TrainDQN

December 9, 2024

[1]:
```
import torch
import torch.nn as nn
import torch.optim as optim
import numpy as np
import pandas as pd
from src.dqn.DQNAgent import DQNAgent
from src.dqn.ReplayBuffer import ReplayBuffer
from src.ProbBidClearing import ProbBidClearing
```

[2]:
```
# load day-ahead and real-time prices
DAP = pd.read_csv("./data/CAISO_DAP.csv")
RTP = pd.read_csv("./data/CAISO_RTP.csv")

# read datetime and drop duplicate data
RTP["Date"] = pd.to_datetime(RTP["Date"], format="%m/%d/%Y %I:%M:%S %p")
RTP = RTP.drop_duplicates(subset=["Date", "hub"])
DAP["Date"] = pd.to_datetime(DAP["Date"], format="%m/%d/%Y %I:%M:%S %p")
DAP = DAP.drop_duplicates(subset=["Date", "zone"])

# pivot data
DAP_pivoted = DAP.pivot(index="Date", columns="zone", values="price")
RTP_pivoted = RTP.pivot(index="Date", columns="hub", values="price")

# rename 'Date' column to 'ts'
DAP_pivoted.index.names = ["ts"]
RTP_pivoted.index.names = ["ts"]

# merge dataframes on index
CAISO_PRICES = pd.merge(DAP_pivoted, RTP_pivoted, on=["ts"], how="outer")
CAISO_PRICES = CAISO_PRICES.ffill().reset_index()
```

[3]:
```
# form datasets
PGAE_NP15 = CAISO_PRICES[["ts", "PGAE", "TH_NP15"]].rename(
    columns={"PGAE": "dap", "TH_NP15": "rtp"}
)
PGAE_ZP26 = CAISO_PRICES[["ts", "PGAE", "TH_ZP26"]].rename(
    columns={"PGAE": "dap", "TH_ZP26": "rtp"}
)
```

```
SCE_SP15 = CAISO_PRICES[["ts", "SCE", "TH_SP15"]].rename(
    columns={"SCE": "dap", "TH_SP15": "rtp"}
)
SDGE_SP15 = CAISO_PRICES[["ts", "SDGE", "TH_SP15"]].rename(
    columns={"SDGE": "dap", "TH_SP15": "rtp"}
)
```

[4]:
```
# Hyperparameters
lr = 1e-3
batchsize = 128
maxlength = 10000
episodes = 5
initialsize = 5000
tau = 100
epsilon = 0.2
gamma = 0.99
```

[5]:
```
# init the prob clearer

clearer = ProbBidClearing()
prob_clear_function = clearer.timevarying_norm_prob_clear
```

[6]:
```
# init DQN Agent
agent = DQNAgent(lr=lr,
                 prob_clear=prob_clear_function,
                 attitude="honest",
                 data=PGAE_NP15
                )

# init Replay Buffer
buffer = ReplayBuffer(maxlength=maxlength)
```

[7]:
```
agent.train(buffer, gamma, initialsize, batchsize, tau, episodes)
```

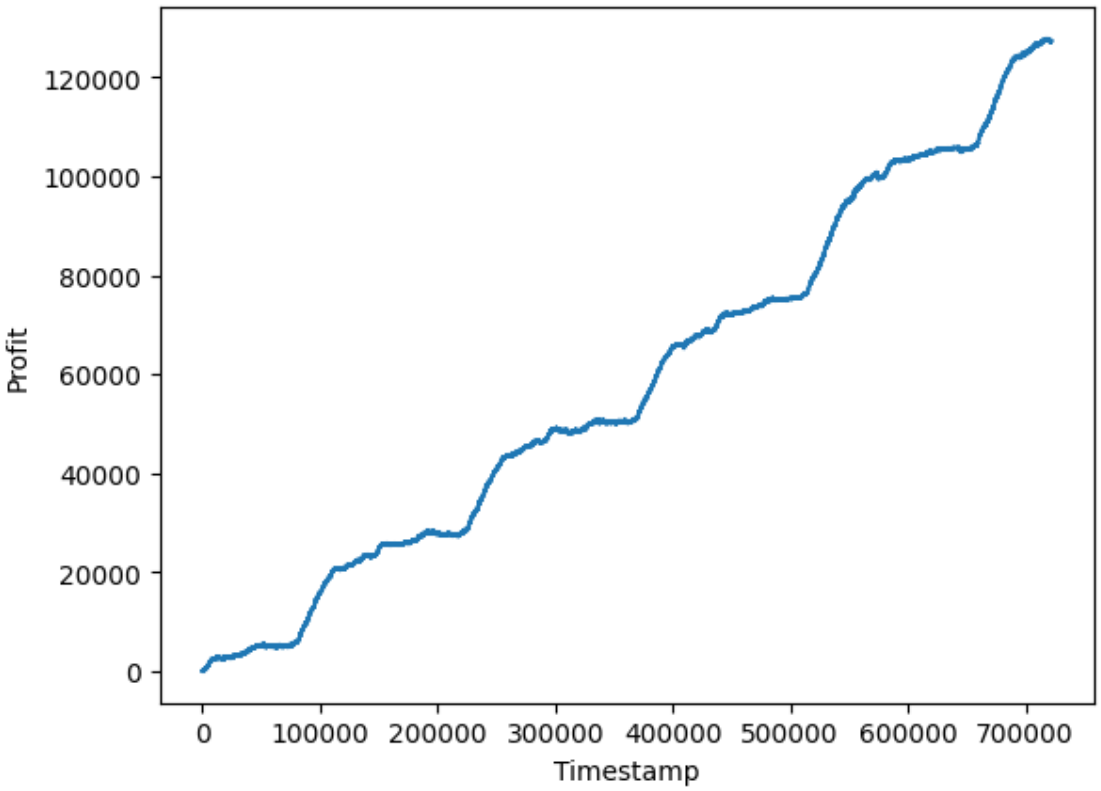
```
/Users/shadunts/Documents/study/ORCSE4529/EnergyStorageRLBidder/src/dqn/DQNAgent
.py:240: UserWarning: Creating a tensor from a list of numpy.ndarrays is
extremely slow. Please consider converting the list to a single numpy.ndarray
with numpy.array() before converting to a tensor. (Triggered internally at
/Users/runner/work/pytorch/pytorch/pytorch/torch/csrc/utils/tensor_new.cpp:281.)
  states = torch.FloatTensor(states)

Episode 0, Overall Reward: 23234.538267732125
Episode 1, Overall Reward: 23066.633432101098
Episode 2, Overall Reward: 22396.375007098144
Episode 3, Overall Reward: 30930.10327957917
Episode 4, Overall Reward: 27748.174443899294
```

[8]:
```
import matplotlib.pyplot as plt

plt.plot(np.cumsum(agent.profit_hist))
plt.xlabel("Timestamp")
plt.ylabel("Profit")
```

[8]:
```
Text(0, 0.5, 'Profit')
```



[9]:
```
import pickle as pkl

agent._reset_sim()

with open('agents/timevarying_norm_honest.pkl', 'wb') as f:
    pkl.dump(agent, f)
```