

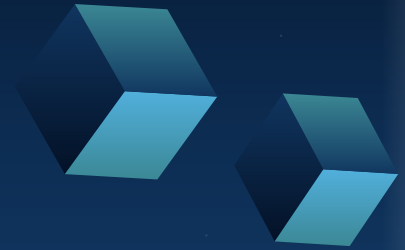


# AI Mini-Project: Snake AI

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# Problem Statement and Analysis

- Develop an AI system capable of playing Snake
- Accomplished through neural networks, deep Q-learning, and reinforcement learning techniques
- The Snake AI learns the best strategies to achieve high scores through multiple training iterations





# Use-Case Scenarios

01

Entertainment  
and Gaming

02

Educational Tools

03

Benchmarking  
and Evaluation

04

Adaptive UI

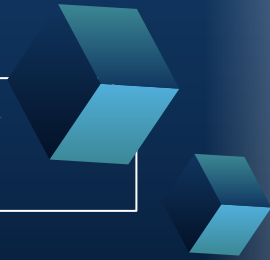
05

Robotic Control  
and Navigation

06

AI Competition  
Platforms

# AI Algorithm and Model



STATE:

[danger straight, danger right, danger left,  
direction left, direction right, direction up, direction down,  
Food left, Food right, Food up, Food down]

Ex.

[1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 1]

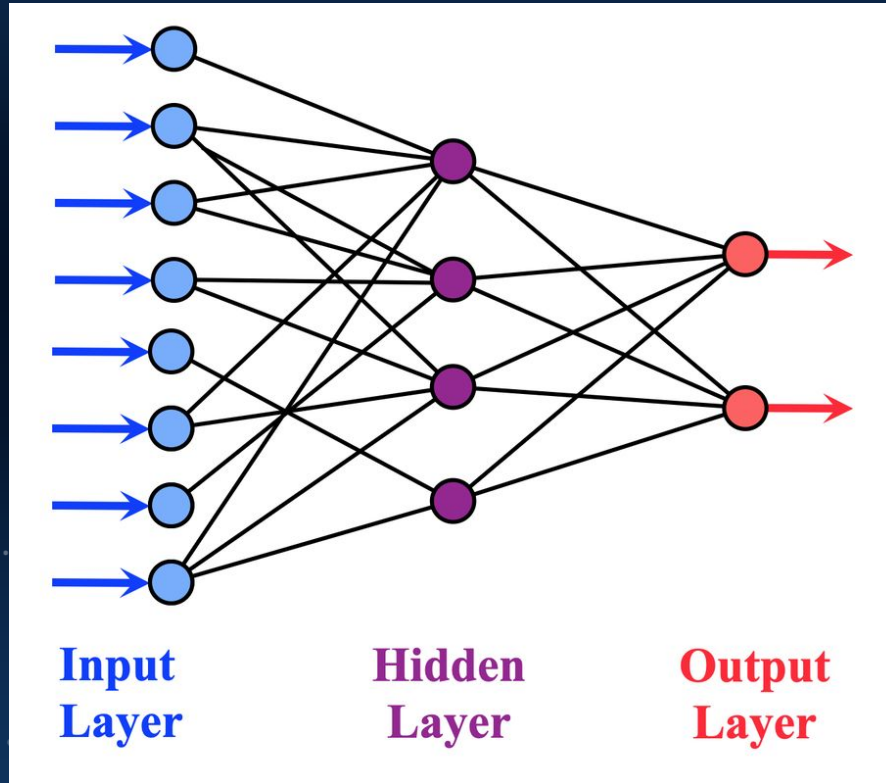
# AI Algorithm and Model

Apple Eaten: +10

Dies: -10

Other: 0

# AI Algorithm and Model



# AI Algorithm and Model

The diagram illustrates the Q-learning update equation, showing how the new Q-value is calculated based on the current Q-value, the reward, and the maximum expected future reward. The equation is presented as:

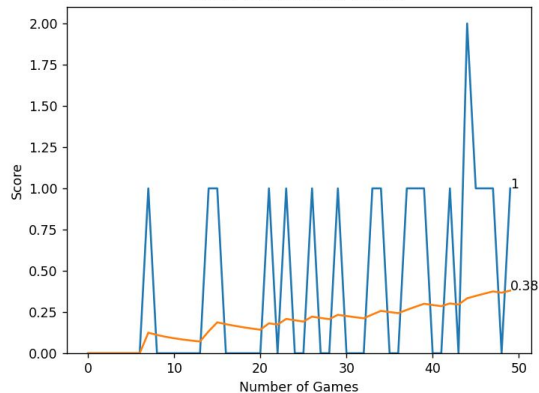
$$\text{New } Q(s, a) = Q(s, a) + \alpha [R(s, a) + \gamma \max_{a'} Q'(s', a') - Q(s, a)]$$

