pa2-dqn-acro-bot

March 29, 2023

```
[]: import math
     import numpy as np
     import random
     import torch
     import torch.nn as nn
     import torch.nn.functional as F
     from collections import namedtuple, deque
     import torch.optim as optim
     import datetime
     import gym
     from gym.wrappers.record_video import RecordVideo
     import glob
     import io
     import base64
     import matplotlib.pyplot as plt
     from IPython.display import HTML
     from pyvirtualdisplay import Display
     import tensorflow as tf
     from IPython import display as ipythondisplay
     from PIL import Image
     import tensorflow_probability as tfp
     import warnings
     warnings.filterwarnings("ignore")
```

```
[]: env = gym.make('Acrobot-v1')
  env.seed(0)

state_shape = env.observation_space.shape[0]
  no_of_actions = env.action_space.n

print(state_shape)
  print(no_of_actions)
  print(env.action_space.sample())
  print("----")
state = env.reset()
```

```
''' This returns the initial state (when environment is reset) '''
     print(state)
     print("----")
     action = env.action_space.sample()
     ''' We take a random action now '''
     print(action)
     print("----")
     next_state, reward, done, info = env.step(action)
     ^{\prime\prime\prime} env.step is used to calculate new state and obtain reward based on old _{\! \sqcup}
     ⇔state and action taken '''
     print(next_state)
     print(reward)
     print(done)
     print(info)
     print("----")
    6
    3
    [ \ 0.99962485 \ \ 0.02738891 \ \ 0.9989402 \ \ -0.04602639 \ \ -0.09180529 \ \ -0.09669447 ]
    1
    [0.9999849 \quad 0.00548956 \quad 0.9983176 \quad -0.05798252 \quad -0.12309824 \quad -0.02443151]
    -1.0
    False
    {}
[]: parameters_dict = {
          'NUM NEURONS EACH LAYER' : {
              'values': [64,90,128]
           },
          'NUM_LAYERS' :{
             'values': [2,4,8,10]
         },
     sweep_config['parameters'] = parameters_dict
[]: import math
     parameters_dict.update({
```

```
'LR': {
    'distribution': 'uniform',
    'min': (0.00001),
   'max': (0.0001)
  },
'BATCH_SIZE': {
    'distribution': 'q_log_uniform_values',
    'q' : 1,
    'min': (64),
   'max': (512),
  },
'UPDATE_EVERY': {
    'distribution': 'q_log_uniform_values',
    'q' : 1,
    'min': (10),
   'max': (200),
  },
'GAMMA': {
    'distribution': 'uniform',
    'min': 0.8,
    'max': 1,
  },
'MAX_TRUNCATION': {
    'distribution': 'uniform',
    'min': (0.5),
    'max': (2),
'EPS_DECAY': {
    'distribution': 'uniform',
    'min': 0.9,
    'max': 0.995,
 },
'a_TUNE': {
    'distribution': 'uniform',
    'min': 0,
    'max': 1,
  }
})
```

```
[]: import pprint
     pprint.pprint(sweep_config)
    {'method': 'random',
     'metric': {'goal': 'minimize', 'name': 'num episodes tosolve env'},
     'parameters': {'BATCH_SIZE': {'distribution': 'q_log_uniform_values',
                                    'max': 512,
                                    'min': 64,
                                    'q': 1},
                     'EPS_DECAY': {'distribution': 'uniform',
                                   'max': 0.995,
                                   'min': 0.9},
                     'GAMMA': {'distribution': 'uniform', 'max': 1, 'min': 0.8},
                     'LR': {'distribution': 'uniform', 'max': 0.0001, 'min': 1e-05},
                     'MAX_TRUNCATION': {'distribution': 'uniform',
                                        'max': 2,
                                        'min': 0.5},
                     'NUM_LAYERS': {'values': [2, 4, 8, 10]},
                     'NUM_NEURONS_EACH_LAYER': {'values': [64, 90, 128]},
                     'UPDATE_EVERY': {'distribution': 'q_log_uniform_values',
                                      'max': 200,
                                      'min': 10,
                                      'q': 1},
                     'a_TUNE': {'distribution': 'uniform', 'max': 1, 'min': 0}}}
[]:|sweep_id = wandb.sweep(sweep_config, project="Hyper parameter tuning Acrobot -u

  v1")
    Failed to detect the name of this notebook, you can set it manually with the
    WANDB_NOTEBOOK_NAME environment variable to enable code saving.
    Create sweep with ID: pbokhaz2
    Sweep URL: https://wandb.ai/me19b190/Hyper%20parameter%20tuning%20Acrobot%20-%20
    v1/sweeps/pbokhaz2
[]: import torch
     import torch.nn as nn
     import torch.nn.functional as F
     class QNetwork1(nn.Module): #take state s and outputs Q(s,a)
       def __init__(self,seed, state_size, action_size,__
      onum_layers, neurons_each_layer): #num_layers = number of hidden_
      ⇔layers, neurons_each_layer = number of neurons in hidden layers
         super(QNetwork1,self).__init__()
         self.seed = torch.manual_seed(seed)
```

```
self.input_size = state_size
  self.output_size = action_size
  self.num_layers = num_layers
  self.neurons_each_layer = neurons_each_layer
  self.linears = nn.ModuleList([nn.Linear(self.input_size, self.
→neurons_each_layer[0])])
  self.linears.extend([nn.Linear(self.neurons_each_layer[i-1], self.
→neurons_each_layer[i]) for i in range(1, self.num_layers)])
  self.linears.append(nn.Linear(self.neurons_each_layer[-1], self.
→output_size))
def forward(self, state):
  for i in range(self.num_layers+1):
    if i == 0:
      h = F.relu(self.linears[0](state))
    elif i<(self.num_layers):</pre>
      h = F.relu(self.linears[i](h))
    else:
      return self.linears[self.num_layers](h)
```

```
[]: import random
     import torch
     import numpy as np
     from collections import deque, namedtuple
     device = torch.device("cuda:0" if torch.cuda.is_available() else "cpu")
     class ReplayBuffer:
         """Fixed-size buffer to store experience tuples."""
         def __init__(self, action_size, buffer_size, batch_size, seed):
             """Initialize a ReplayBuffer object.
             Params
             _____
                 action_size (int): dimension of each action
                 buffer_size (int): maximum size of buffer
                 batch_size (int): size of each training batch
                 seed (int): random seed
             self.action_size = action_size
             self.memory = deque(maxlen=buffer_size)
             self.batch_size = batch_size
             self.experience = namedtuple("Experience", field_names=["state",__

¬"action", "reward", "next_state", "done"])
             self.seed = random.seed(seed)
```

```
def add(self, state, action, reward, next_state, done): #added TD
             """Add a new experience to memory."""
             e = self.experience(state, action, reward, next_state, done)
             self.memory.append(e)
         def sample(self,batch_size=None,a=1.0):
             """Randomly sample a batch of experiences from memory."""
             experiences = random.sample(self.memory, k=self.batch_size)
             states = torch.from_numpy(np.vstack([e.state for e in experiences if eu
      →is not None])).float().to(device)
             actions = torch.from numpy(np.vstack([e.action for e in experiences if
      →e is not None])).long().to(device)
             rewards = torch.from_numpy(np.vstack([e.reward for e in experiences if_
      →e is not None])).float().to(device)
             next_states = torch.from_numpy(np.vstack([e.next_state for e in_
      ⇔experiences if e is not None])).float().to(device)
             dones = torch.from_numpy(np.vstack([e.done for e in experiences if e is_
      →not None]).astype(np.uint8)).float().to(device)
             return (states, actions, rewards, next_states, dones)
         def __len__(self):
             """Return the current size of internal memory."""
             return len(self.memory)
[]: class TutorialAgent():
         def __init__(self, state_size, action_size,__
      -seed, num layers, neurons_each_layer, lr, gamma, update_every, batch_size, max_tRUNCATION):
             ''' Agent Environment Interaction '''
             self.state_size = state_size
             self.action size = action size
             self.seed = random.seed(seed)
             self.batch_size = batch_size
             self.gamma = gamma
             self.MAX_TRUNCATION = max_tRUNCATION
             self.update_every = update_every
             ''' Q-Network '''
             self.qnetwork_local = QNetwork1(seed=seed, state_size= state_size,_u
      ⇔action size=action size
      ,num_layers=num_layers,neurons_each_layer=neurons_each_layer).to(device)
```

```
self.qnetwork_target =QNetwork1(seed=seed, state_size= state_size,__
⇔action_size=action_size_
, num_layers=num_layers, neurons_each_layer=neurons_each_layer).to(device)
       self.optimizer = optim.Adam(self.qnetwork local.parameters(), lr=lr)
       ''' Replay memory '''
       self.memory = ReplayBuffer(action_size, int(1e5), self.batch_size,_
⇒seed=seed)
       ''' Initialize time step (for updating every UPDATE_EVERY steps)
    -Needed for Q Targets '''
       self.t step = 0
  def step(self, state, action, reward, next_state, done,a):
       ''' Save experience in replay memory '''
       self.memory.add(state, action, reward, next_state, done)
       ^{\prime\prime} ^{\prime\prime} If enough samples are available in memory, get random subset and _{\sqcup}
⇔learn '''
       if len(self.memory) >= self.batch_size:
           experiences = self.memory.sample(a=a)
           self.learn(experiences, self.gamma)
       """ +O TARGETS PRESENT """
       ''' Updating the Network every 'UPDATE_EVERY' steps taken '''
       self.t_step = (self.t_step + 1) % self.update_every
       if self.t_step == 0:
           self.qnetwork_target.load_state_dict(self.qnetwork_local.
⇔state_dict())
  def act(self, state, eps=0.):
      self.eps = eps
      state = torch.from_numpy(state).float().unsqueeze(0).to(device)
      self.qnetwork_local.eval()
      with torch.no_grad():
           action_values = self.qnetwork_local(state)
      self.qnetwork_local.train()
       ''' Epsilon-greedy action selection (Already Present) '''
