

DEEP Q-LEARNING IMPLEMENTATION

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Sebelum melakukan implementasi DQL ini ada beberapa library yang harus dipersiapkan yaitu:

1. IPYKERNEL
2. PYTORCH
3. PYGAME
4. IPYTHON

1. Cara Instal IPYKERNEL

- a. Pastikan Anda telah menginstal ipykernel di lingkungan Anda. Jika Anda menggunakan pip untuk menginstal ipykernel di python env, pastikan pip diinstal dengan syntax sebagai berikut.

```
pip install ipykernel
```

- b. Misalnya, menggunakan lingkungan conda, instal Kernel di lingkungan pertama:Python (myenv)

```
source activate myenv
```

```
python -m ipykernel install --user --name myenv --display-name "Python (myenv)"
```

- c. Dan di lingkungan kedua, setelah memastikan ipykernel diinstal di dalamnya:

```
source activate other-env
```

```
python -m ipykernel install --user --name other-env --display-name "Python (other-env)"
```

```
Command Prompt
Successfully installed decorator-5.1.1

C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>pip install ipykernel
Requirement already satisfied: ipykernel in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (6.4.1)
Requirement already satisfied: traitlets<6.0, >=4.1.0 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipykernel) (5.1.0)
Requirement already satisfied: debugpy<2.0, >=1.0.0 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipykernel) (1.4.1)
Requirement already satisfied: matplotlib-inline<0.2.0, >=0.1.0 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipykernel) (0.1.2)
Requirement already satisfied: jupyter-client<8.0 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipykernel) (6.1.12)
Requirement already satisfied: ipython<8.0, >=7.23.1 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipykernel) (7.29.0)
Requirement already satisfied: ipython-genutils in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipykernel) (0.2.0)
Collecting tornado<7.0, >=4.2
  Downloading tornado-6.1.tar.gz (497 kB)
    497 kB 152 kB/s
Requirement already satisfied: pygments in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipython<8.0, >=7.23.1->ipykernel) (2.10.0)
Requirement already satisfied: pickleshare in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipython<8.0, >=7.23.1->ipykernel) (0.7.5)
Requirement already satisfied: setuptools<18.5 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipython<8.0, >=7.23.1->ipykernel) (62.1.0)
Requirement already satisfied: decorator in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipython<8.0, >=7.23.1->ipykernel) (5.1.1)
Requirement already satisfied: prompt-toolkit!=3.0.0, !=3.0.1, <3.1.0, >=2.0.0 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipython<8.0, >=7.23.1->ipykernel) (3.0.29)
Requirement already satisfied: jedi<=0.16 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipython<8.0, >=7.23.1->ipykernel) (0.18.0)
Requirement already satisfied: backcall in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipython<8.0, >=7.23.1->ipykernel) (0.2.0)
Requirement already satisfied: colorama in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from ipython<8.0, >=7.23.1->ipykernel) (0.4.4)
Requirement already satisfied: parso<0.9.0, >=0.8.0 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from jedi<=0.16->ipython<8.0, >=7.23.1->ipykernel) (0.8.3)
Requirement already satisfied: jupyter-core<=4.6.0 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from jupyter-client<8.0->ipykernel) (4.8.1)
Requirement already satisfied: python-dateutil<=2.1 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from jupyter-client<8.0->ipykernel) (2.8.2)
Collecting pyzmq<=13
  Downloading pyzmq-22.3.0-cp310-cp310-win_amd64.whl (1.1 MB)
    1.1 MB 6.4 MB/s
Collecting pywin32<=1.0
  Downloading pywin32-303-cp310-cp310-win_amd64.whl (9.2 MB)
    9.2 MB 2.2 MB/s
Requirement already satisfied: wcwidth in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from prompt-toolkit!=3.0.0, !=3.0.1, <3.1.0, >=2.0.0->ipython<8.0, >=7.23.1->ipykernel) (0.2.5)
Requirement already satisfied: six<=1.5 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from python-dateutil<=2.1->jupyter-client<8.0->ipykernel) (1.16.0)
Building wheels for collected packages: tornado
  Building wheel for tornado (setup.py) ... done
  Created wheel for tornado: filename=tornado-6.1-cp310-cp310-win_amd64.whl size=419561 sha256=9483a4d30d968bf95f75309a1f9e3d49edf6416bed51304898e4aedf4b934652
  Stored in directory: c:\users\lenovo\appdata\local\pip\cache\wheels\80\32\8d\21cf0fa6ee4e083f6530e5b83dfdfa9489a3890d320803f4c7
Successfully built tornado
```

