ROSE 5760 Robot Learning Assignment 1

Coding Results Part

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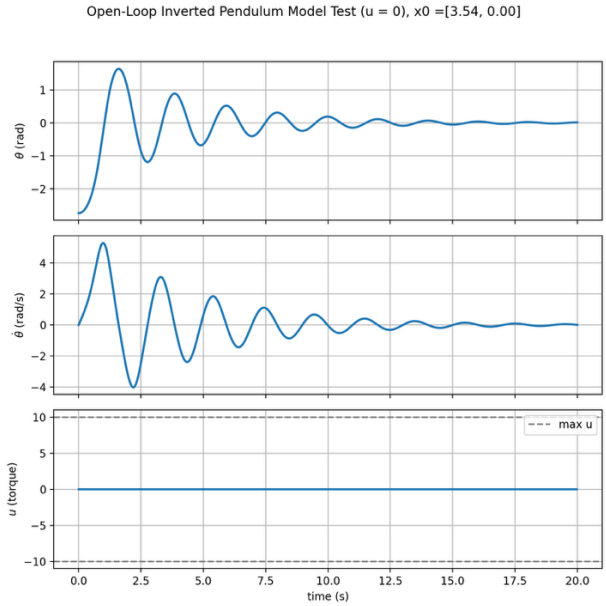
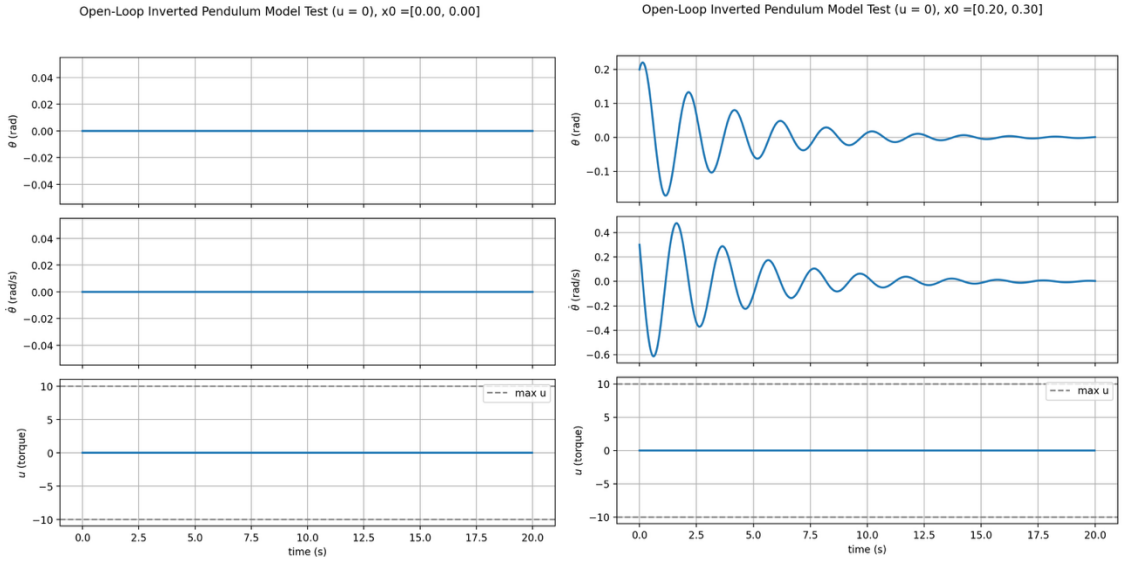
Problem 1.3: Free Dynamics Tests