       if random.random() > eps:
           return np.argmax(action_values.cpu().data.numpy())
       else:
           return random.choice(np.arange(self.action_size))
  def learn(self, experiences, gamma):
```

```
""" +E EXPERIENCE REPLAY PRESENT """
             (states, actions, rewards, next_states, dones) = experiences
             ''' Get max predicted Q values (for next states) from target model'''
             Q_targets_next = self.qnetwork_target(next_states).detach().max(1)[0].
      unsqueeze(1)
             ''' Compute Q targets for current states '''
             Q_targets = rewards + (gamma * Q_targets_next * (1 - dones))
             ''' Get expected Q values from local model '''
             Q_expected = self.qnetwork_local(states).gather(1, actions)
             #print("Type of TD error: ",type(TD_error),TD_error.size())
             loss = F.mse_loss(Q_expected, Q_targets)
             #print("Type of imp wei:",__
      →type(importance_weights), len(importance_weights))
             ''' Compute loss '''
             ''' Minimize the loss '''
             self.optimizer.zero_grad()
             loss.backward()
             ''' Gradiant Clipping '''
             """ +T TRUNCATION PRESENT """
             '''for param in self.qnetwork_local.parameters():
                 param.grad.data.clamp_(-1, 1)'''
             torch.nn.utils.clip grad norm (self.qnetwork local.parameters(), self.
      →MAX TRUNCATION)
             self.optimizer.step()
[]: def calculate_mean(array):
         lens = [len(i) for i in array]
         arr = np.ma.empty((np.max(lens),len(array)))
         arr.mask = True
         for idx, l in enumerate(array):
             arr[:len(1),idx] = 1
         return arr.mean(axis = -1), arr.std(axis=-1)
[]: ''' Defining DQN Algorithm '''
     state_shape = env.observation_space.shape[0]
     action_shape = env.action_space.n
     def dqn(agent,n_episodes=5000, max_t=500, eps_start=1.0, eps_end=0.01,_
      \Rightarroweps decay=0.999,a = 0.7):
```

```
scores = []
  ''' list containing scores from each episode '''
  steps = []
  scores_window_printing = deque(maxlen=10)
  ''' For printing in the graph '''
  scores_window= deque(maxlen=100)
  ''' last 100 scores for checking if the aug is more than 195 '''
  scores_exit_bad_paramas = deque(maxlen=200)
  eps = eps start
  ''' initialize epsilon '''
  for i_episode in range(1, n_episodes+1):
      state = env.reset()
      score = 0
      step = 0
      for t in range(max_t):
          action = agent.act(state, eps)
          next_state, reward, done, _ = env.step(action)
          agent.step(state, action, reward, next_state, done,a = a)
          state = next_state
          score += reward
          step += 1
          if done:
              break
      steps.append(step)
      scores window.append(score)
      scores_window_printing.append(score)
      scores_exit_bad_paramas.append(score)
       ''' save most recent score '''
      eps = max(eps_end, eps_decay*eps)
       ''' decrease epsilon '''
      print('\rEpisode {}\tAverage Score: {:.2f}'.format(i_episode, np.
→mean(scores_window)), end="")
      if i_episode>500 and np.mean(scores_exit_bad_paramas)<-450 or_
→(i_episode>500 and (np.std(scores_exit_bad_paramas)*100/np.
→mean(scores_exit_bad_paramas))<=1):</pre>
         print("\nExperiment ended because of bad results, no significant_
→improvement of the agent performance")
         return [np.array(steps),np.array(scores),i_episode,True]
      if i_episode % 10 == 0:
          scores.append(np.mean(scores_window_printing))
      if i_episode % 100 == 0:
         print('\rEpisode {}\tAverage Score: {:.2f}'.format(i_episode, np.
→mean(scores_window)))
```

```
if np.mean(scores_window)>=-100.0:
          print('\nEnvironment solved in {:d} episodes!\tAverage Score: {:.
 break
   return [np.array(steps),np.array(scores),i_episode,False]
''' Trial run to check if algorithm runs and saves the data '''
BATCH_SIZE= 64
EPS_DECAY= 0.995
GAMMA= 0.99
LR=5e-4
MAX_TRUNCATION= 1
NUM_LAYERS= 2
NUM_NEURONS_EACH_LAYER= 64
UPDATE_EVERY= 20
a_TUNE= 0
agent_1 = None
steps_over_10_runs = []
rewards_over_10_runs = []
episodes = []
min_len = np.inf
for run in range(1):
     print("Run: ",run+1,"_
     env = gym.make('Acrobot-v1')
     seed = run
      env.seed(seed)
     state_shape = env.observation_space.shape[0]
     action_shape = env.action_space.n
     begin_time = datetime.datetime.now()
     neurons_each_layer_ = [NUM_NEURONS_EACH_LAYER] *NUM_LAYERS
      agent = TutorialAgent(state_size= state_shape, action_size=action_shape,_u
 seed=seed,num_layers=NUM_LAYERS,neurons_each_layer=neurons_each_layer_⊔
 ,lr=LR,gamma=GAMMA,update_every=UPDATE_EVERY,batch_size=BATCH_SIZE,max_tRUNCATION=MAX_TRUNC
      steps_eps_greedy,reward_eps_greedy, episodes_eps_greedy,agent_l =_
 →dqn(agent,eps_decay = EPS_DECAY, a = a_TUNE)
      steps_over_10_runs.append(steps_eps_greedy)
     rewards_over_10_runs.append(reward_eps_greedy)
      episodes.append(episodes_eps_greedy)
      if len(reward_eps_greedy) < min_len:</pre>
       min_len = len(reward_eps_greedy)
     time_taken = datetime.datetime.now() - begin_time
     print(time_taken)
```

```
rewards = np.array(rewards_over_10_runs)
    avg episodes = int(np.array(episodes).mean())
    steps = np.array(steps_over_10_runs)
    y, error = calculate_mean(steps)
[]: pprint.pprint(sweep_config)
    {'method': 'random',
     'metric': {'goal': 'minimize', 'name': 'num_episodes_tosolve_env'},
     'parameters': {'BATCH_SIZE': {'distribution': 'q_log_uniform_values',
                                   'max': 512,
                                   'min': 64,
                                   'q': 1},
                    'EPS_DECAY': {'distribution': 'uniform',
                                  'max': 0.995,
                                  'min': 0.9},
                    'GAMMA': {'distribution': 'uniform', 'max': 1, 'min': 0.8},
                    'LR': {'distribution': 'uniform', 'max': 0.0001, 'min': 1e-05},
                    'MAX_TRUNCATION': {'distribution': 'uniform',
                                       'max': 2,
                                       'min': 0.5},
                    'NUM LAYERS': {'values': [2, 4, 8, 10]},
                    'NUM_NEURONS_EACH_LAYER': {'values': [64, 90, 128]},
                    'UPDATE_EVERY': {'distribution': 'q_log_uniform_values',
                                     'max': 200,
                                     'min': 10,
                                     'q': 1},
                    'a_TUNE': {'distribution': 'uniform', 'max': 1, 'min': 0}}}
[]: def train(config = None):
      with wandb.init(config = config):
         config = wandb.config
        BUFFER_SIZE = int(1e5) # replay buffer size
        BATCH_SIZE = config.BATCH_SIZE ## minibatch size
        GAMMA = config.GAMMA
                                      ## discount factor
        LR = config.LR
                                      ## learning rate
        UPDATE_EVERY = config.UPDATE_EVERY
                                              ## how often to update the network
      → (When Q target is present)
        NUM_NEURONS_EACH_LAYER = config.NUM_NEURONS_EACH_LAYER
                                                                         ##number of
      ⇔neurons in each hidden layer
        NUM LAYERS =
                        config.NUM LAYERS
                                                        ##number of layers for the_
      ⇔neural network
        MAX_TRUNCATION = config.MAX_TRUNCATION
                                                                  ##max number of
      steps in each episode(needed only for cartpole, acrobot and mountain car
      ⇔these are already defined)
```

```
EPS_DECAY = config.EPS_DECAY
                                                   ##epsilon decay for
⇔epsilon exploration
  a_TUNE = config.a_TUNE
  steps_over_10_runs = []
  rewards_over_10_runs = []
  episodes = []
  min_len = np.inf
  bad = False
  for run in range(10):
    print("Run: ",run+1,"__
           -----")
    env = gym.make('Acrobot-v1')
    seed = run
    env.seed(seed)
    state_shape = env.observation_space.shape[0]
    action_shape = env.action_space.n
    begin_time = datetime.datetime.now()
    agent = TutorialAgent(state_size=state_shape,action_size =_

¬action_shape, seed =
□
seed,num_layers=NUM_LAYERS,neurons_each_layer=[NUM_NEURONS_EACH_LAYER]*NUM_LAYERS,lr∪
→ LR,gamma= GAMMA,update_every=UPDATE_EVERY,batch_size =
→BATCH_SIZE, max_tRUNCATION = MAX_TRUNCATION)
    steps_eps_greedy,reward_eps_greedy, episodes_eps_greedy,bad =_
dqn(agent,eps_decay = EPS_DECAY, a = a_TUNE)
    steps_over_10_runs.append(steps_eps_greedy)
    rewards_over_10_runs.append(reward_eps_greedy)
    episodes.append(episodes_eps_greedy)
    if len(reward_eps_greedy) < min_len:</pre>
      min_len = len(reward_eps_greedy)
    time_taken = datetime.datetime.now() - begin_time
    print(time_taken)
  rewards = np.array(rewards_over_10_runs)
  avg_episodes = int(np.array(episodes).mean())
  steps = np.array(steps_over_10_runs)
  y, error = calculate_mean(rewards)
  plt.figure(figsize = (15,10))
  plt.subplot(121)
  plt.plot(np.arange(len(y))+1, y, color='darkblue',label='average')
  plt.fill_between(np.arange(len(y))+1, y-error, y+error,color =__
plt.title("Episodes vs rewards")
  plt.xlabel("Number of episodes(x10)")
```

```
plt.ylabel("Reward per episode")
  plt.legend()
  plt.subplot(122)
  y, error = calculate_mean(steps)
  plt.plot(np.arange(len(y))+1, y, color='darkblue',label='average')
  plt.fill_between(np.arange(len(y))+1, y-error, y+error,color =__
plt.title("Episodes vs steps ")
  plt.xlabel("Number of episodes")
  plt.ylabel("Steps taken per episode")
  plt.legend()
  plt.savefig('run-hyp'+str(LR)+'.jpg', dpi = 250)
  plt.show()
  for i in range(avg_episodes):
    print("Episode: ",i+1, 'Number of steps: ',round(y[i]))
  if bad == False:
    wandb.log({"num_episodes_tosolve_env":avg_episodes-100})
  else:
    wandb.log({"num_episodes_tosolve_env":5000})
```

