Table of Contents

Format

```
clc
format compact
close all
clear all
```

Organizing provided training data

```
y_train = load('./dataForStudents/Ytrain.mat');
x_train = load('./dataForStudents/Xtrain.mat');
y_test = load('./dataForStudents/Ytest.mat');
x_test = load('./dataForStudents/Xtest.mat');
```

3.1 Train the Network

```
%Use the provided training data to train a 2-layer feed-forward neural
%network that predicts vehicle velocities as a function of wheel velocities
%and current temperature.

netconf = [10 10]; %two layers

net = feedforwardnet(netconf);

% Trainig the network
net = train(net, x_train.X, y_train.Y);
```

Network Diagram

Training Results

Training finished: Met validation criterion ✓

Training Progress

Unit	Initial Value	Stopped Value	Target Value	
Epoch	0	12	1000	▲
Elapsed Time	-	00:00:05	-	
Performance	8.04	0.0345	0	
Gradient	20.9	0.00849	1e-07	
Mu	0.001	1e-05	1e+10	
Validation Checks	0	6	6	▼

Training Algorithms

Data Division: Random   dividerand
Training: Levenberg-Marquardt   trainlm
Performance: Mean Squared Error   mse
Calculations: MEX

Training Plots

| Performance | Training State |
| Error Histogram | Regression |

3.2

```matlab
% Organizing testing data