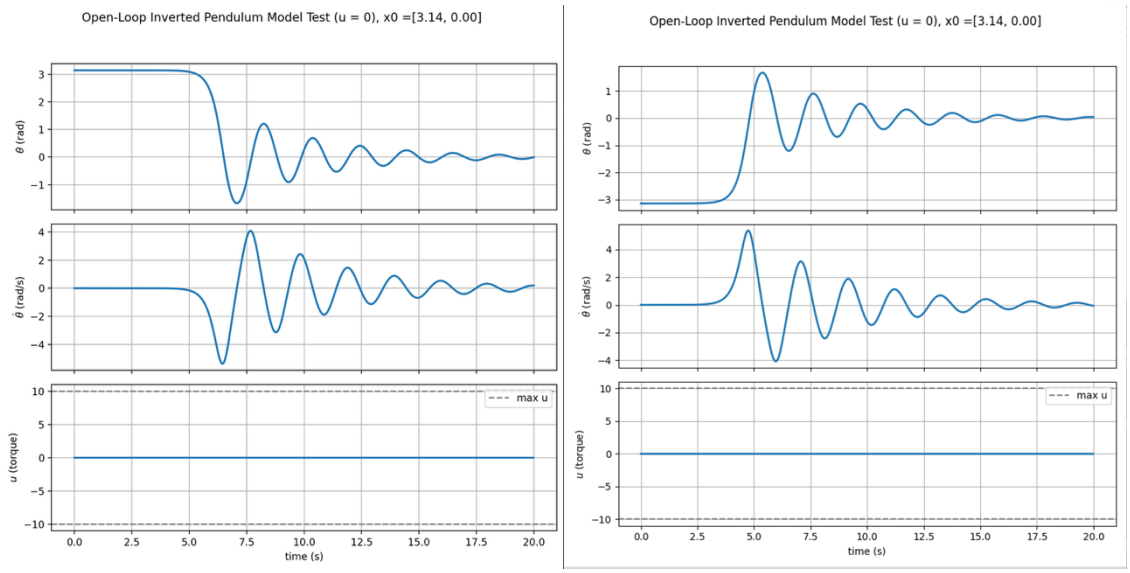
1. Default arguments



2. Initial condition: $[\theta_0, \dot{\theta}_0] = [0, 0]$ and $[0 + 0.2, 0.3]$

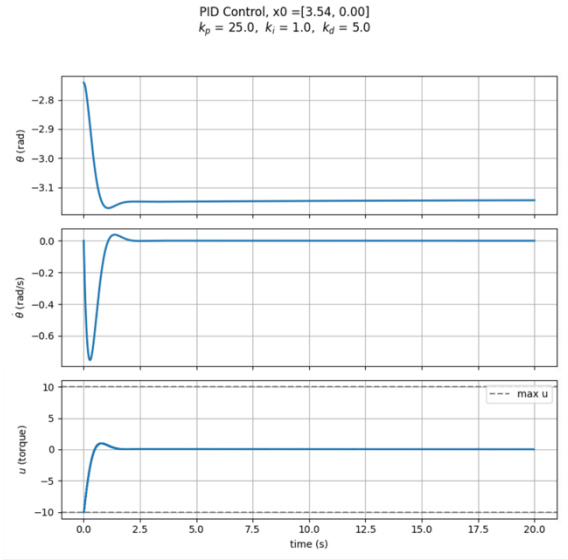


3. Initial condition: $[\theta_0, \dot{\theta}_0] = [\pi, 0]$ and $[\pi, +0.001, 0]$



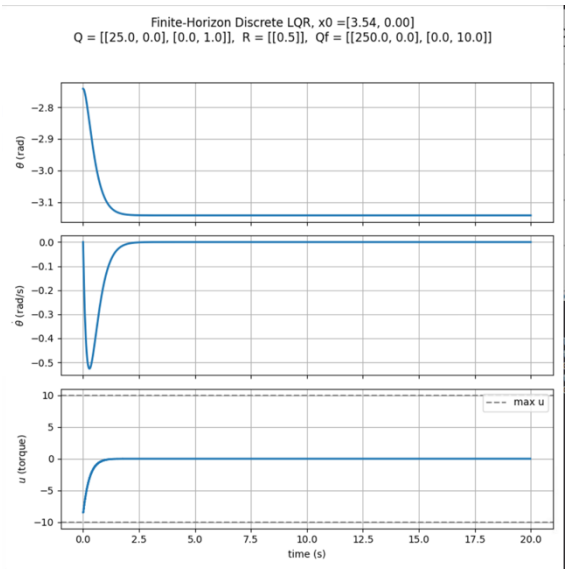
Problem 2: PID Control

1. PID Evaluation



Problem 3: Linear Quadratic Regulator (LQR)