[]: wandb.agent(sweep_id, train, count=12)

```
wandb: Agent Starting Run: iq11582e with config:
wandb:
          BATCH SIZE: 388
wandb:
          EPS_DECAY: 0.9075031992719798
wandb:
          GAMMA: 0.9984859956300742
wandb:
         LR: 9.773930288182236e-05
wandb:
         MAX_TRUNCATION: 0.7158217342638222
wandb:
          NUM_LAYERS: 8
wandb:
          NUM_NEURONS_EACH_LAYER: 90
          UPDATE EVERY: 14
wandb:
wandb:
          a_TUNE: 0.21189352510607284
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
wandb: Currently logged in as: me19b190. Use `wandb
login --relogin` to force relogin
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
```

```
Run: 1 ------
Episode 100
           Average Score: -390.76
           Average Score: -120.53
Episode 200
Episode 236
            Average Score: -99.982
Environment solved in 136 episodes! Average Score: -99.98
0:09:48.878962
Run: 2 ------
Episode 100 Average Score: -373.07
Episode 200
           Average Score: -121.21
Episode 237 Average Score: -99.573
Environment solved in 137 episodes! Average Score: -99.57
0:09:23.407114
Run: 3 ------
Episode 100 Average Score: -269.74
Episode 200 Average Score: -100.50
           Average Score: -98.506
Episode 209
Environment solved in 109 episodes! Average Score: -98.50
0:06:22.304254
Run: 4 -----
Episode 100
           Average Score: -311.88
Episode 200 Average Score: -102.88
Episode 204 Average Score: -99.997
Environment solved in 104 episodes! Average Score: -99.99
0:06:39.384156
Run: 5 -----
Episode 100 Average Score: -375.81
Episode 200
           Average Score: -144.28
Episode 300
           Average Score: -106.25
Episode 334
            Average Score: -100.00
Environment solved in 234 episodes! Average Score: -100.00
0:10:41.226444
Run: 6 ------
Episode 100
           Average Score: -291.47
Episode 187
           Average Score: -99.537
Environment solved in 87 episodes! Average Score: -99.53
0:06:09.536175
Run: 7 ------
Episode 100
           Average Score: -373.48
Episode 200
           Average Score: -100.64
Episode 201 Average Score: -99.80
Environment solved in 101 episodes! Average Score: -99.80
0:07:07.419433
Run: 8 -----
Episode 100
           Average Score: -412.31
           Average Score: -130.89
Episode 200
Episode 300 Average Score: -105.49
Episode 375 Average Score: -99.383
Environment solved in 275 episodes! Average Score: -99.38
```

0:11:00.520085

Run: 9 ------

Episode 100 Average Score: -406.24 Episode 200 Average Score: -141.64 Episode 300 Average Score: -105.16 Episode 319 Average Score: -98.601

Environment solved in 219 episodes! Average Score: -98.60

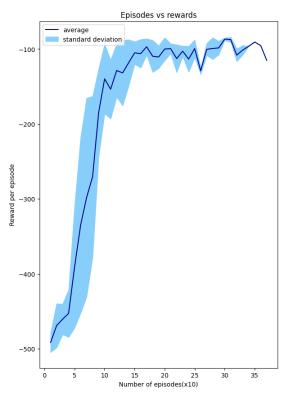
0:09:39.337708

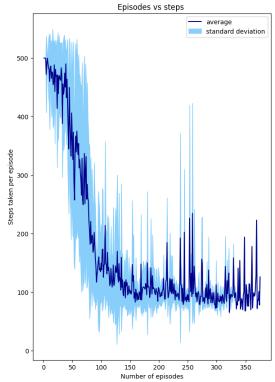
Run: 10 ------

Episode 100 Average Score: -287.23 Episode 200 Average Score: -99.577

Environment solved in 100 episodes! Average Score: -99.57

0:05:15.925278





Episode: 1 Number of steps: 500 Episode: 2 Number of steps: 500 Episode: 3 Number of steps: 500 4 Number of steps: Episode: 500 Episode: 5 Number of steps: 472 Episode: 6 Number of steps: 490 Episode: 7 Number of steps: 500 Episode: 8 Number of steps: 491

