

Results for Linear Regression

RESULTS for linear regression using Closed Form:

1) optimal Theta:

n = 1: theta = [[17.81209242 4.8607913]]

n = 2: theta = [[9.49203678 4.79191663 1.52906587]]

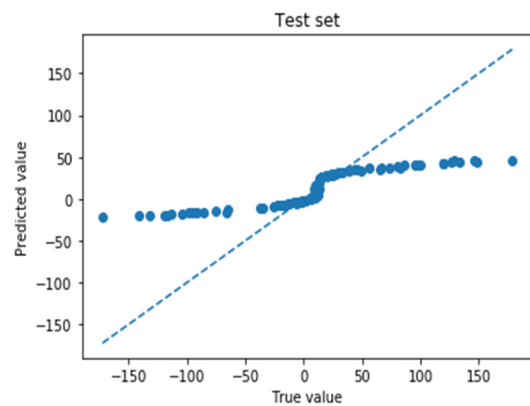
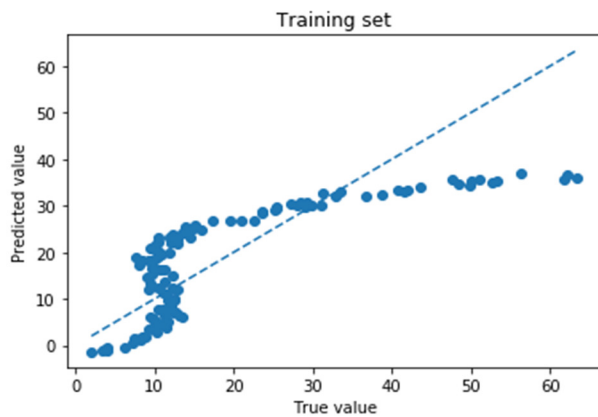
n = 3: theta = [[10.00815033 0.20418927 1.47413164 0.47320168]]

n = 5: theta = [[9.84545670e+00 2.03644970e-01 1.57564738e+00 4.75176601e-01 -7.40094164e-03 -1.77139419e-04]]

2) errors using Closed Form:

n = 1: training: 78.7011234662

test: 2137.79262022



n = 2: training: 24.7419196363

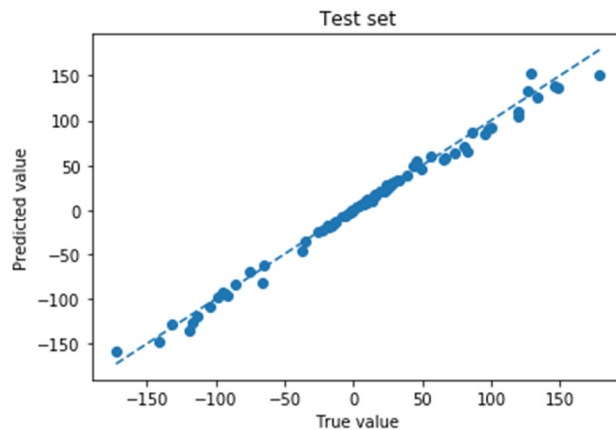
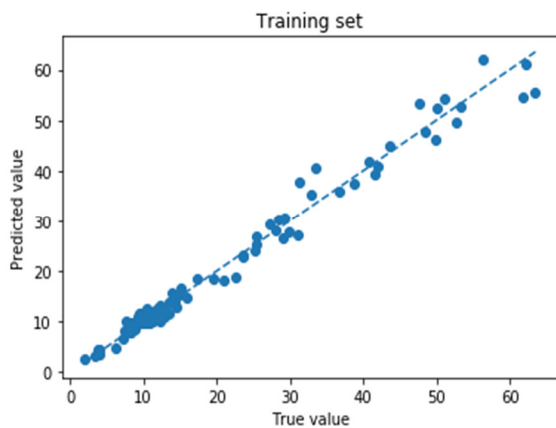
test: 4413.5867675

