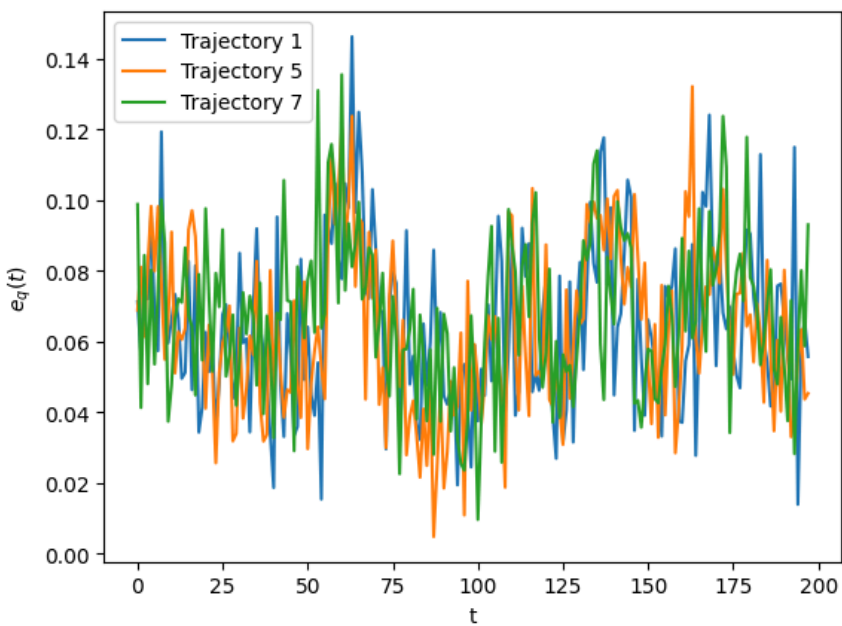# Lab 5A

Mon Apr 8, 2024

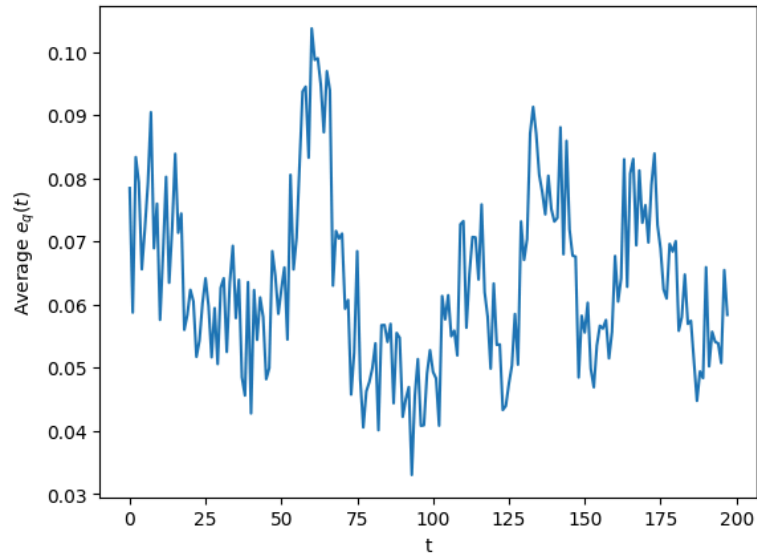Deme Apostolou

Varun Chitturi

Task 1

Do not report

Task 2

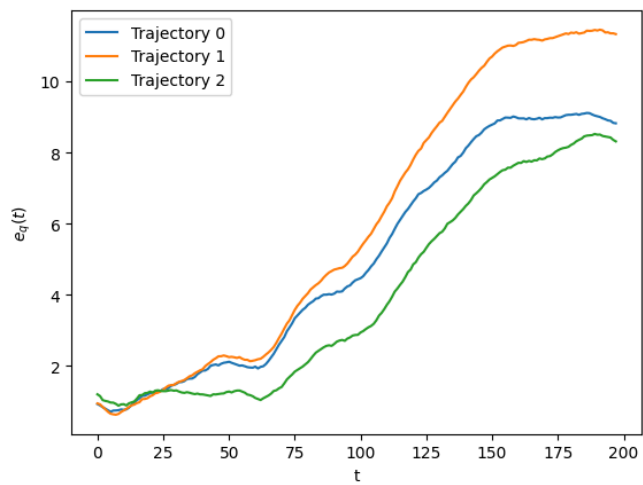Plot of trajectory errors eq(t) [cf. (6)]