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Episode:
          9 Number of steps:
                               483
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          10 Number of steps:
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          12 Number of steps:
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          13 Number of steps:
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          19 Number of steps:
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57 Number of steps:
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          151 Number of steps:
                                  102
Episode:
          152 Number of steps:
                                  96
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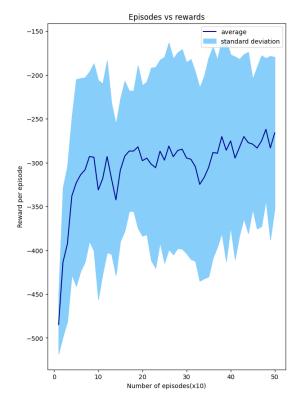
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Episode:
          153 Number of steps:
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          154 Number of steps:
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          156 Number of steps:
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           158 Number of steps:
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          159 Number of steps:
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          160 Number of steps:
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          168 Number of steps:
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          169 Number of steps:
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          170 Number of steps:
          171 Number of steps:
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          178 Number of steps:
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          198 Number of steps:
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Episode:
          199 Number of steps:
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Episode:
          200 Number of steps:
                                  106
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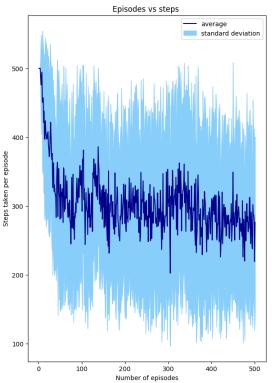
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Episode:
          201 Number of steps:
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Episode:
          202 Number of steps:
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          203 Number of steps:
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          205 Number of steps:
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          214 Number of steps:
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          215 Number of steps:
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          216 Number of steps:
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          217 Number of steps:
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          220 Number of steps:
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          221 Number of steps:
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          222 Number of steps:
Episode:
          223 Number of steps:
                                  122
          224 Number of steps:
                                  100
Episode:
Episode:
          225 Number of steps:
                                  97
Episode:
          226 Number of steps:
                                  114
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Episode:
          227 Number of steps:
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          228 Number of steps:
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          231 Number of steps:
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Episode:
          233 Number of steps:
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          234 Number of steps:
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          235 Number of steps:
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          237 Number of steps:
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249 Number of steps:
Episode:
Episode:
          250 Number of steps:
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
wandb: Agent Starting Run: qgk52z1n with config:
          BATCH_SIZE: 241
wandb:
wandb:
          EPS_DECAY: 0.9052805013001712
wandb:
          GAMMA: 0.8912424502665621
wandb:
         LR: 9.90039793637383e-05
wandb:
         MAX_TRUNCATION: 1.6653802057405689
wandb:
          NUM_LAYERS: 4
wandb:
          NUM_NEURONS_EACH_LAYER: 64
wandb:
          UPDATE_EVERY: 104
wandb:
           a_TUNE: 0.4031355618855549
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
                Average Score: -344.61
Episode 100
Episode 200
               Average Score: -240.78
Episode 300
               Average Score: -177.88
Episode 400
               Average Score: -167.98
Episode 500
               Average Score: -200.54
Episode 501
               Average Score: -202.34
Experiment ended because of bad results, no significant improvement of the agent
performance
0:12:23.490573
Run: 2 -----
Episode 100
                Average Score: -420.91
Episode 200
                Average Score: -266.78
Episode 300
               Average Score: -208.42
                Average Score: -165.43
Episode 400
Episode 500
                Average Score: -180.93
Episode 501
                Average Score: -182.14
Experiment ended because of bad results, no significant improvement of the agent
```

```
performance
0:12:08.463354
Run: 3 ------
Episode 100 Average Score: -349.89
Episode 200
              Average Score: -287.70
Episode 300 Average Score: -451.98
Episode 400 Average Score: -406.19
Episode 500 Average Score: -342.84
Episode 501
              Average Score: -339.71
Experiment ended because of bad results, no significant improvement of the agent
performance
0:18:09.756962
Run: 4 -----
Episode 100 Average Score: -500.00
Episode 200 Average Score: -376.36
Episode 300
              Average Score: -290.70
Episode 400
              Average Score: -220.91
Episode 500 Average Score: -335.81
Episode 501 Average Score: -337.79
Experiment ended because of bad results, no significant improvement of the agent
performance
0:18:58.474949
Run: 5 -----
Episode 100 Average Score: -259.02
Episode 200 Average Score: -298.15
Episode 300 Average Score: -206.20
Episode 400
              Average Score: -382.01
Episode 500
               Average Score: -359.37
Episode 501
                Average Score: -357.36
Experiment ended because of bad results, no significant improvement of the agent
performance
0:16:08.891238
Run: 6 ------
Episode 100
               Average Score: -301.69
Episode 200 Average Score: -355.10
Episode 300 Average Score: -269.92
Episode 400 Average Score: -274.44
Episode 400
              Average Score: -274.44
Episode 500
              Average Score: -222.75
Episode 501 Average Score: -222.36
Experiment ended because of bad results, no significant improvement of the agent
performance
0:14:44.953078
Run: 7 ------
Episode 100
              Average Score: -396.44
Episode 200
              Average Score: -225.74
Episode 300 Average Score: -321.98
Episode 400 Average Score: -250.70
Episode 500
              Average Score: -261.80
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Average Score: -261.26
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:15:28.586434
Run: 8 -----
Episode 100
              Average Score: -199.57
Episode 100 Average Score: -199.57
Episode 200 Average Score: -286.55
Episode 300 Average Score: -499.24
Episode 400
             Average Score: -489.33
Episode 500
             Average Score: -442.13
           Average Score: -441.63
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:20:57.425560
Run: 9 -----
             Average Score: -322.78
Episode 100
Episode 200
              Average Score: -286.05
Episode 300 Average Score: -217.35
Episode 400 Average Score: -370.86
Episode 500
             Average Score: -248.57
            Average Score: -247.35
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:16:07.230690
Run: 10 ------
Episode 100
              Average Score: -397.24
Episode 200
              Average Score: -403.82
Episode 300
             Average Score: -282.74
Episode 400
              Average Score: -229.62
Episode 500
              Average Score: -179.20
              Average Score: -178.53
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:16:29.429603
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Episode:
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Episode:
          3 Number of steps:
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          4 Number of steps:
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Episode:
          5 Number of steps:
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          6 Number of steps:
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          7 Number of steps:
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          10 Number of steps:
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          12 Number of steps:
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          13 Number of steps:
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          14 Number of steps:
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Episode:
          23 Number of steps:
                                 391
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Episode:
          24 Number of steps:
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          25 Number of steps:
                                 372
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          26 Number of steps:
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Episode:
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wandb: LR: 2.165713334068911e-05
wandb: MAX_TRUNCATION: 0.8757895326472167
wandb: NUM_LAYERS: 2
wandb: NUM_NEURONS_EACH_LAYER: 90
wandb: UPDATE_EVERY: 46
wandb:
          a_TUNE: 0.35732259618380335
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
Run: 1 ------
Episode 100
               Average Score: -203.42
            Average Score: -152.02
Episode 200
Episode 300
             Average Score: -118.96
Episode 400
             Average Score: -114.25
Episode 500 Average Score: -106.06
Episode 501 Average Score: -106.33
Experiment ended because of bad results, no significant improvement of the agent
performance
0:05:36.579300
Run: 2 ------
Episode 100
             Average Score: -164.34
Episode 118 Average Score: -99.898
Environment solved in 18 episodes! Average Score: -99.89
0:01:23.863921
Run: 3 ------
Episode 100
               Average Score: -196.36
Episode 200
              Average Score: -117.99
Episode 300
              Average Score: -150.22
            Average Score: -124.81
Average Score: -114.64
Episode 400
Episode 500
```

Average Score: -114.27

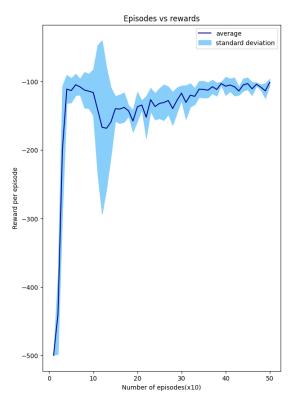
Episode 501

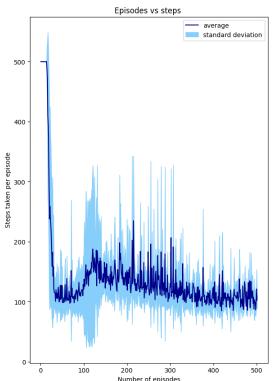
```
Experiment ended because of bad results, no significant improvement of the agent
performance
0:05:42.381905
Run: 4 ------
Episode 100
            Average Score: -171.31
Episode 118 Average Score: -97.357
Environment solved in 18 episodes! Average Score: -97.35
0:01:25.240232
Run: 5 -----
Episode 100
            Average Score: -173.33
Episode 119 Average Score: -98.993
Environment solved in 19 episodes! Average Score: -98.99
0:01:28.872051
Run: 6 ------
Episode 100
           Average Score: -241.28
Episode 200
            Average Score: -248.31
Episode 300 Average Score: -140.68
Episode 400 Average Score: -118.16
Episode 500 Average Score: -106.83
Episode 501
            Average Score: -106.47
Experiment ended because of bad results, no significant improvement of the agent
performance
0:06:53.585544
Run: 7 ------
Episode 100 Average Score: -186.88
Episode 200 Average Score: -126.47
Episode 300 Average Score: -115.80
Episode 373 Average Score: -99.943
Environment solved in 273 episodes! Average Score: -99.94
0:03:57.744639
Run: 8 ------
Episode 100 Average Score: -192.47
Episode 126 Average Score: -98.280
Environment solved in 26 episodes! Average Score: -98.28
0:01:49.997484
Run: 9 -----
Episode 100
            Average Score: -188.73
Episode 200 Average Score: -144.26
Episode 300 Average Score: -150.27
Episode 400 Average Score: -117.22
Episode 465
            Average Score: -99.374
Environment solved in 365 episodes! Average Score: -99.37
0:05:23.232957
Run: 10 -----
Episode 100 Average Score: -199.03
Episode 200 Average Score: -131.30
Episode 300 Average Score: -117.41
Episode 400
            Average Score: -104.85
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Episode 429 Average Score: -99.246