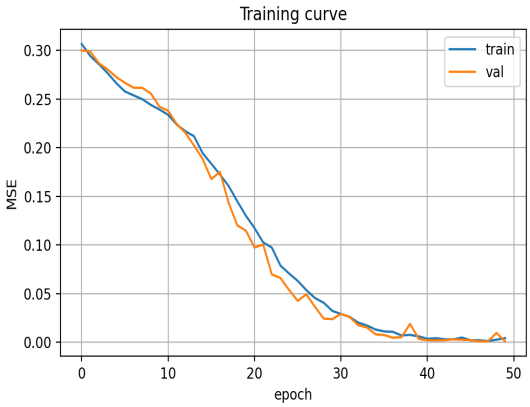
1. LQR Implementation

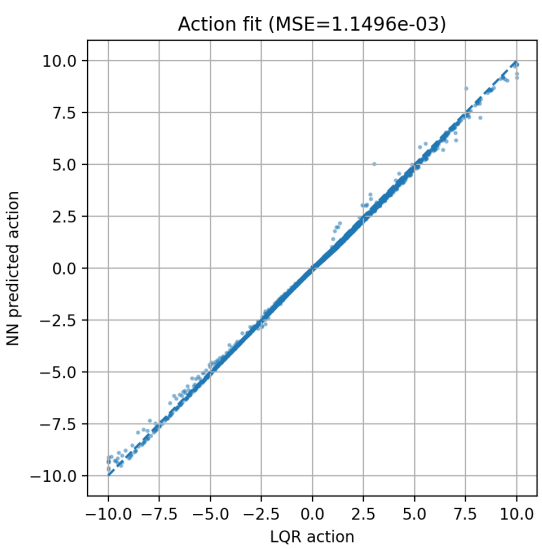


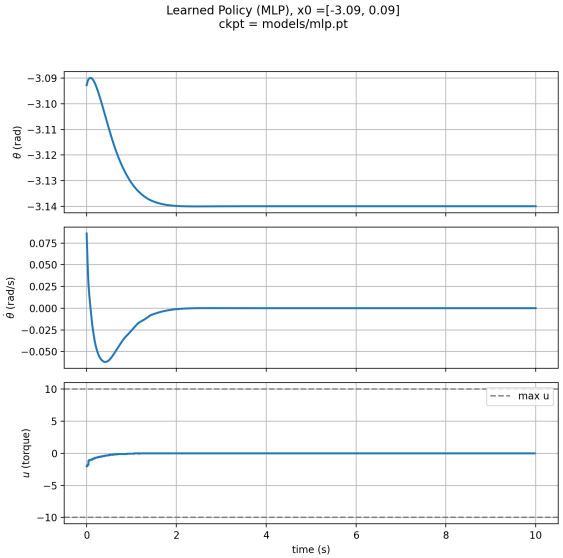
Problem 4: Supervised Learning from LQR

1. MLP Policy

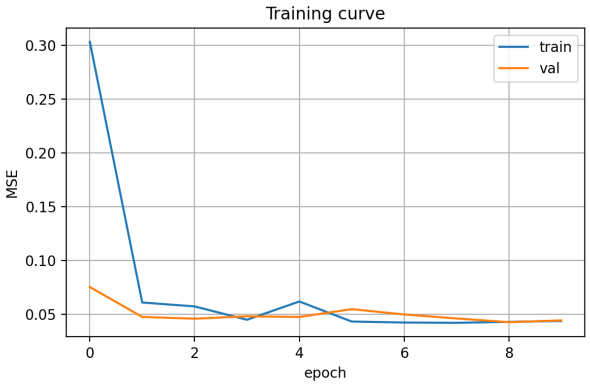
```
(robole) zhang@ZHANG:~/zst/robot_learning$ python train_mlp.py
Epoch 0001 | train 0.307837 | val 0.303708
Epoch 0005 | train 0.260436 | val 0.276873
Epoch 0010 | train 0.234905 | val 0.252749
Epoch 0015 | train 0.180592 | val 0.194910
Epoch 0020 | train 0.105138 | val 0.140903
Epoch 0025 | train 0.056354 | val 0.063179
Epoch 0030 | train 0.024322 | val 0.024593
Epoch 0035 | train 0.010686 | val 0.014245
Epoch 0040 | train 0.004305 | val 0.002952
Epoch 0045 | train 0.001779 | val 0.002353
Epoch 0050 | train 0.005509 | val 0.001207
Saved: models/mlp.pt
```

