ReadMe for 105-3-K2-Base-Average-Eta-NV-2021-06-22.py
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I. INTRODUCTION:

This ReadMe contains the steps for:
- setting up the environment,
- running 105-3-K2-Base-Average-Eta-NV-2021-06-22.py code file and
- eta calculations

for performance comparison of Baseline and K2 Algorithms

I. PREREQUISITES:

1. We will be using python environment ‘unityenv’ we created for mlagents project.
```
(base) nisargvadher@Nisargs-MBP ~ % conda activate unityenv
(unityenv) nisargvadher@Nisargs-MBP ~ %
```

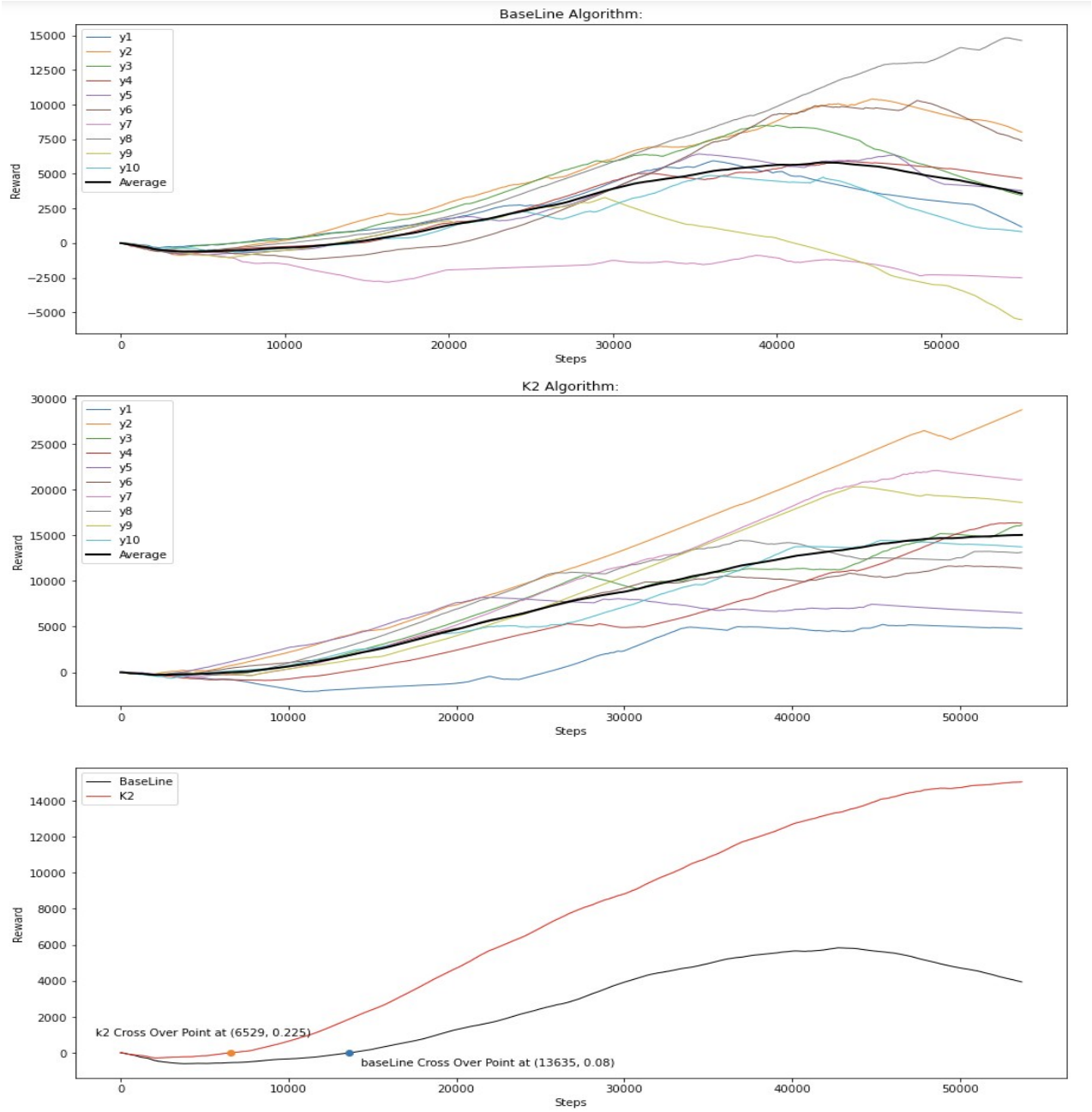
2. Execute below commands to confirm we have Packages: matplotlib and pandas installed
   conda install pandas
   conda install matplotlib
3. Download and Place folder ‘trainingData’ folder from the Email, in the same folder in which our python file exists.
   - If executing python code through terminal, make sure present working directory is the one in which the file resides. (Type pwd to see the current working directory)
```
(unityenv) nisargvadher@Nisargs-MBP ~ % pwd
/Users/nisargvadher
```
4. Navigate to the folder where we have kept our downloaded python file and ‘trainingData’ folder. In my case it is:
```
(unityenv) nisargvadher@Nisargs-MBP ~ % cd ~/Documents/Work/roboticArm
(unityenv) nisargvadher@Nisargs-MBP roboticArm %
```
5. Run the python code by following command
   Command: python 105-3-K2-Base-Average-Eta-NV-2021-06-22.py
```
(unityenv) nisargvadher@Nisargs-MBP roboticArm % python 105-3-K2-Base-Average-Eta-NV-2021-06-22.py
```