The components of the equation are labeled with arrows:

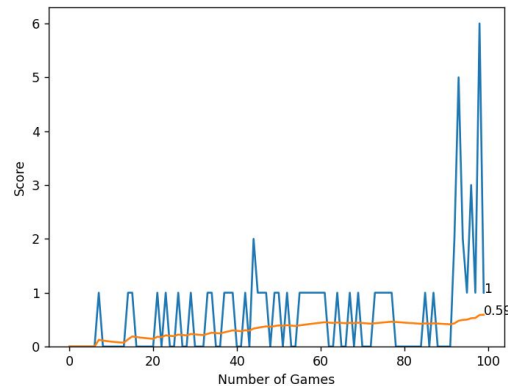
- New  $Q(s, a)$** : New Q value for the state and action (points to the leftmost term in the equation).
- $Q(s, a)$** : Current Q values (points to the second term in the equation).
- $\alpha$** : Learning Rate (points to the learning rate symbol).
- $R(s, a)$** : Reward for taking an action in a state (points to the reward term).
- $\gamma$** : Discount Rate (points to the discount rate symbol).
- $\max_{a'} Q'(s', a')$** : Maximum expected future reward (points to the max term).
- $Q(s, a)$** : Current Q values (points to the final subtraction term in the equation).

# Results and Demonstration

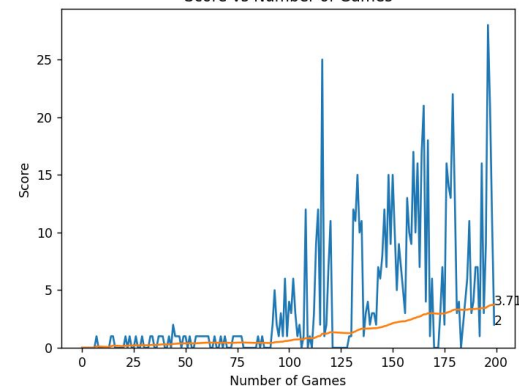
Score vs Number of Games



