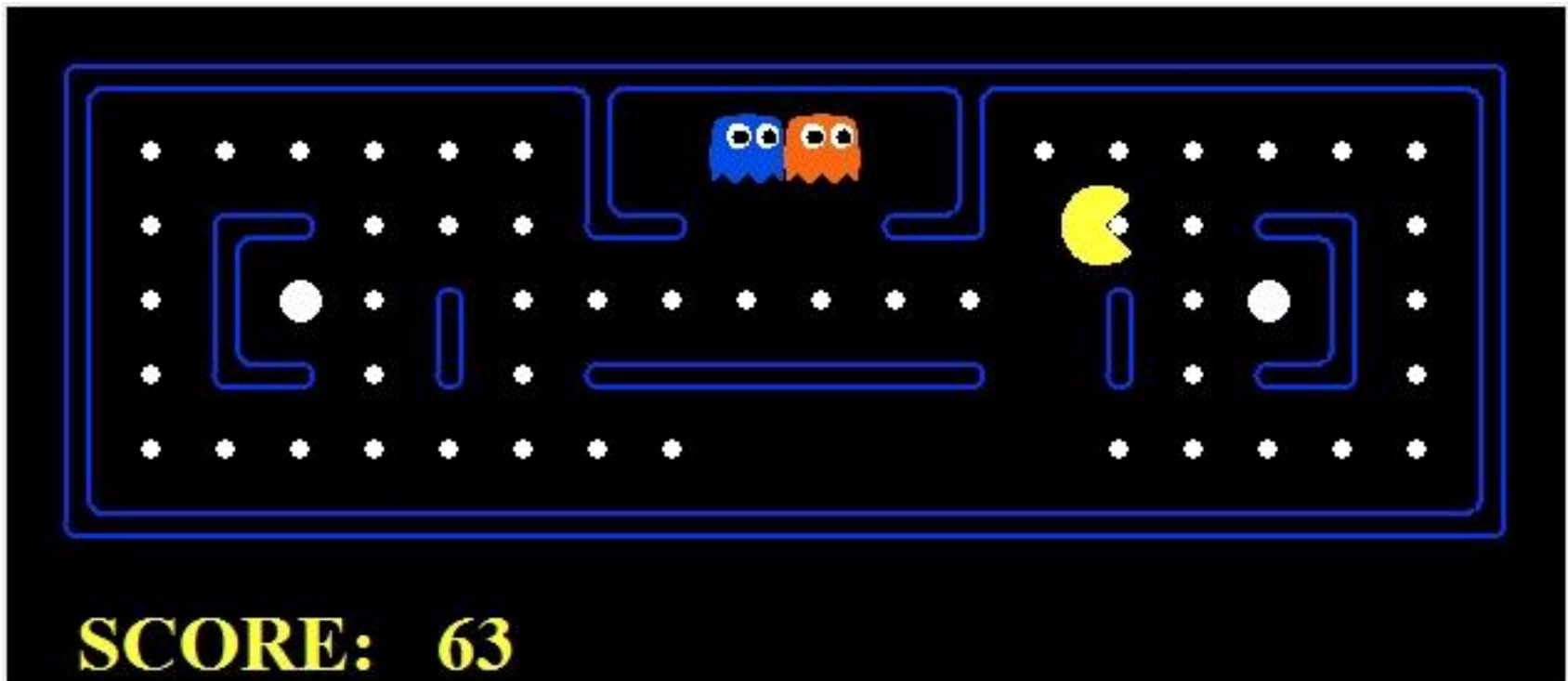
---

- Must use
  - `self.depth()`
  - `self.evaluationFunction()`
    - default: `scoreEvaluationFunction()`
- Grading (25%)
  - `autograder.py -q q2 --no-graphics`

Objectives (3/4)