III OUTPUT:

After a successful run, we will get following output.

```
BaseLine First Negative Index: 40
BaseLine CrossOver Point: 13635
K2 First Negative Index: 59
k2 CrossOver Point: 6529
Total Steps of BaseLine: 54920
Total Steps of K2: 53689
BaseLine Negative Index Summation: [-5205975.7]
BaseLine Positive Index Summation: [1.52978159e+08]
K2 Negative Index Summation: [-1102275.]
K2 Positive Index Summation: [3.96901875e+08]
ETA Negative: [0.21173264]
ETA Positive: [2.59450027]
```

And we also get below graphs:



IV ALGORITHM:

1. Imports 10 files of training Data for Baseline Algorithm and K2 Algorithm.
2. To maintain consistency for both Baseline and K2 Algorithm we drop extra rows by keeping the max Record count as the least record count from one of the ten csv files
3. To generate Average, we concatenate all the data from 10 CSV Files for both Algorithms and we use groupby along with mean.
4. Two CSV Files are exported for the Average Values of Baseline and K2 Algorithms
5. Logic used to find Eta Calculations can be found at bottom and results of calculation with Graphs attached below:
   [Note: Here, Record count Starts from Index: 0]

   Crossover Points and Total Records of both Algorithms:

```
BaseLine First Negative Index: 40
BaseLine CrossOver Point: 13635
K2 First Negative Index: 59
k2 CrossOver Point: 6529
Total Steps of BaseLine: 54920
Total Steps of K2: 53689
```

   Eta Calculation Results:

```
BaseLine Negative Index Summation: [-5205975.7]
BaseLine Positive Index Summation: [1.52978159e+08]
K2 Negative Index Summation: [-1102275.]
K2 Positive Index Summation: [3.96901875e+08]
ETA Negative: [0.21173264]
ETA Positive: [2.59450027]
```

V . PERFORMANCE EVALUATION CALCULATIONS:

For BaseLine:

Index for the accumulated Negative reward:

$$I_{N,B}=\sum_{t=40}^{t=13634} r(t) ¿(1)¿$$

$$I_{N,B}=-520595.7\ ¿(2)\ ¿$$

Index for the accumulated Positive reward:

$$I_{P,B}=\sum_{t=0}^{t=39} r(t)+\sum_{t=13635}^{t=54919} r(t)\ ¿(3)\ ¿$$

$$I_{P,B}=1.52978159\times 10^{8} ¿(4)¿$$

For K2 Algorithm:

Index for Accumulated Negative Reward:

$$I_{N,K2}=\sum_{t=59}^{t=6528} r(t) ¿(5)¿$$

$$I_{N,K2}=-1102275 ¿(6)¿$$

Index for Accumulated Positive Reward:

$$I_{P,K2}=\sum_{t=0}^{t=58} r(t)+\sum_{t=6529}^{t=53688} r(t) ¿(7)¿$$

$$I_{P,K2}=3.96901875\times 10^{8} ¿(8)¿$$

Now, we calculate η for both- Negative and Positive Values.

For Negative,

$$\eta_N=\frac{I_{N,K2}}{I_{N,B}} ¿(9)¿$$

$$\eta_N=0.21173264 ¿(10)¿$$

For Positive,

$$\eta_P=\frac{I_{P,K2}}{I_{P,B}} ¿(11)¿$$

$$\eta_P=2.59450027 ¿(12)¿$$

(END)