

Robot Learning Project 3 – Learning Forward Dynamics

Data Collection Policy

The initial state is set to -90 degrees before starting the data collection process. Then a NumPy array of torque values is defined which consists of linearly spaced values range from -1.75 Nm to 1.75 Nm to make the model robust over the required torque range. Next the action variable is populated with the torque values selected at random and time is set to 0. Now the data which consists of system state and action is collected for 5 seconds for one action and the state is advanced simultaneously using *arm_teacher.advance()*. Post collection of data for one torque value the system is reset to its initial state and to X & Y data are horizontally stacked after each loop.

Network Architecture

The network which is trained to learn the forward dynamics of a simple three-link arm is a simple Deep Neural Network (DNN). The DNN has 6 fully connected layers and all hidden layers have ReLU activations. The Network is:

Layer1_dim = (input_dim, 32)

Layer2_dim = (32, 64)

Layer3_dim = (64, 256)

Layer4_dim = (256, 64)

Layer5_dim = (64, 32)

Layer6_dim = (32, 6)

The optimizer used here is Adam with a learning rate of 0.0001. The batch_size is set to 150 and the network is trained for 300 epochs.

Conclusion

The model weights that I picked for the testing my model for the testing policy is from epoch 291 which has a training loss of 6.43 e-07 and testing loss of 0.0017