Environment solved in 329 episodes! Average Score: -99.24

0:04:38.256286





Episode: 1 Number of steps: 500 Episode: 2 Number of steps: 500 Episode: 3 Number of steps: 500 Episode: 4 Number of steps: 500 Episode: 5 Number of steps: 500 Episode: 6 Number of steps: 500 Episode: 7 Number of steps: 500 Episode: 8 Number of steps: 500 Episode: 9 Number of steps: 500 Episode: 10 Number of steps: 500 Episode: 11 Number of steps: 500 500 Episode: 12 Number of steps: Episode: 13 Number of steps: 500 Episode: 14 Number of steps: 500 Episode: 15 Number of steps: 488 Episode: 471 16 Number of steps: Episode: 17 Number of steps: 410 Episode: 18 Number of steps: 394 Episode: 19 Number of steps: 347

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<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
wandb: Sweep Agent: Waiting for job.
wandb: Job received.
wandb: Agent Starting Run: tt23px1v with config:
wandb:
          BATCH_SIZE: 350
wandb:
          EPS_DECAY: 0.993282797245706
wandb:
          GAMMA: 0.8597187535725886
wandb:
          LR: 6.696939860766036e-05
wandb:
          MAX_TRUNCATION: 1.9266143477676312
wandb:
          NUM LAYERS: 4
wandb:
          NUM_NEURONS_EACH_LAYER: 128
wandb:
          UPDATE_EVERY: 191
wandb:
           a_TUNE: 0.945639425385108
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
```

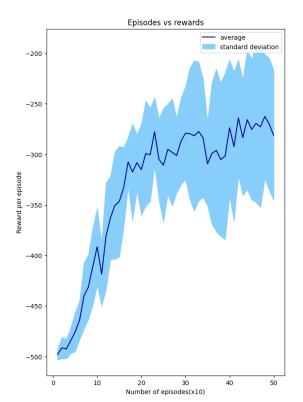
```
Episode 100
             Average Score: -459.91
Episode 200
              Average Score: -364.48
Episode 300 Average Score: -276.97
Episode 400 Average Score: -275.85
Episode 500
             Average Score: -284.41
           Average Score: -284.57
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:21:40.639026
Run: 2 ------
Episode 100
              Average Score: -481.52
Episode 200
              Average Score: -363.46
Episode 300
            Average Score: -311.86
           Average Score: -284.88
Episode 400
Episode 500
             Average Score: -252.63
Episode 501
              Average Score: -251.28
Experiment ended because of bad results, no significant improvement of the agent
performance
0:22:10.864284
Run: 3 ------
Episode 100
           Average Score: -455.77
Episode 200
             Average Score: -357.71
Episode 300
            Average Score: -299.31
Episode 400 Average Score: -227.17
Episode 500 Average Score: -216.72
Episode 501
              Average Score: -214.46
Experiment ended because of bad results, no significant improvement of the agent
performance
0:20:19.842995
Run: 4 -----
Episode 100
             Average Score: -454.89
Episode 200
            Average Score: -327.27
Episode 300
             Average Score: -289.98
Episode 400
            Average Score: -316.83
           Average Score: -231.78
Episode 500
Episode 501
             Average Score: -230.80
Experiment ended because of bad results, no significant improvement of the agent
performance
0:21:04.730489
Run: 5 ------
Episode 100
              Average Score: -469.34
Episode 200
             Average Score: -380.83
Episode 300
            Average Score: -299.42
Episode 400
              Average Score: -338.93
Episode 500
            Average Score: -280.56
Episode 501
              Average Score: -279.11
Experiment ended because of bad results, no significant improvement of the agent
```

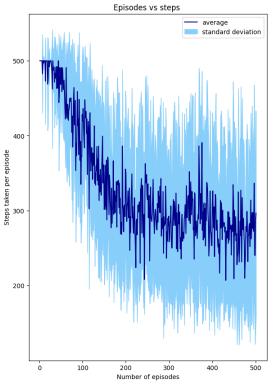
```
performance
0:23:05.613355
Run: 6 ------
Episode 100 Average Score: -442.38
Episode 200
              Average Score: -290.17
Episode 300 Average Score: -280.44
Episode 400 Average Score: -243.82
Episode 500 Average Score: -263.62
Episode 501
              Average Score: -263.89
Experiment ended because of bad results, no significant improvement of the agent
performance
0:19:47.245435
Run: 7 ------
Episode 100 Average Score: -464.50
Episode 200 Average Score: -376.22
Episode 300
              Average Score: -279.18
Episode 400
              Average Score: -250.22
Episode 500 Average Score: -274.18
Episode 501 Average Score: -274.16
Experiment ended because of bad results, no significant improvement of the agent
performance
0:20:19.767000
Run: 8 -----
Episode 100 Average Score: -443.28
Episode 200 Average Score: -314.95
Episode 300 Average Score: -318.10
Episode 400
              Average Score: -430.74
Episode 500
               Average Score: -436.86
Episode 501
               Average Score: -438.10
Experiment ended because of bad results, no significant improvement of the agent
performance
0:25:20.750822
Run: 9 -----
Episode 100
              Average Score: -454.59
Episode 100 Average Score: -454.59
Episode 200 Average Score: -346.22
Episode 300 Average Score: -270.63
Episode 400
              Average Score: -262.66
Episode 500
              Average Score: -272.82
Episode 501 Average Score: -275.87
Experiment ended because of bad results, no significant improvement of the agent
performance
0:21:01.031569
Run: 10 ------
Episode 100
              Average Score: -452.45
Episode 200
              Average Score: -318.61
Episode 300 Average Score: -327.18
Episode 400 Average Score: -276.16
```

Average Score: -223.22

Episode 500

Episode 501 Average Score: -221.61 Experiment ended because of bad results, no significant improvement of the agent performance 0:20:31.877189





Episode: 1 Number of steps: 500 Episode: 2 Number of steps: 500 Episode: 3 Number of steps: 500 Episode: 4 Number of steps: 500 Episode: 5 Number of steps: 500 Episode: 6 Number of steps: 500 Episode: 7 Number of steps: 483 Episode: 8 Number of steps: 500 Episode: 9 Number of steps: 500 Episode: 10 Number of steps: 497 Episode: 11 Number of steps: 500 Episode: 12 Number of steps: 500 Episode: 13 Number of steps: 500 Episode: 14 Number of steps: 473 500 Episode: 15 Number of steps: Episode: 16 Number of steps: 500 Episode: 17 Number of steps: 500 Episode: 18 Number of steps: 500

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          23 Number of steps:
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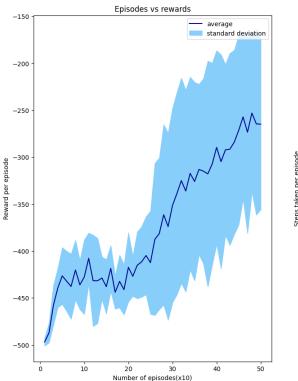
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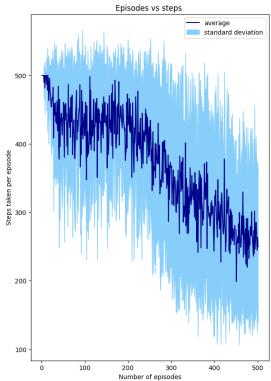
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499 Number of steps:
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         501 Number of steps:
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Episode:
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
wandb: Agent Starting Run: 1yllrqqd with config:
wandb:
          BATCH_SIZE: 102
          EPS_DECAY: 0.9424872838793752
wandb:
wandb:
          GAMMA: 0.9301573373446202
wandb:
         LR: 6.113264781306483e-05
wandb:
         MAX_TRUNCATION: 0.6279127280060699
wandb:
          NUM_LAYERS: 10
wandb:
          NUM_NEURONS_EACH_LAYER: 128
wandb:
          UPDATE_EVERY: 140
wandb:
          a_TUNE: 0.28667494135594473
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
Run: 1 ------
Episode 100
               Average Score: -438.44
Episode 200
               Average Score: -433.52
Episode 300
               Average Score: -440.03
Episode 400
              Average Score: -410.83
Episode 500
              Average Score: -271.29
Episode 501
               Average Score: -271.59
Experiment ended because of bad results, no significant improvement of the agent
performance
0:23:40.170411
Run: 2 -----
                 _____
Episode 100
               Average Score: -435.02
Episode 200
               Average Score: -420.20
Episode 300
               Average Score: -305.21
Episode 400
               Average Score: -165.82
Episode 500
               Average Score: -159.48
Episode 501
              Average Score: -160.15
```

