

# Video Plan for DQN Agent in Godot

## Video 1: Introduction & Project Overview

- Teach what reinforcement learning is and how it works
- Agents, environments, states, actions, and rewards.
- Q-Learning vs DQN.
- Why deep learning is needed for complex environments.
- Introduction to Godot for game development.
- Overview and summary of what's gonna be completed

## Video 2: Q-Learning Fundamentals

- How Q-Learning actually works: Q-table, update rule, and balancing exploration vs. exploitation.
- The role of rewards in learning and why the discount factor matters.
- Simple grid-world example to visualize the learning process.
- Introduction to the epsilon-greedy strategy and why it's important.

## Video 3: From Q-Learning to Deep Q-Networks (DQN)

- Why Q-Learning falls apart in complex environments.
- Using deep neural networks to approximate Q-values.
- Key DQN concepts: Q-network, target network, and experience replay.
- Important hyperparameters to tweak: epsilon, gamma, batch size, target update.

## Video 4: Setting Up the Godot Project

- Installing and launching the base Godot game.
- Setting up the neural network library in Godot.
- Writing the DQN agent code and linking it to the character.

## Video 5: Coding the Environment & Agent Interaction

- How the agent "sees" the environment (implementing `get_state()`).
- Using `RayCast2D` for vision and detecting collisions.
- Coding the reward function and defining different reward values.
- Making sure the environment resets properly for new episodes.
- Implementing `get_state()`, `update_vision()`, and `get_reward()`.

## **Video 6: Building the Training Loop & Agent Actions**

- Understanding how the main training loop works (`_physics_process()`).
- How the agent updates its state, picks actions, and stores experiences.
- Epsilon-greedy action selection in `choose_action()`.
- Managing experience replay and updating the neural network.
- Writing out the training loop step by step.

## **Video 7: Fine-Tuning & Debugging**

- Adjusting hyperparameters for better performance.
- Debugging common issues that mess with training.

## **Video 8: Final Walkthrough & Demo**

- Live test of the fully trained DQN agent.
- Recap of everything covered, from Q-Learning to a working DQN in Godot.
- Ideas for improvements and possible extensions.
- Reviewing the final code and best practices.
- Encouraging experimentation and further development.