2. Cara Instal PYTORCH

Cara install PyTorch di Windows sangatlah mudah. Cukup buka *Anaconda Prompt* (AP). Untuk menemukan Anaconda Prompt, bisa dicari melalui **Start ->**

Command Prompt-> direktori script python

Setelah itu cukup ketikkan di cmd tepat seperti ini: **pip install torch**

Tunggu beberapa saat, kemudian akan dicollage oleh sistem.

```
Command Prompt

C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>pip install decorator
Requirement already satisfied: decorator in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (5.1.1)

C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>pip install decorator --upgrade
Requirement already satisfied: decorator in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (5.1.1)

C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>pip install torch
Requirement already satisfied: torch in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (1.11.0)
Requirement already satisfied: typing-extensions in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from torch) (4.2.0)

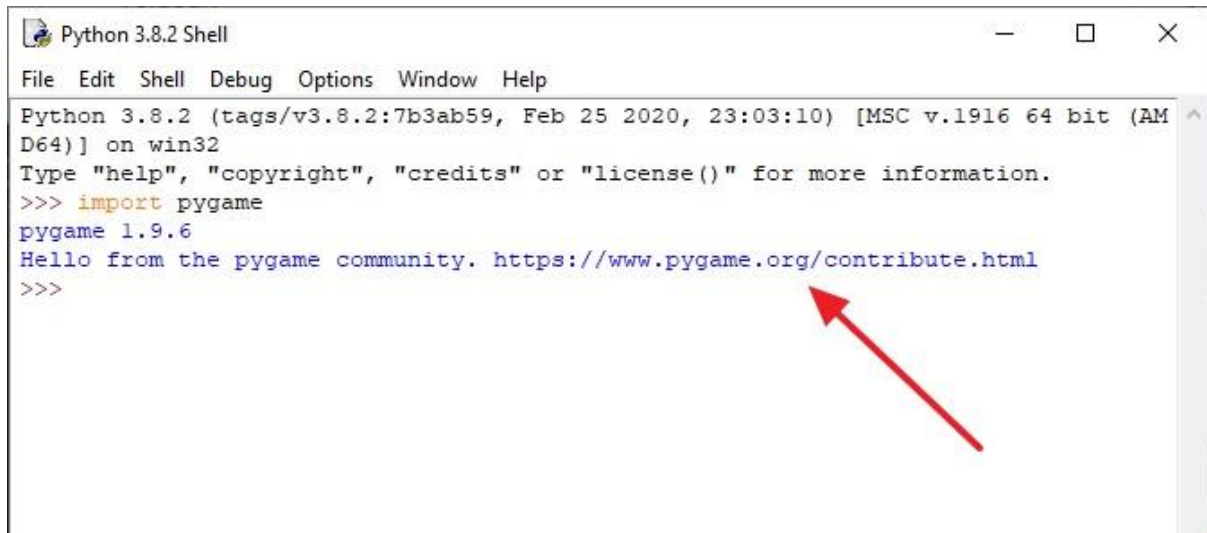
C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>
```

3. Cara Instal PYGAME

- Buka CMD
- cek versi python dengan cara **python -version**
- mengecek pip python dengan cara **pip -version**
- setelah itu menginstall Pygame dengan cara **pip install pygame**

e. setelah itu buka IDLE setelah itu di dalamnya ketikkan **import pygame** f.