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Experiment ended because of bad results, no significant improvement of the agent
performance
0:16:40.873814
Run: 3 -----
Episode 100
               Average Score: -449.75
Episode 200 Average Score: -438.46
Episode 300 Average Score: -346.88
Episode 400 Average Score: -255.99
Episode 500
               Average Score: -222.99
Episode 501
                Average Score: -222.21
Experiment ended because of bad results, no significant improvement of the agent
performance
0:20:13.302273
Run: 4 -----
Episode 100
             Average Score: -440.05
Episode 200
               Average Score: -425.17
Episode 300 Average Score: -427.26
Episode 400 Average Score: -382.52
Episode 500 Average Score: -402.21
               Average Score: -402.15
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:25:01.231554
Run: 5 ------
Episode 100 Average Score: -457.89
Episode 200 Average Score: -452.86
Episode 300 Average Score: -440.70
Episode 400 Average Score: -370.02
Episode 500 Average Score: -260.57
Episode 501 Average Score: -257.73
Experiment ended because of bad results, no significant improvement of the agent
performance
0:23:57.415878
Run: 6 -----
Episode 100 Average Score: -454.66
Episode 200 Average Score: -432.82
Episode 300 Average Score: -276.86
Episode 400
               Average Score: -149.82
Episode 500 Average Score: -169.53
Episode 501 Average Score: -170.40
Experiment ended because of bad results, no significant improvement of the agent
performance
0:17:54.576442
Run: 7 ------
Episode 100
               Average Score: -436.00
Episode 200 Average Score: -397.07
Episode 300 Average Score: -411.84
Episode 400
               Average Score: -418.21
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Episode 500
              Average Score: -394.75
Episode 501
             Average Score: -394.75
Experiment ended because of bad results, no significant improvement of the agent
performance
0:25:01.404804
Run: 8 -----
Episode 100 Average Score: -451.15
Episode 200 Average Score: -420.89
Episode 300
             Average Score: -435.62
Episode 400
              Average Score: -426.98
            Average Score: -411.42
Episode 500
Episode 501
              Average Score: -408.80
Experiment ended because of bad results, no significant improvement of the agent
performance
0:24:45.879394
Run: 9 ------
Episode 100
              Average Score: -444.91
           Average Score: -438.20
Average Score: -417.14
Episode 200
Episode 300
Episode 400
             Average Score: -231.35
           Average Score: -181.25
Average Score: -181.56
Episode 500
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:19:06.267379
Run: 10 -----
Episode 100
              Average Score: -453.55
Episode 200
              Average Score: -431.68
           Average Score: -424.67
Episode 300
Episode 400
             Average Score: -374.09
Episode 500
              Average Score: -283.63
Episode 501
              Average Score: -280.31
Experiment ended because of bad results, no significant improvement of the agent
performance
0:22:02.008915
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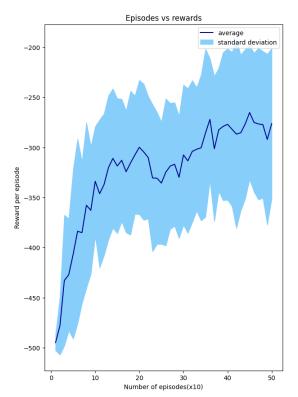
```
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
wandb: Agent Starting Run: iy2mq63o with config:
wandb: BATCH_SIZE: 293
wandb:
          EPS DECAY: 0.9619679995459268
wandb:
          GAMMA: 0.8127181467649989
wandb: LR: 8.473334576266545e-05
wandb: MAX_TRUNCATION: 0.9556717269630692
wandb: NUM_LAYERS: 8
wandb: NUM_NEURONS_EACH_LAYER: 128
wandb: UPDATE_EVERY: 86
wandb:
          a_TUNE: 0.42067345390090927
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
Run: 1 ------
Episode 100
               Average Score: -423.17
Episode 200
               Average Score: -334.41
              Average Score: -337.06
Episode 300
Episode 400
               Average Score: -359.09
            Average Score: -365.49
Average Score: -362.65
Episode 500
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:24:09.275880
Run: 2 ------
Episode 100 Average Score: -401.15
Episode 200 Average Score: -302.01
Episode 300 Average Score: -362.69
Episode 400
              Average Score: -254.25
               Average Score: -246.06
Episode 500
               Average Score: -247.71
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:20:50.329134
Run: 3 ------
```

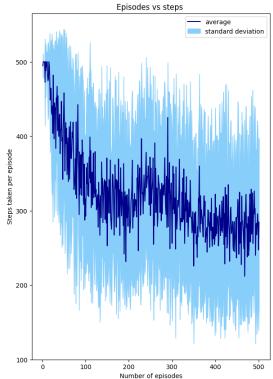
Average Score: -436.87

Episode 100

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Episode 200
              Average Score: -309.86
Episode 300
             Average Score: -333.02
Episode 400
              Average Score: -283.75
Episode 500
              Average Score: -215.35
Episode 501
              Average Score: -214.13
Experiment ended because of bad results, no significant improvement of the agent
performance
0:20:56.263675
Run: 4 ------
Episode 100
              Average Score: -452.70
           Average Score: -330.00
Episode 200
Episode 300
Episode 400
Episode 500
              Average Score: -229.44
Episode 501
               Average Score: -229.77
Experiment ended because of bad results, no significant improvement of the agent
performance
0:22:11.378296
Run: 5 -----
Episode 100
              Average Score: -458.20
Episode 200 Average Score: -430.47
Episode 300 Average Score: -458.27
Episode 400
             Average Score: -453.81
Episode 500
             Average Score: -449.35
           Average Score: -447.10
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:30:43.318805
Run: 6 ------
Episode 100
             Average Score: -464.23
Episode 200
              Average Score: -392.77
Episode 300 Average Score: -267.38
Episode 400 Average Score: -254.82
              Average Score: -270.09
Episode 500
Episode 501
              Average Score: -270.42
Experiment ended because of bad results, no significant improvement of the agent
performance
0:21:59.446416
Run: 7 -----
Episode 100
              Average Score: -303.62
Episode 200
             Average Score: -211.15
Episode 300
              Average Score: -228.62
              Average Score: -294.96
Episode 400
Episode 500
              Average Score: -278.87
Episode 501
               Average Score: -280.48
Experiment ended because of bad results, no significant improvement of the agent
performance
0:17:18.798370
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Episode 100
               Average Score: -403.63
Episode 200 Average Score: -260.92
Episode 300 Average Score: -287.40
Episode 400 Average Score: -286.20
Episode 500
                Average Score: -273.55
             Average Score: -275.11
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:20:08.238105
Run: 9 ------
Episode 100
               Average Score: -307.93
Episode 200 Average Score: -291.08
Episode 300 Average Score: -220.73
Average Score: -204.98
Episode 501
                Average Score: -207.85
Experiment ended because of bad results, no significant improvement of the agent
performance
0:17:11.392699
Run: 10 ------
Episode 100
             Average Score: -411.02
Episode 200
               Average Score: -323.92
Episode 300 Average Score: -313.57
Episode 400 Average Score: -261.56
Episode 500 Average Score: -259.93
                Average Score: -259.76
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:21:10.390148
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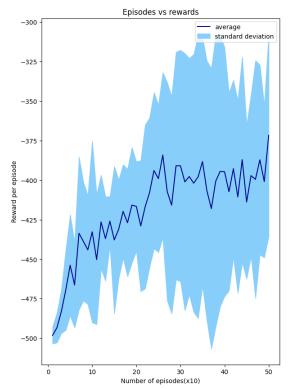
<IPython.core.display.HTML object>

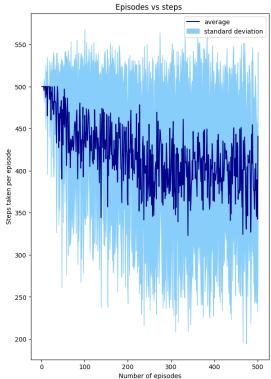
```
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
wandb: Sweep Agent: Waiting for job.
wandb: Job received.
wandb: Agent Starting Run: vxhmOp1l with config:
          BATCH_SIZE: 450
wandb:
wandb:
         EPS DECAY: 0.949669131145169
wandb:
         GAMMA: 0.9300741926730316
wandb:
         LR: 4.4901194019768936e-05
wandb: MAX_TRUNCATION: 1.011958205810783
wandb: NUM_LAYERS: 10
wandb:
         NUM_NEURONS_EACH_LAYER: 64
          UPDATE_EVERY: 140
wandb:
wandb:
          a_TUNE: 0.9064139760653244
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
Run: 1 ------
Episode 100
               Average Score: -491.46
Episode 200
               Average Score: -472.85
Episode 300
               Average Score: -460.41
Episode 400
               Average Score: -449.96
               Average Score: -444.82
Episode 500
Episode 501
               Average Score: -446.00
Experiment ended because of bad results, no significant improvement of the agent
performance
0:39:38.435406
Run: 2 -----
Episode 100
               Average Score: -480.34
Episode 200
               Average Score: -418.71
Episode 300
               Average Score: -283.30
               Average Score: -172.02
Episode 400
Episode 500
               Average Score: -251.59
Episode 501
               Average Score: -251.62
Experiment ended because of bad results, no significant improvement of the agent
performance
```