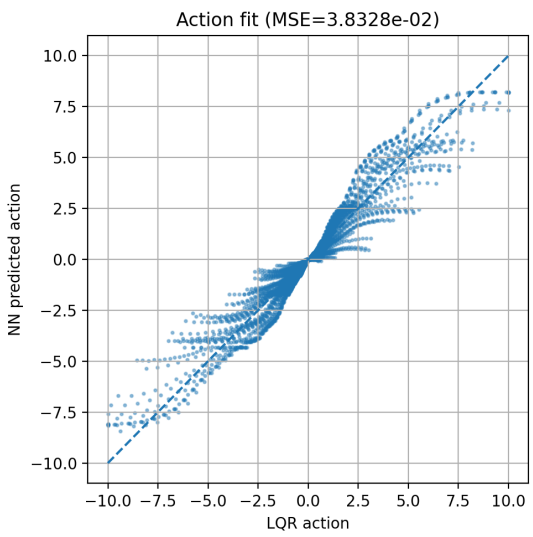


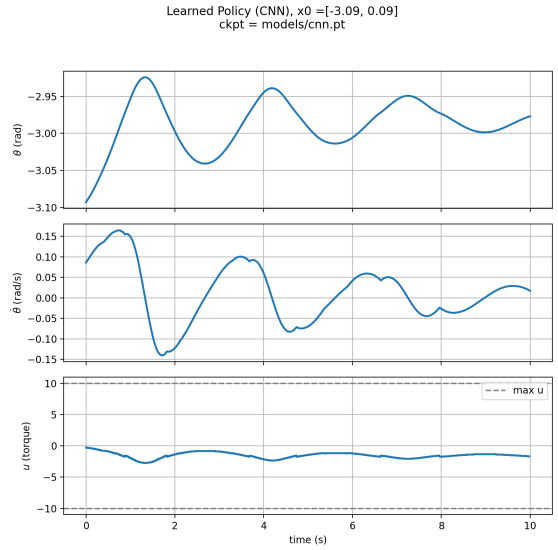




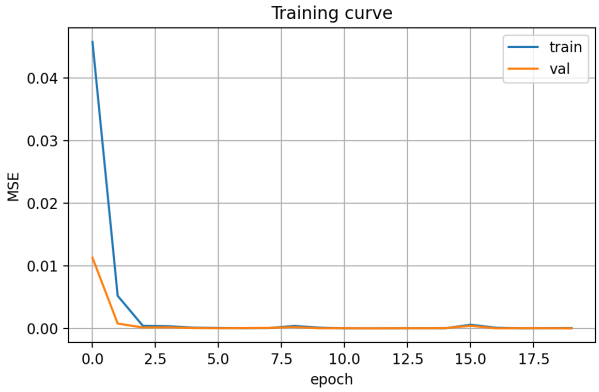
2. CNN Policy

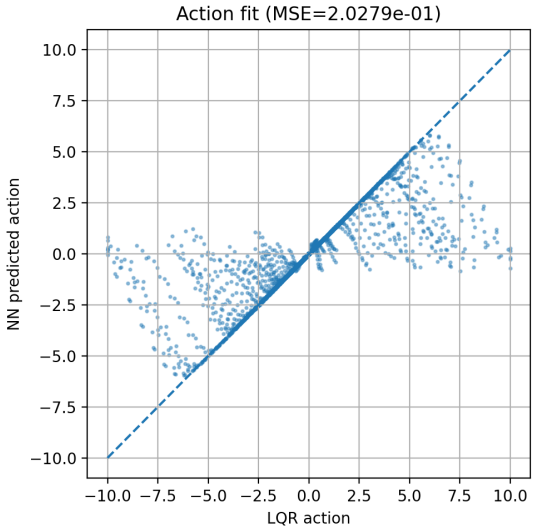






3. LSTM Policy





Learned Policy (LSTM), x0 =[-3.09, 0.09]
ckpt = models/lstm.pt