theta_dot_r_test = x_test.Xtest(1,:);
theta_dot_l_test = x_test.Xtest(2,:);
temp_test = x_test.Xtest(3,:);

vehicle_velo_measured = y_test.Ytest(1,:);
vehicle_omega_measured = y_test.Ytest(2,:);

% Making a prediction based on network and organizing values
vehicle_predicted = net(x_test.Xtest);

vehicle_velo_predicted = vehicle_predicted(1,:);
vehicle_omega_predicted = vehicle_predicted(2,:);
```
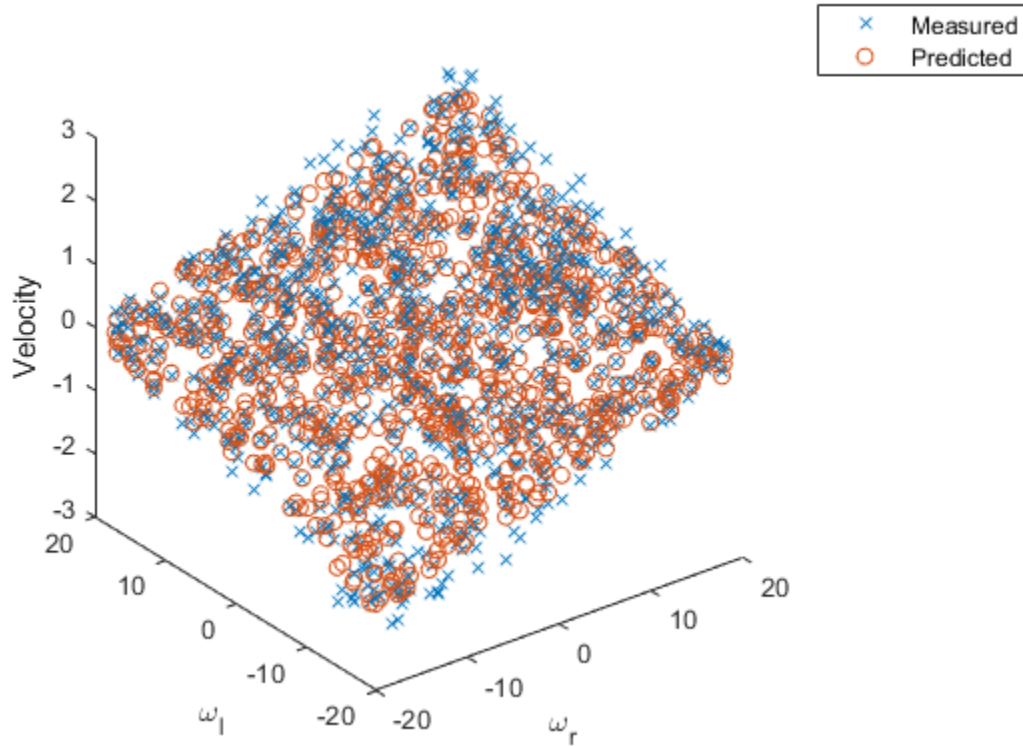
Plotting

```matlab
% Test v predicted Velocity
figure()
    plot3(theta_dot_r_test, theta_dot_l_test, vehicle_velo_measured, 'x');
    hold on
    plot3(theta_dot_r_test, theta_dot_l_test, vehicle_velo_predicted, 'o');
```
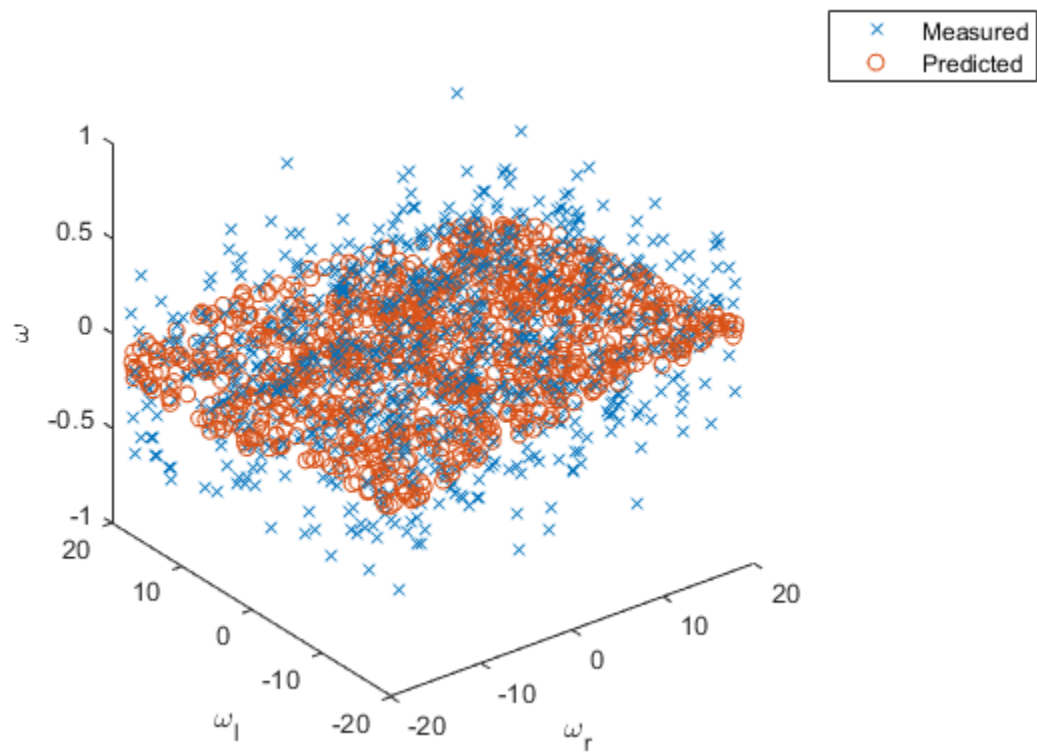
```matlab
    hold off
    xlabel("\omega_r")
    ylabel("\omega_l")
    zlabel("Velocity")
    legend("Measured", "Predicted")

% Test v predicted Angular Velocity
figure()
    plot3(theta_dot_r_test, theta_dot_l_test, vehicle_omega_measured, 'x');
    hold on
    plot3(theta_dot_r_test, theta_dot_l_test, vehicle_omega_predicted, 'o');
    hold off
    xlabel("\omega_r")
    ylabel("\omega_l")
    zlabel("\omega")
    legend("Measured", "Predicted")
```

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