

# Assignment: Train an RL Agent on Atari Games Using Deep Q-Learning

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## Objective:

In this assignment, you will implement the Deep Q-Learning (DQN) algorithm to train an RL agent to play an Atari game. You will use the OpenAI Gym environment for this task.

## Submission Requirements:

### 1. Jupyter Notebook (.ipynb):

- Your notebook should contain all the code required to train the DQN agent.
- Include markdown cells with explanations
- Your notebook should demonstrate the training process and show the agent's performance over time.

### 2. Video Submission:

- A 2-minute face-cam video explaining your code and demonstrating the gameplay of your trained agent.
- The video should cover:
  - An overview of your approach
  - Key components of your code
  - Results and gameplay demonstration

## Submission Deadline:

The assignment is due as a midterm submission. Please adhere to the given deadline.

## Resources:

### OpenAI Gym Documentation:

- [OpenAI Gym](<https://gym.openai.com/docs/>)
- [Atari Environments](<https://gym.openai.com/envs/#atari>)

### Deep Q-Learning Algorithm:

- [Introduction to Deep Q-Learning](<https://towardsdatascience.com/deep-q-learning-tutorial-mindqn-2a4c855abffc>)

### Tutorials and Code Examples:

- [DQN Tutorial by OpenAI](<https://github.com/openai/baselines/tree/master/baselines/deepq>)
- [Deep Q-Learning with OpenAI Gym](<https://medium.com/emergent-future/simple-reinforcement-learning-with-tensorflow-part-4-deep-q-networks-and-beyond-79a0ed7a506f>)
- [Deep Q-Learning with Keras and Gym](<https://keon.github.io/deep-q-learning/>)

### Research Papers:

- [Playing Atari with Deep Reinforcement Learning](<https://www.cs.toronto.edu/~vmnih/docs/dqn.pdf>) by Mnih et al.

### Suggested Workflow:

#### 1. Setup Environment:

- Install necessary libraries: Gym, TensorFlow/PyTorch, etc.
- Select an Atari game (e.g., Breakout, Pong).

#### 2. Implement DQN:

- Build a neural network model to approximate the Q-value function.
- Implement the experience replay buffer.
- Train the DQN agent using the selected Atari environment.

#### 3. Training and Evaluation:

- Train your agent and evaluate its performance over episodes
- Plot the training progress (e.g., reward over episodes)

#### 4. Video Presentation:

- Record a 2-minute video explaining your project.
- Cover the key components of your code and demonstrate the trained agent's gameplay.