Atari Breakout with Reinforcement Learning

Table of Contents

Overview

This project aims to train a reinforcement learning agent to play Atari's Breakout game. We use Python 3.5 and various libraries like Gym, Keras, and Keras-RL to accomplish this. The project contains two main scripts:

- `train.py`: Trains the agent using DQN (Deep Q-Network).
- `play.py`: Allows the trained agent to play the game.

Requirements

- Python 3.5
- NumPy 1.15
- Gym 0.17.2
- Keras 2.2.5
- Keras-RL 0.4.2

Setting Up a Conda Environment

Conda is a package and environment management system that allows you to install software packages and manage different environments for various projects. Follow these steps to set up a Conda environment:

1. **Install Anaconda or Miniconda**: Download from Anaconda or Miniconda.
2. **Open Terminal**: Open your terminal (Command Prompt on Windows, Terminal on macOS or Linux).
3. **Create a New Environment**: Run `conda create --name atari_breakout python=3.5`.
4. **Activate the Environment**: Run `conda activate atari_breakout` on Windows or `source activate atari_breakout` on macOS and Linux.

For more details, check the Conda documentation.

Installing Dependencies

After activating your Conda environment, install the required packages:

```
conda install numpy=1.15 gym=0.17.2
pip install keras==2.2.5 keras-rl==0.4.2

## Running the Code

    - Train the Agent: Run python train.py to train the agent. The trained
model will be saved as policy.h5.
    - Play the Game: Run python play.py to see the trained agent in action.

## Troubleshooting

    - Conda Command Not Found: Make sure Anaconda/Miniconda is installed and
added to your system's PATH. See detailed guide.
    - Environment Doesn't Exist: Ensure you have the correct Gym version and
have installed the Atari dependencies (pip install gym[atari]).

## Contributing

Feel free to contribute to this project by opening issues or submitting pull
requests.

# Project badge
## Deep Q-learning

    Master
    By: Alexa Orrico, Software Engineer at Holberton School
    Weight: 6
    Manual QA review must be done (request it when you are done with the
project)

# Resources

## Read or watch:

    Deep Q-Learning - Combining Neural Networks and Reinforcement Learning
    Replay Memory Explained - Experience for Deep Q-Network Training
    Training a Deep Q-Network - Reinforcement Learning
    Training a Deep Q-Network with Fixed Q-targets - Reinforcement Learning
```

```
## References:

    Setting up anaconda for keras-rl
    keras-rl
        rl.policy
        rl.memory
        rl.agents.dqn
    Playing Atari with Deep Reinforcement Learning

## Learning Objectives

    What is Deep Q-learning?
    What is the policy network?
    What is replay memory?
    What is the target network?
    Why must we utilize two separate networks during training?
    What is keras-rl? How do you use it?

# Requirements
## General

    Allowed editors: vi, vim, emacs
    All your files will be interpreted/compiled on Ubuntu 16.04 LTS using
python3 (version 3.5)
    Your files will be executed with numpy (version 1.15), gym (version
0.17.2), keras (version 2.2.5), and keras-rl (version 0.4.2)
    All your files should end with a new line
    The first line of all your files should be exactly #!/usr/bin/env python3
    A README.md file, at the root of the folder of the project, is mandatory
    Your code should use the pycodestyle style (version 2.4)
    All your modules should have documentation (python3 -c
'print(__import__("my_module").__doc__)')
    All your classes should have documentation (python3 -c
'print(__import__("my_module").MyClass.__doc__)')
    All your functions (inside and outside a class) should have documentation
(python3 -c 'print(__import__("my_module").my_function.__doc__)' and python3 -c
'print(__import__("my_module").MyClass.my_function.__doc__)')
    All your files must be executable
    Your code should use the minimum number of operations

Installing Keras-RL

pip install --user keras-rl

Dependencies (that should already be installed)

pip install --user keras==2.2.4
pip install --user Pillow
pip install --user h5py


# Tasks
## 0. Breakout
```

```
mandatory

Write a python script train.py that utilizes keras, keras-rl, and gym to train
an agent that can play Atari’s Breakout:

    Your script should utilize keras-rl‘s DQNAgent, SequentialMemory, and
EpsGreedyQPolicy
    Your script should save the final policy network as policy.h5

Write a python script play.py that can display a game played by the agent
trained by train.py:

    Your script should load the policy network saved in policy.h5
    Your agent should use the GreedyQPolicy

Repo:

    GitHub repository: holbertonschool-machine_learning
    Directory: reinforcement_learning/deep_q_learning
    File: train.py, play.py
```