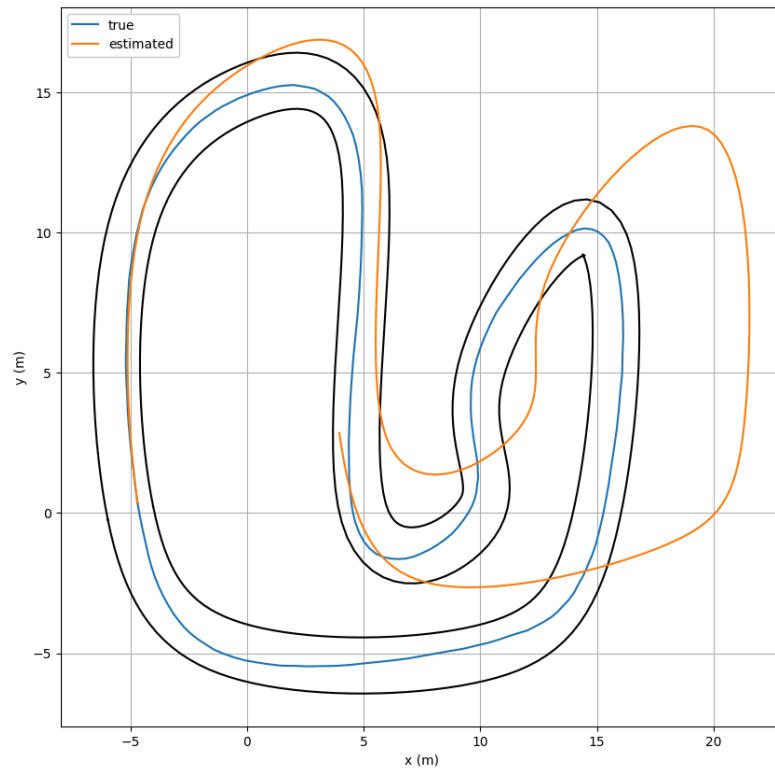Average error $\bar{e}_q(t)$

Average Error: 0.06329752727784835

Task 3

Plot of trajectory errors eq(t) [cf. (8)]

Plot of an observed trajectory and the corresponding model predicted trajectory

Differences between observed and model predicted trajectories:

The trajectories made by the model deviate from the true trajectories as seen in the figure above. As time goes on, the discrepancies between the two accumulate and make the model worse. The accumulation of errors is exemplified by the fact that the differences in the model and the true trajectories gets larger as time progresses.
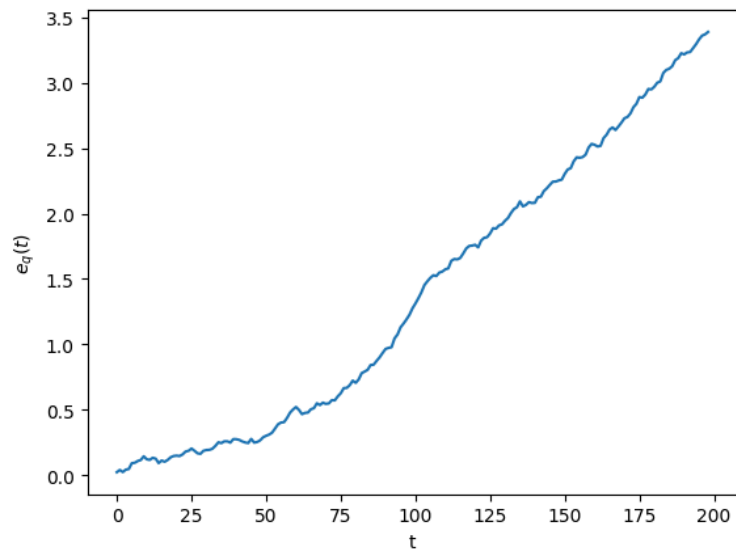
Task 4

Training loss and test loss

```
Train Loss: 0.0002527604519855231
Test Loss: 0.00024410900368820876
```
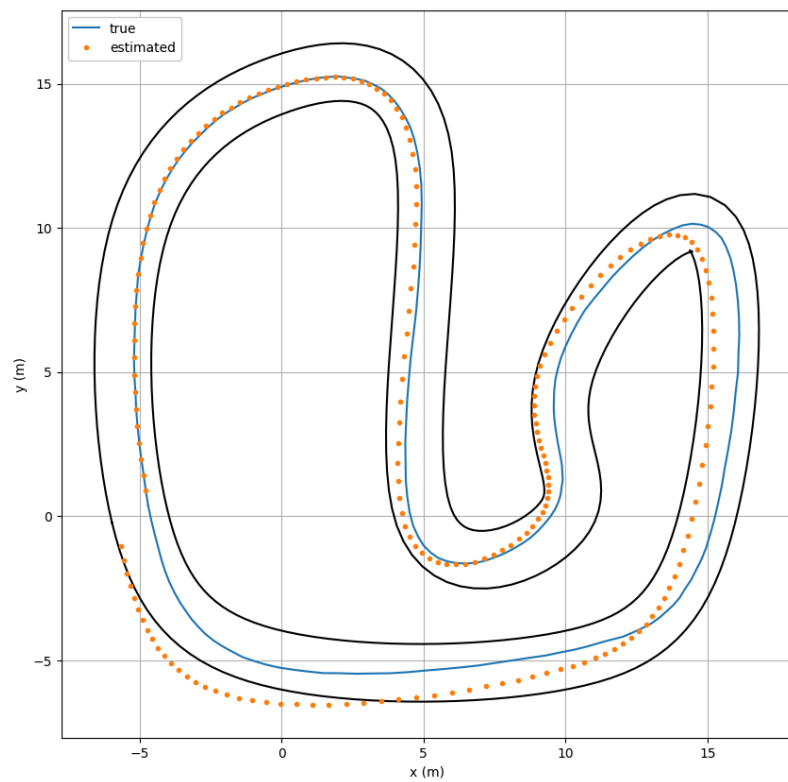
Task 5

Plot of test trajectory errors eq(t)

Average error over time is: 1.3796477317810059

Plot of an observed trajectory and the corresponding learned model predicted trajectory

Comparison of ideal point mass model with learned model:

The observed trajectories are not as accurate as the ones predicted by the learned model. However, there is still some deviation between the actual trajectories and the model predicted ones as this is an inherent feature of dynamical systems. The learned model is more accurate than the ideal point mass model in the previous task but we still observe accumulation of errors.

Task 6

Optimal loss

`Loss: 0.08331475406885147`

Task 7

Plot of L1 loss as a function of time