# Alpha-Beta Pruning

- `pacman.py -p AlphaBetaAgent`  
-l `smallClassic` -a `depth=3`





## Objectives (3/4)

# Alpha-Beta Pruning

---

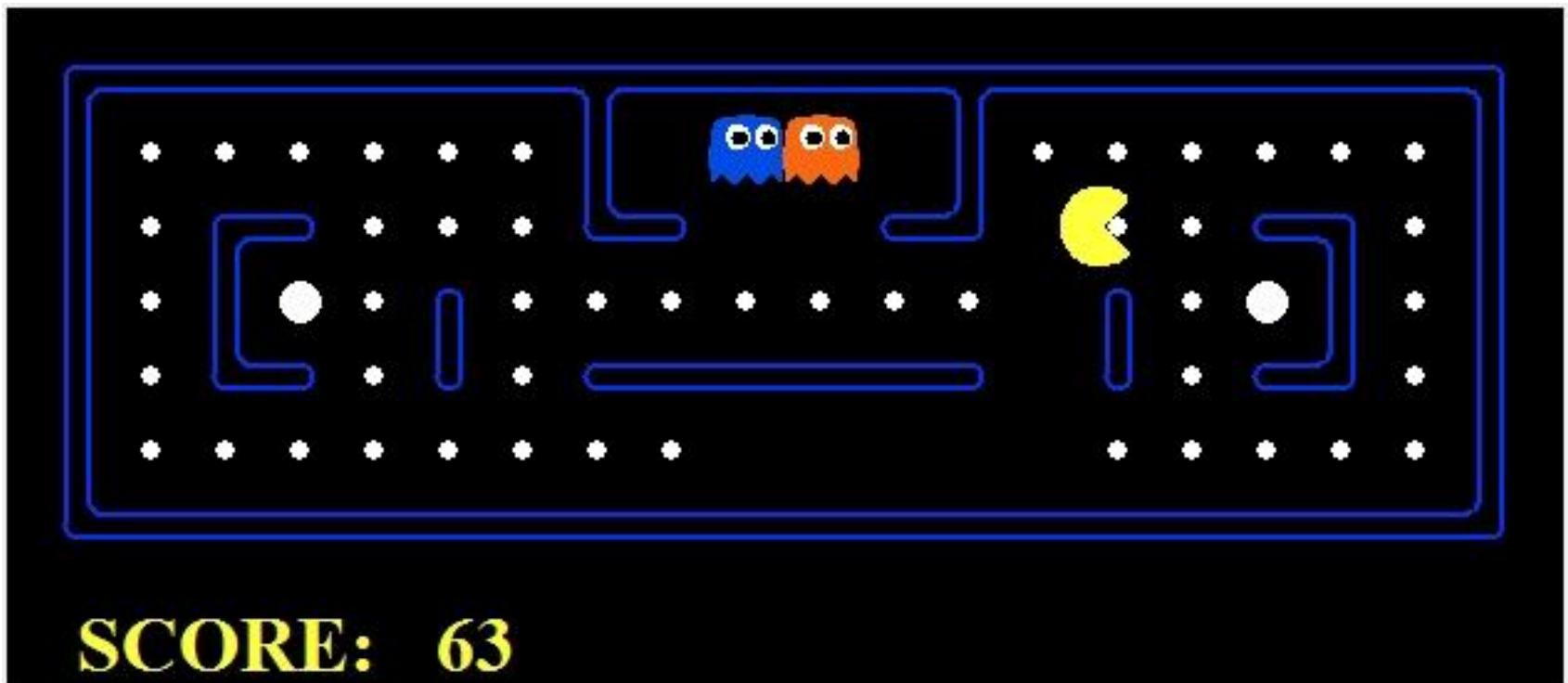
- Do not prune on equality!
- Grading (25%)
  - `autograder.py -q q3 --no-graphics`



## Objectives (4/4)

# Better Evaluation

- `pacman.py -p AlphaBetaAgent -l smallClassic -a depth=3,evalFn=better`



## Objectives (4/4)

# Better Evaluation

---

- Better evaluation
  - $\text{eval}(\text{state}) = w_1 f_1 + w_2 f_2 + \dots$
  - Describe your features in the comments.
- Grading (40%)
  - smallClassic, Alpha-Beta, depth=3, 10 times
    - 5/10: +10
    - 10/10: +10
    - $\text{avg} > 500$ : +10
    - $\text{avg} > 1000$ : +10

# Options

-z 0.5	0.5x window size
-n #	Play # times
-q	Quiet mode, no graphics
-g DirectionalGhost	Using directional ghost
-k #	Number of ghosts = #
-f	Fixed random seed; line 533, pacman.py
--frameTime 0	No frame time



# Submit

---

- Edit and upload **multiAgents.py** to e3
- Search for “[Project 3] YOUR CODE HERE”
- Deadline: **4/21** 23:59 (3 weeks)
- Late policy: 80%
- **No plagiarism**