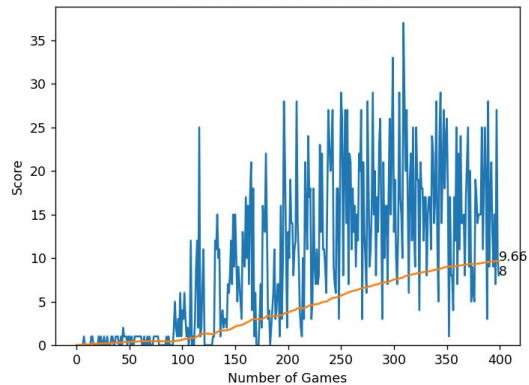
Score vs Number of Games



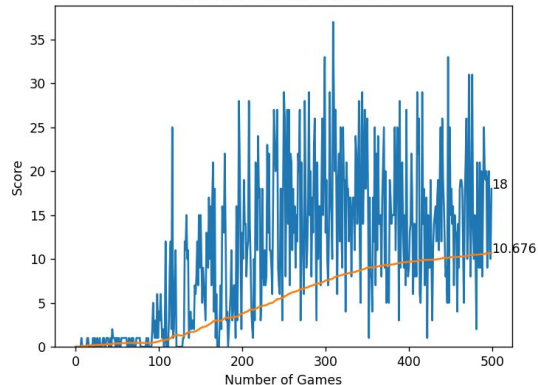
Score vs Number of Games



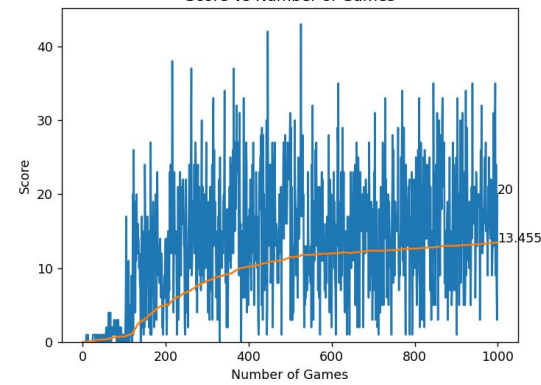
Score vs Number of Games



Score vs Number of Games

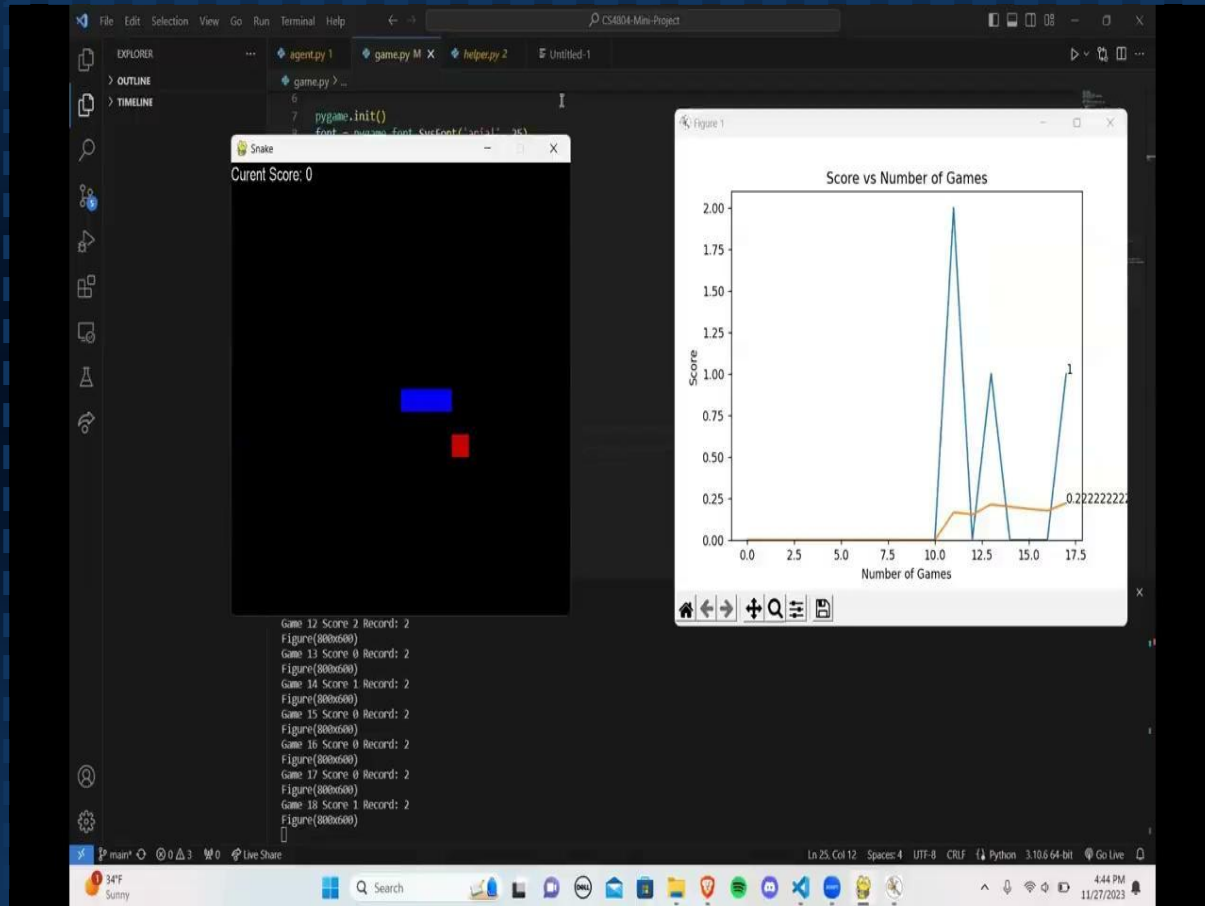


Score vs Number of Games





# Results and Demonstration



# Lessons Learned

- Learning improvement tapers off over a large number of iterations
- Repetitive behavior indicates a need for improved decision-making and strategic planning.
- Achieving a balance between exploration and exploitation is challenging but essential for effective learning
- Recognizing and addressing edge cases, is crucial for improving the overall robustness of the Snake AI

# Q & A

Thank you for listening to our presentation!

Questions?