0:26:30.423827

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Episode 100
             Average Score: -411.07
Episode 200
             Average Score: -391.29
Episode 300 Average Score: -388.46
Episode 400 Average Score: -432.09
Episode 500
             Average Score: -418.34
           Average Score: -420.25
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:35:10.634036
Run: 4 ------
Episode 100
              Average Score: -485.51
Episode 200
             Average Score: -453.50
Episode 300
            Average Score: -439.56
           Average Score: -443.52
Episode 400
Episode 500
             Average Score: -431.15
Episode 501
              Average Score: -430.24
Experiment ended because of bad results, no significant improvement of the agent
performance
0:38:53.123285
Run: 5 -----
Episode 100
           Average Score: -442.07
Episode 200
             Average Score: -414.75
Episode 300
            Average Score: -415.02
Episode 400 Average Score: -420.32
Episode 500 Average Score: -394.73
Episode 501
              Average Score: -395.61
Experiment ended because of bad results, no significant improvement of the agent
performance
0:37:29.008944
Run: 6 ------
Episode 100
             Average Score: -460.90
Episode 200
            Average Score: -441.53
Episode 300
             Average Score: -423.86
Episode 400
            Average Score: -424.82
           Average Score: -400.56
Episode 500
Episode 501
             Average Score: -400.56
Experiment ended because of bad results, no significant improvement of the agent
performance
0:39:25.756573
Run: 7 ------
Episode 100
              Average Score: -451.19
Episode 200
             Average Score: -400.60
Episode 300
            Average Score: -390.01
Episode 400
              Average Score: -390.80
Episode 500
            Average Score: -411.89
Episode 501
              Average Score: -413.63
Experiment ended because of bad results, no significant improvement of the agent
```

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performance
0:37:44.809259
Run: 8 -----
Episode 100 Average Score: -451.01
Episode 200
              Average Score: -421.13
Episode 300 Average Score: -400.19
Episode 400 Average Score: -391.37
Episode 500 Average Score: -388.35
              Average Score: -388.35
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:36:19.069526
Run: 9 ------
Episode 100 Average Score: -461.50
Episode 200 Average Score: -439.62
Episode 300
              Average Score: -414.92
Episode 400
               Average Score: -456.39
Episode 500 Average Score: -416.75
Episode 501 Average Score: -417.65
Experiment ended because of bad results, no significant improvement of the agent
performance
0:35:32.564667
Run: 10 -----
Episode 100 Average Score: -478.61
Episode 200 Average Score: -433.63
Episode 300 Average Score: -419.81
              Average Score: -420.20
Episode 400
Episode 500
                Average Score: -409.67
                Average Score: -407.06
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:38:36.463230
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Episode:
          1 Number of steps:
                               500
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          2 Number of steps:
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          3 Number of steps:
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          5 Number of steps:
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Episode:
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                                  377
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          492 Number of steps:
                                  375
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          493 Number of steps:
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                                  402
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          494 Number of steps:
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          495 Number of steps:
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          496 Number of steps:
          497 Number of steps:
                                  353
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          498 Number of steps:
                                  346
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                                  389
Episode:
          499 Number of steps:
Episode:
          500 Number of steps:
                                  342
Episode:
          501 Number of steps:
                                  441
<IPython.core.display.HTML object>
```

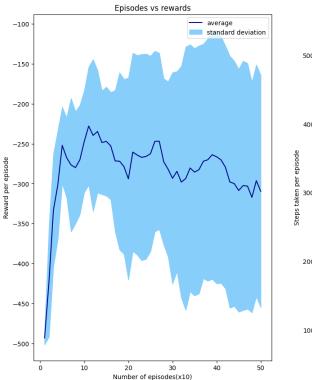
```
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
wandb: Agent Starting Run: 8bvoy6tz with config:
wandb: BATCH_SIZE: 301
wandb:
          EPS DECAY: 0.9771764005327028
wandb:
         GAMMA: 0.9060099113200456
wandb: LR: 5.210569270852514e-05
wandb: MAX_TRUNCATION: 1.465349474835784
wandb: NUM_LAYERS: 4
wandb: NUM_NEURONS_EACH_LAYER: 64
wandb: UPDATE_EVERY: 164
wandb:
          a_TUNE: 0.4603350643255758
Failed to detect the name of this notebook, you can set it manually with the
WANDB NOTEBOOK NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
Run: 1 ------
Episode 100
               Average Score: -327.15
Episode 200
               Average Score: -353.43
              Average Score: -490.76
Episode 300
Episode 400
               Average Score: -359.89
            Average Score: -353.00
Average Score: -356.19
Episode 500
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:26:30.581921
Run: 2 ------
Episode 100 Average Score: -314.52
Episode 200 Average Score: -243.84
Episode 300 Average Score: -178.23
Episode 400
              Average Score: -195.85
               Average Score: -328.57
Episode 500
                Average Score: -327.04
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:18:12.227557
Run: 3 ------
```

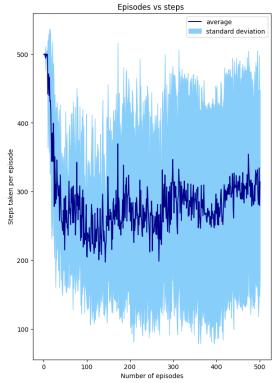
Average Score: -298.42

Episode 100

```
Episode 200
               Average Score: -202.90
Episode 300
              Average Score: -245.35
              Average Score: -488.90
Episode 400
Episode 500
              Average Score: -497.92
Episode 501
              Average Score: -496.32
Experiment ended because of bad results, no significant improvement of the agent
performance
0:32:43.030020
Run: 4 ------
Episode 100
              Average Score: -300.23
Episode 200
              Average Score: -287.18
Episode 300
             Average Score: -346.83
Episode 400
              Average Score: -465.10
Episode 500
              Average Score: -500.00
Episode 501
               Average Score: -500.00
Experiment ended because of bad results, no significant improvement of the agent
performance
0:36:55.029175
Run: 5 -----
Episode 100
              Average Score: -326.46
Episode 200 Average Score: -280.06
Episode 300 Average Score: -272.58
Episode 400
             Average Score: -177.28
Episode 500
             Average Score: -175.44
           Average Score: -176.30
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:23:05.137734
Run: 6 ------
              Average Score: -305.95
Episode 100
Episode 200
              Average Score: -180.18
Episode 300 Average Score: -158.18
Episode 400 Average Score: -166.56
              Average Score: -193.37
Episode 500
Episode 501
              Average Score: -192.63
Experiment ended because of bad results, no significant improvement of the agent
performance
0:19:14.225658
Run: 7 -----
Episode 100
              Average Score: -275.24
Episode 200
             Average Score: -387.99
Episode 300
              Average Score: -172.89
Episode 400
              Average Score: -146.30
Episode 500
              Average Score: -135.22
               Average Score: -135.21
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:21:52.950540
```

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Episode 100
              Average Score: -348.92
Episode 200 Average Score: -234.07
Episode 300 Average Score: -412.57
Episode 400 Average Score: -168.98
Episode 500
              Average Score: -152.31
            Average Score: -154.33
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:26:15.928172
Run: 9 ------
Episode 100
              Average Score: -332.92
               Average Score: -193.13
Episode 200
Episode 300
             Average Score: -215.15
            Average Score: -484.08
Episode 400
Episode 500
              Average Score: -500.00
Episode 501
               Average Score: -500.00
Experiment ended because of bad results, no significant improvement of the agent
performance
0:26:47.578279
Run: 10 ------
            Average Score: -313.54
Episode 100
Episode 200
              Average Score: -203.30
Episode 300 Average Score: -168.66
Episode 400 Average Score: -143.38
Episode 500 Average Score: -148.06
               Average Score: -148.35
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:13:56.959158
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          1 Number of steps:
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          6 Number of steps:
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          7 Number of steps:
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          9 Number of steps:
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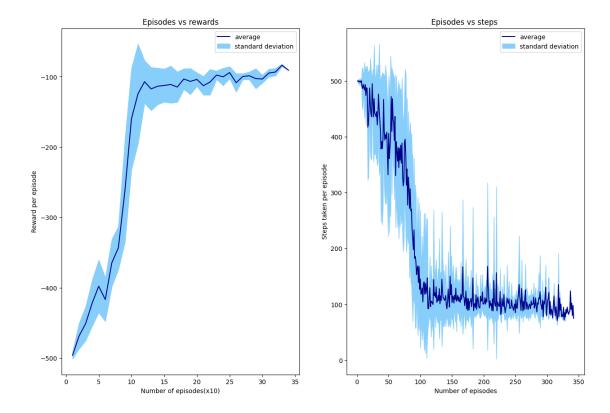
<IPython.core.display.HTML object>