g. jika tidak ada error maka akan muncul seperti gambar dibawah ini

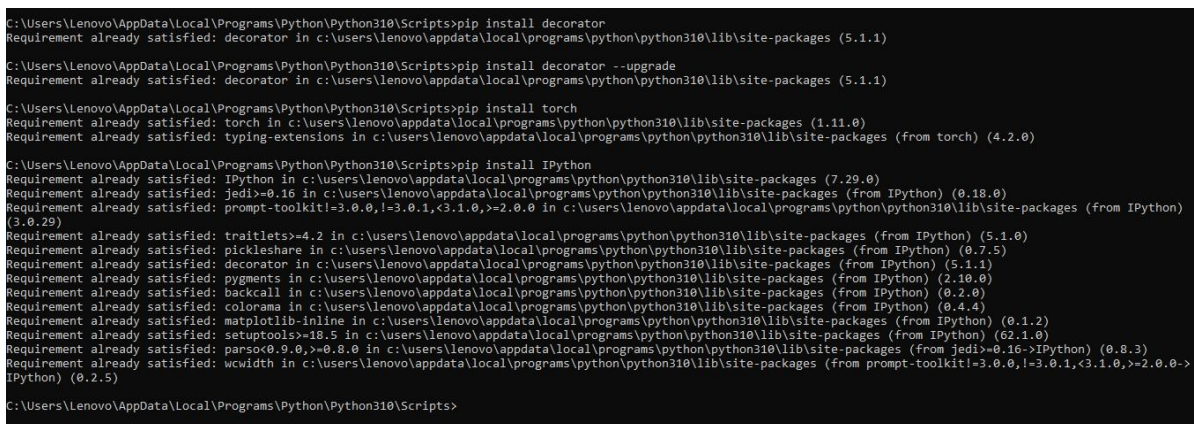


```
Python 3.8.2 Shell
File Edit Shell Debug Options Window Help
Python 3.8.2 (tags/v3.8.2:7b3ab59, Feb 25 2020, 23:03:10) [MSC v.1916 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> import pygame
pygame 1.9.6
Hello from the pygame community. https://www.pygame.org/contribute.html
>>>
```

4. Cara Instal IPYTHON

a. Jika sebelumnya sudah menginstal python langkan selanjutnya untuk mendapatkan IPYTHON adalah dengan **pip install ipython**