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<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
wandb: Sweep Agent: Waiting for job.
wandb: Job received.
wandb: Agent Starting Run: iew1k6qn with config:
        BATCH_SIZE: 78
wandb:
wandb: EPS_DECAY: 0.926953739784783
wandb:
        GAMMA: 0.9933056586619043
wandb: LR: 9.428417248094144e-05
wandb: MAX_TRUNCATION: 0.6335367301001955
wandb: NUM_LAYERS: 8
wandb: NUM_NEURONS_EACH_LAYER: 90
         UPDATE_EVERY: 34
wandb:
wandb:
         a_TUNE: 0.4533718237009434
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
Run: 1 ------
Episode 100
             Average Score: -361.89
             Average Score: -99.351
Episode 190
Environment solved in 90 episodes! Average Score: -99.35
0:05:50.570094
Run: 2 -----
Episode 100 Average Score: -402.84
Episode 200 Average Score: -146.29
Episode 291 Average Score: -99.934
Environment solved in 191 episodes! Average Score: -99.93
0:07:29.876655
Run: 3 -----
Episode 100
             Average Score: -374.65
             Average Score: -108.71
Episode 200
Episode 244
              Average Score: -98.677
Environment solved in 144 episodes! Average Score: -98.67
0:06:31.326290
Run: 4 ------
Episode 100
             Average Score: -412.18
```

Average Score: -115.73

Episode 200

Episode 300 Average Score: -107.25 Average Score: -99.842 Episode 330 Environment solved in 230 episodes! Average Score: -99.84 0:09:59.300580 Run: 5 -----Episode 100 Average Score: -379.76 Episode 184 Average Score: -98.501 Environment solved in 84 episodes! Average Score: -98.50 0:07:41.066031 Run: 6 ------Episode 100 Average Score: -376.31 Average Score: -118.85 Episode 200 Episode 283 Average Score: -98.819 Environment solved in 183 episodes! Average Score: -98.81 0:09:50.624013 Run: 7 ------Episode 100 Average Score: -353.28 Episode 200 Average Score: -100.43 Episode 205 Average Score: -99.680 Environment solved in 105 episodes! Average Score: -99.68 0:07:48.939249 Run: 8 -----Episode 100 Average Score: -367.62 Episode 187 Average Score: -99.007 Environment solved in 87 episodes! Average Score: -99.00 0:07:12.311413 Run: 9 ------Episode 100 Average Score: -369.65 Episode 200 Average Score: -120.79 Episode 300 Average Score: -110.41 Episode 342 Average Score: -99.966 Environment solved in 242 episodes! Average Score: -99.96 0:10:04.667848 Run: 10 -----Episode 100 Average Score: -385.34 Episode 200 Average Score: -115.15 Episode 295 Average Score: -99.298 Environment solved in 195 episodes! Average Score: -99.29 0:09:21.492330



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<IPython.core.display.HTML object>
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<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
wandb: Agent Starting Run: xi8w2cnj with config:
```

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wandb:
         BATCH_SIZE: 420
wandb:
         EPS_DECAY: 0.9616024272996044
wandb:
         GAMMA: 0.851277896970229
        LR: 5.565054761690095e-05
MAX_TRUNCATION: 1.6100037640975235
wandb:
wandb:
         NUM LAYERS: 10
wandb:
wandb:
         NUM NEURONS EACH LAYER: 64
wandb:
         UPDATE_EVERY: 186
wandb:
          a_TUNE: 0.7416087008143881
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
Run: 1 ------
Episode 100
              Average Score: -479.59
Episode 200
              Average Score: -465.51
Episode 300
             Average Score: -444.56
Episode 400
              Average Score: -446.23
Episode 500
              Average Score: -435.37
Episode 501
              Average Score: -435.37
Experiment ended because of bad results, no significant improvement of the agent
performance
0:59:00.965229
Run: 2 ------
Episode 100
              Average Score: -469.17
Episode 200
              Average Score: -414.48
           Average Score: -372.47
Episode 300
Episode 400
             Average Score: -417.64
              Average Score: -461.43
Episode 500
Episode 501
              Average Score: -461.43
Experiment ended because of bad results, no significant improvement of the agent
performance
0:58:41.279853
Run: 3 ------
Episode 100
              Average Score: -456.76
Episode 200
              Average Score: -404.25
Episode 300
              Average Score: -420.79
Episode 400
              Average Score: -392.00
Episode 500
              Average Score: -382.39
Episode 501
              Average Score: -381.75
```

```
Experiment ended because of bad results, no significant improvement of the agent
performance
0:35:39.327747
Run: 4 ------
Episode 100
               Average Score: -487.90
Episode 200 Average Score: -462.87
Episode 300 Average Score: -454.89
Episode 400 Average Score: -447.11
Episode 500
                Average Score: -420.31
Episode 501
                 Average Score: -419.50
Experiment ended because of bad results, no significant improvement of the agent
performance
0:36:44.096148
Run: 5 -----
Episode 100
             Average Score: -478.46
Episode 200
                Average Score: -446.63
Episode 300 Average Score: -461.18
Episode 400 Average Score: -428.50
Episode 500 Average Score: -430.78
                Average Score: -429.97
Episode 501
Experiment ended because of bad results, no significant improvement of the agent
performance
0:38:37.797573
Run: 6 ------
Episode 100 Average Score: -452.37
Episode 200 Average Score: -437.55
Episode 300 Average Score: -369.99
Episode 400 Average Score: -360.98
Episode 500 Average Score: -326.04
Episode 501 Average Score: -327.15
Experiment ended because of bad results, no significant improvement of the agent
performance
0:36:07.425897
Run: 7 ------
Episode 100 Average Score: -489.32
Episode 200 Average Score: -454.80
Episode 300 Average Score: -446.96
Episode 400 Average Score: -454.35
Episode 500 Average Score: -421.94
Episode 501 Average Score: -424.30
Experiment ended because of bad results, no significant improvement of the agent
performance
0:42:32.677448
Run: 8 -----
Episode 100 Average Score: -469.82
Episode 300 Average Score: -482.69
Average Score: -427.68
                Average Score: -427.68
```

Episode 500 Average Score: -389.84 Episode 501 Average Score: -392.75

Experiment ended because of bad results, no significant improvement of the agent performance

0:37:46.114911

Run: 9 ------

Episode 100 Average Score: -482.96 Episode 200 Average Score: -443.64 Episode 300 Average Score: -375.11 Episode 400 Average Score: -443.83 Episode 500 Average Score: -450.99 Episode 501 Average Score: -451.14

Experiment ended because of bad results, no significant improvement of the agent performance

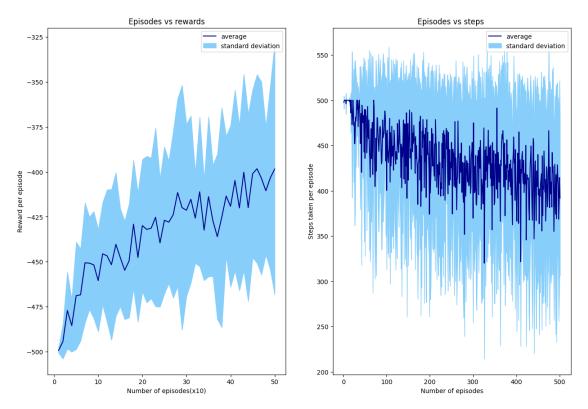
0:36:26.315576

Run: 10 ------

Episode 100 Average Score: -447.58
Episode 200 Average Score: -443.31
Episode 300 Average Score: -431.17
Episode 400 Average Score: -401.39
Episode 500 Average Score: -341.42
Episode 501 Average Score: -339.71

Experiment ended because of bad results, no significant improvement of the agent performance

0:33:56.339938



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wandb: Agent Starting Run: be4dq3x3 with config:
wandb:
           BATCH_SIZE: 263
wandb:
           EPS_DECAY: 0.9199302836486072
wandb:
          GAMMA: 0.8088152991883967
wandb:
          LR: 2.372054651756627e-05
wandb:
          MAX_TRUNCATION: 1.58041969823976
wandb:
          NUM LAYERS: 8
wandb:
          NUM_NEURONS_EACH_LAYER: 128
wandb:
          UPDATE EVERY: 36
wandb:
           a_TUNE: 0.8520842949316129
Failed to detect the name of this notebook, you can set it manually with the
WANDB_NOTEBOOK_NAME environment variable to enable code saving.
<IPython.core.display.HTML object>
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<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
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Run: 1 -----
Episode 100
             Average Score: -387.53
Episode 200
             Average Score: -220.42
Episode 300 Average Score: -190.47
Episode 400 Average Score: -212.91
Episode 500
             Average Score: -204.10
Episode 501
           Average Score: -203.73
Experiment ended because of bad results, no significant improvement of the agent
performance
0:15:48.835083
Run: 2 ------
           Average Score: -480.08
Episode 100
Episode 200
             Average Score: -438.70
Episode 300 Average Score: -372.28
Episode 400 Average Score: -330.78
Episode 500 Average Score: -270.67
Episode 501
             Average Score: -269.87
Experiment ended because of bad results, no significant improvement of the agent
performance
0:24:56.320493
Run: 3 ------
Episode 100 Average Score: -387.27
Episode 179 Average Score: -266.86
```