b. Setelah tidak ada error mak library **ipython** sudah terpasang di komputer.



```
C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>pip install decorator
Requirement already satisfied: decorator in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (5.1.1)

C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>pip install decorator --upgrade
Requirement already satisfied: decorator in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (5.1.1)

C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>pip install torch
Requirement already satisfied: torch in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (1.11.0)
Requirement already satisfied: typing-extensions in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from torch) (4.2.0)

C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>pip install IPython
Requirement already satisfied: IPython in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (7.29.0)
Requirement already satisfied: jedi>=0.16 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (0.18.0)
Requirement already satisfied: prompt-toolkit!=3.0.0,!=3.0.1,<3.1.0,>=2.0.0 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (3.0.29)
Requirement already satisfied: traitlets>=4.2 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (5.1.0)
Requirement already satisfied: pickleshare in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (0.7.5)
Requirement already satisfied: decorator in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (5.1.1)
Requirement already satisfied: pygments in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (2.16.0)
Requirement already satisfied: backcall in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (0.2.0)
Requirement already satisfied: colorama in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (0.4.4)
Requirement already satisfied: matplotlib-inline in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (0.1.2)
Requirement already satisfied: setuptools>=18.5 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from IPython) (62.1.0)
Requirement already satisfied: parso<0.9.0,>=0.8.0 in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from jedi>=0.16->IPython) (0.8.3)
Requirement already satisfied: wcwidth in c:\users\lenovo\appdata\local\programs\python\python310\lib\site-packages (from prompt-toolkit!=3.0.0,!=3.0.1,<3.1.0,>=2.0.0->IPython) (0.2.5)

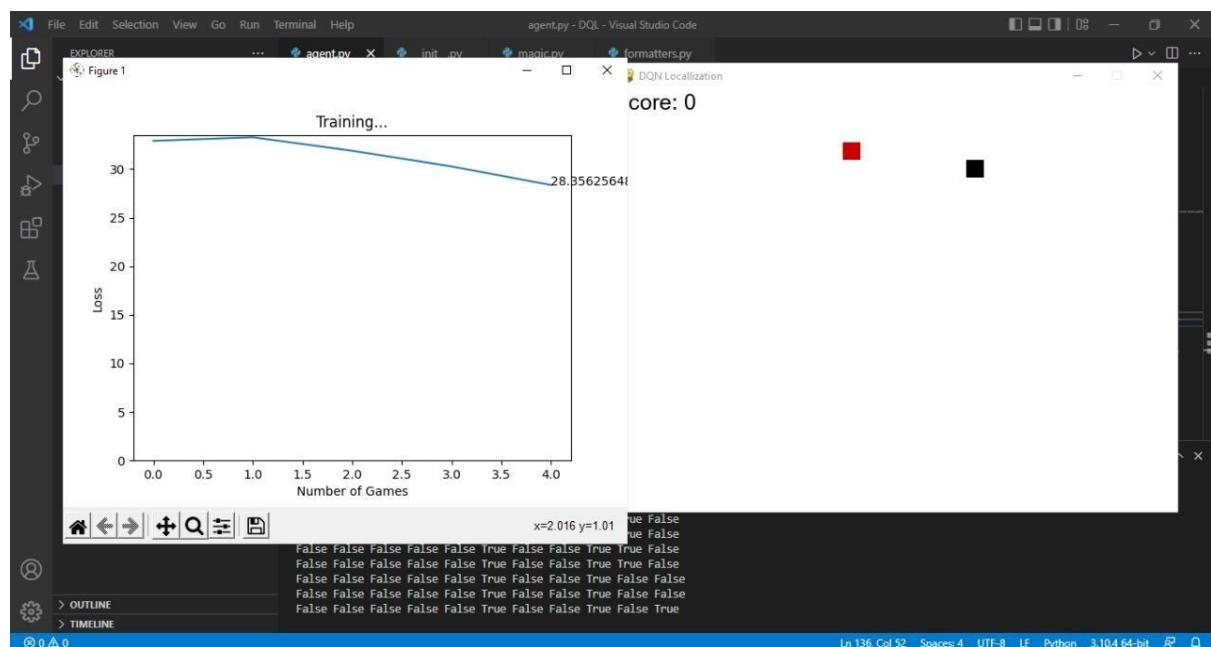
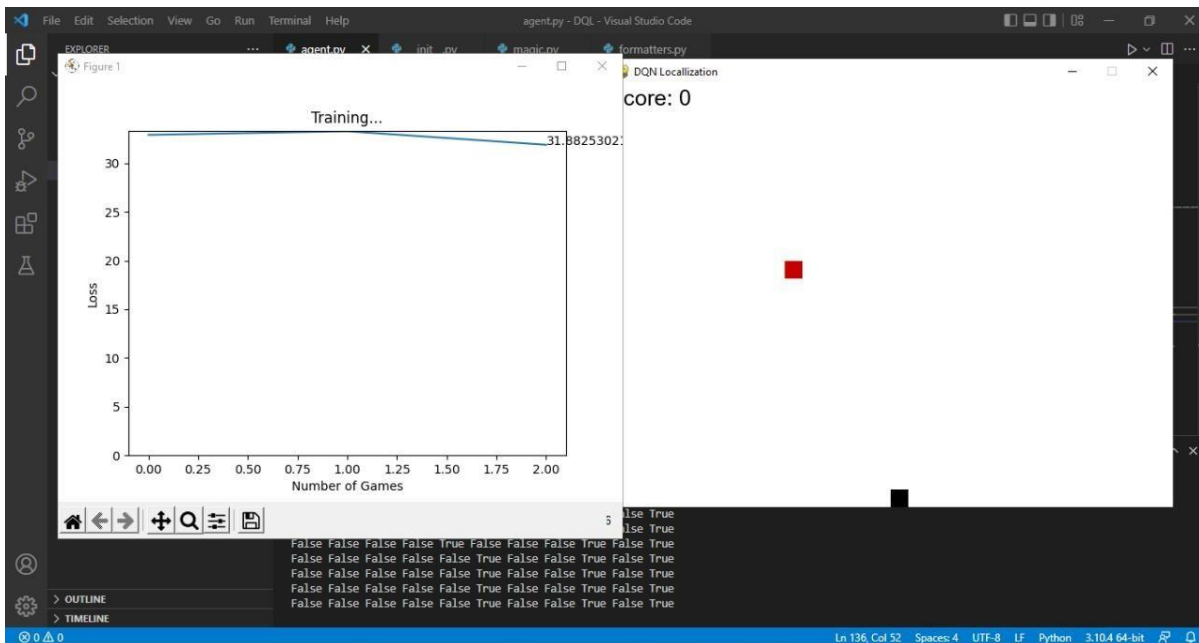
C:\Users\Lenovo\AppData\Local\Programs\Python\Python310\Scripts>
```

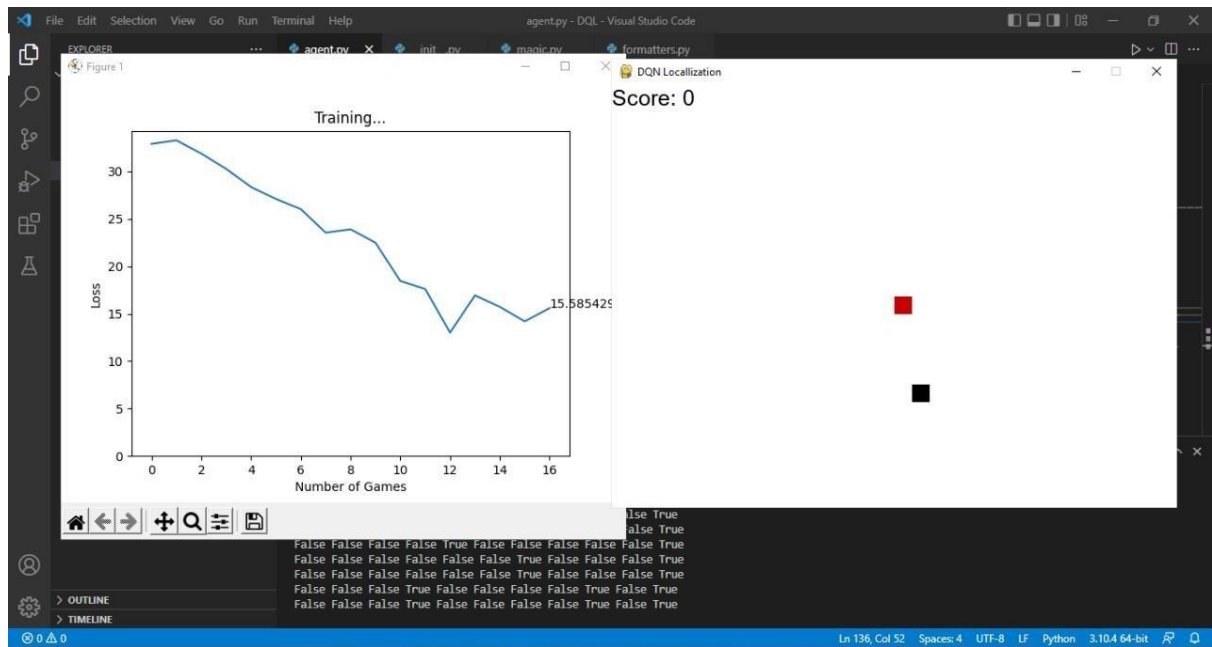
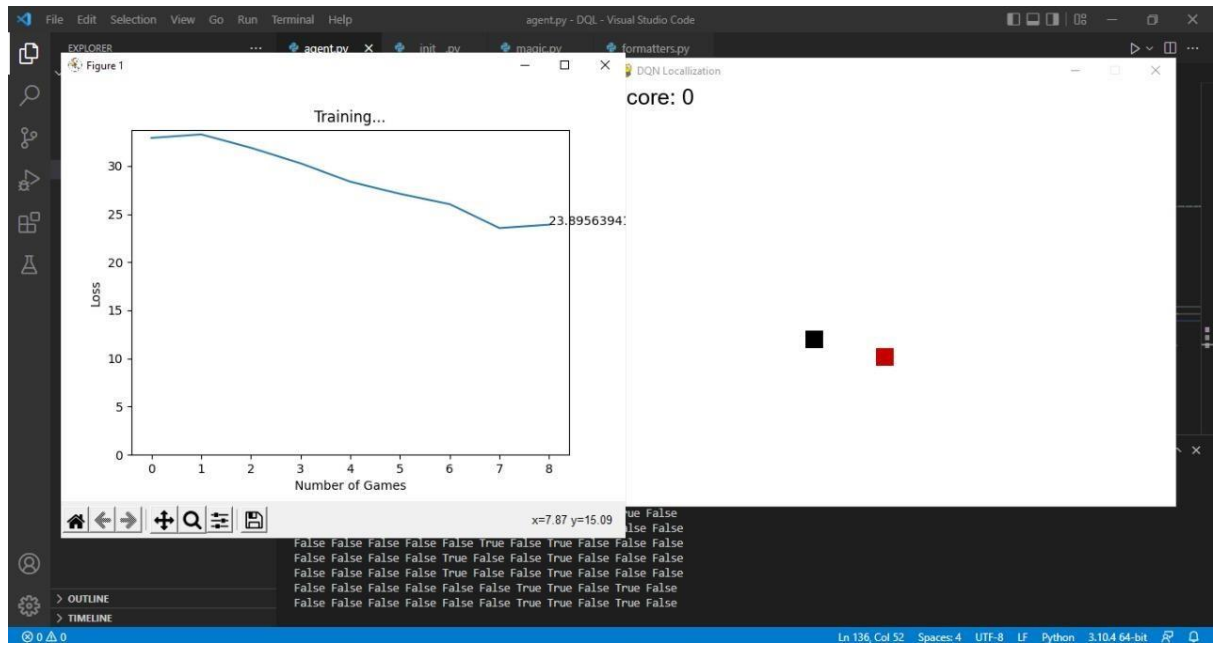
karena pada site-packages di laptop saya sudah ada IPython, maka ketika saya ingin install kembali status IPython telah already.

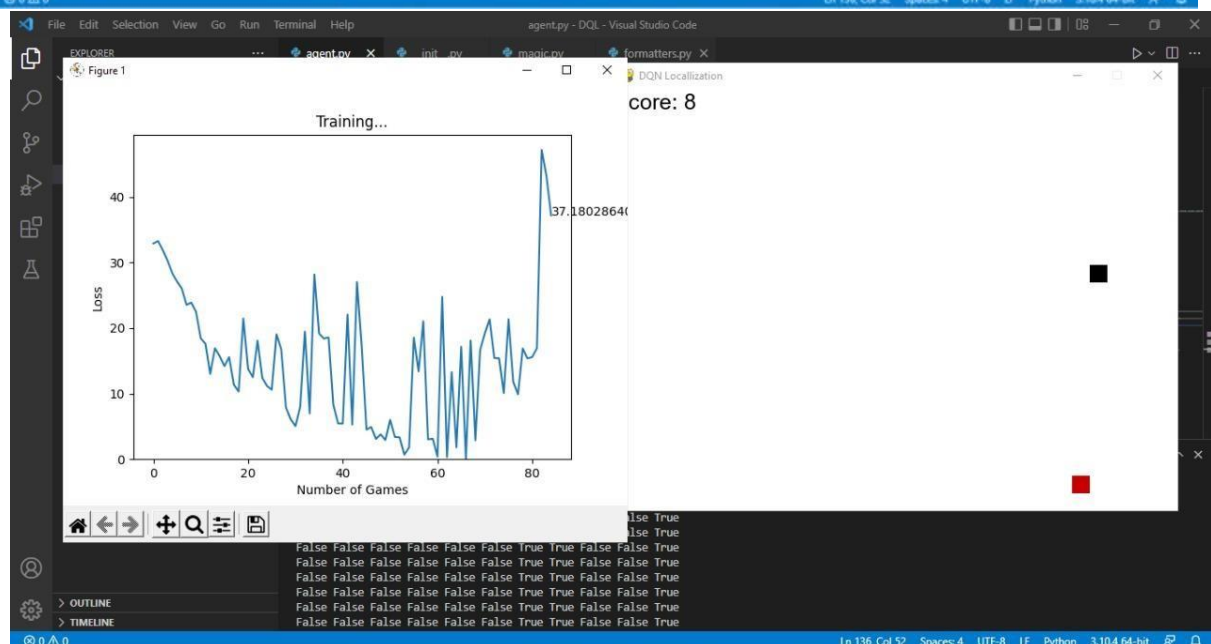
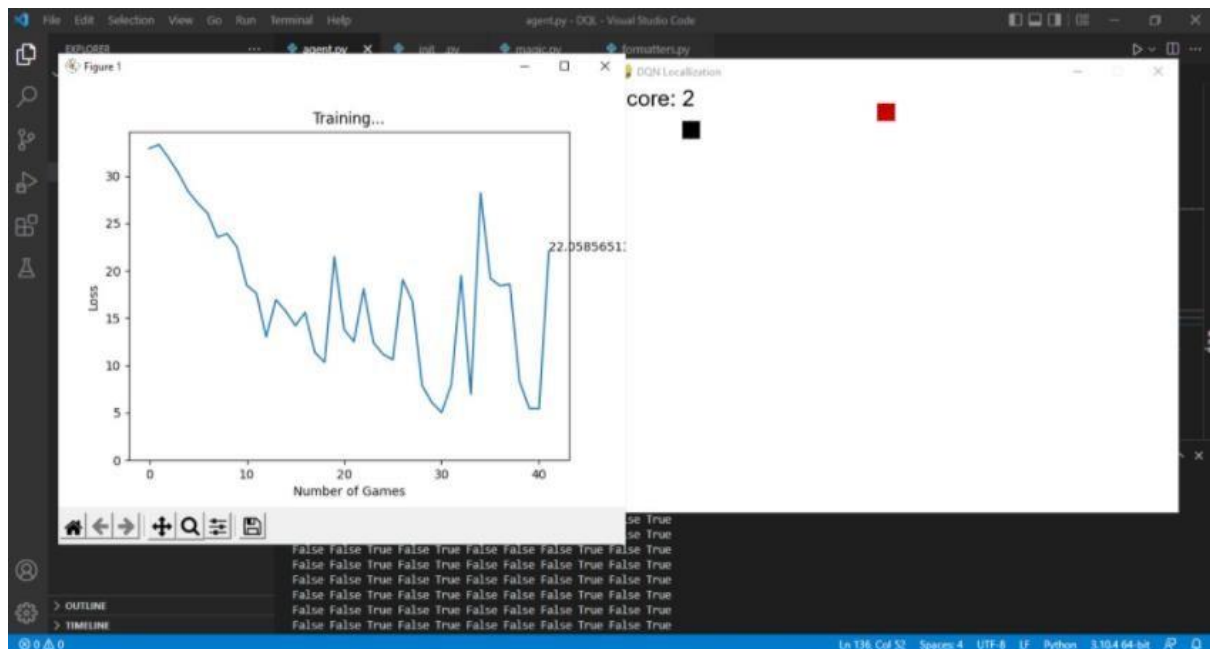
5. ANALISIS HASIL RUN

Kami telah berhasil running folder DQL dengan merunning file agent.py. Karena kami telah menginstall library dan konfigurasi dependency nya, maka file agent.py berhasil dijalankan. Kami

memeriksa hasil running program selama beberapa menit lalu menganalisis sistem trainingnya. Bukti running dan hasil program dapat dilihat pada gambar berikut.







Berdasarkan hasil grafik di atas, dapat dilihat bahwa pada awal-awal running, proses training berjalan lambat. Agent dan reward yang didapat sangat lama sehingga memerlukan waktu beberapa menit lagi untuk mendapatkan hasil training yang bagus. Setelah sekitar kurang lebih 10 menit, hasil training menjadi cukup bagus sehingga proses agent, action, dan reward yang didapat dapat dirasakan dengan lumayan cepat.