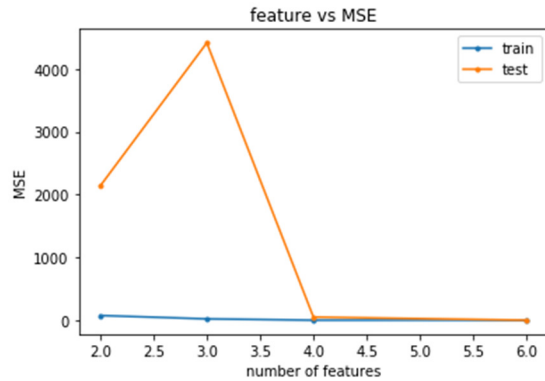
n = 3: training: 3.96786315703

test: 53.8311491635

n = 5: training: 3.94688107228

test: 3.94688107228





RESULTS for linear regression using Stochastic Gradient Descent

1) optimal Theta for training set

size of batch = 5:

Loss iteration 0: 54.148446028

Loss iteration 50: 39.8000521106

Loss iteration 100: 39.8000521106

Loss iteration 150: 39.8000521106

Loss iteration 200: 39.8000521106

Loss iteration 250: 39.8000521106

Loss iteration 300: 39.8000521106

Loss iteration 350: 39.8000521106

Loss iteration 400: 39.8000521106

Loss iteration 450: 39.8000521106

Loss iteration 500: 39.8000521106

Loss iteration 550: 39.8000521106

Loss iteration 600: 39.8000521106

Loss iteration 650: 39.8000521106

Loss iteration 700: 39.8000521106

Loss iteration 750: 39.8000521106

Loss iteration 800: 39.8000521106

Loss iteration 850: 39.8000521106

Loss iteration 900: 39.8000521106

Loss iteration 950: 39.8000521106

theta = [[17.71255965] [5.26776856]]

2) optimal Theta for test set

size of batch = 5:

Loss iteration 0: 908.544165941

Loss iteration 50: 395.958499279

Loss iteration 100: 395.958499278

Loss iteration 150: 395.958499278

Loss iteration 200: 395.958499278

Loss iteration 250: 395.958499278

Loss iteration 300: 395.958499278

Loss iteration 350: 395.958499278

Loss iteration 400: 395.958499278

Loss iteration 450: 395.958499278

Loss iteration 500: 395.958499278

Loss iteration 550: 395.958499278

Loss iteration 600: 395.958499278

Loss iteration 700: 395.958499278

Loss iteration 800: 395.958499278

Loss iteration 900: 395.958499278

theta = [[25.16436854] [13.53396449]]

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size of batch = 23:

Loss iteration 0: 2465.98268246

Loss iteration 100: 426.025462213

Loss iteration 200: 426.025571194

Loss iteration 300: 426.025571194

Loss iteration 400: 426.025571194

Loss iteration 500: 426.025571194

Loss iteration 600: 426.025571194

Loss iteration 700: 426.025571194

Loss iteration 800: 426.025571194

Loss iteration 900: 426.025571194

theta = [[26.93622753] [15.53300307]]

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size of batch = 50:

Loss iteration 0 2107.17316816

Loss iteration 100: 396.829343418

Loss iteration 200: 397.658568907

Loss iteration 300: 397.665137892

Loss iteration 400: 397.665184739

Loss iteration 500: 397.665185073

Loss iteration 600: 397.665185075

Loss iteration 700: 397.665185075

Loss iteration 800: 397.665185075

Loss iteration 900: 397.665185075

theta = [[26.90984712] [14.20544544]]

Loss iteration 650: 395.958499278

Loss iteration 750: 395.958499278

Loss iteration 850: 395.958499278

Loss iteration 950: 395.958499278

Loss iteration 50: 425.781281538

Loss iteration 150: 426.025571145

Loss iteration 250: 426.025571194

Loss iteration 350: 426.025571194

Loss iteration 450: 426.025571194

Loss iteration 550: 426.025571194

Loss iteration 650: 426.025571194

Loss iteration 750: 426.025571194

Loss iteration 850: 426.025571194

Loss iteration 950: 426.025571194

Loss iteration 50: 399.741707041

Loss iteration 150: 397.58741935

Loss iteration 250: 397.664626186

Loss iteration 350: 397.665181092

Loss iteration 450: 397.665185047

Loss iteration 550: 397.665185075

Loss iteration 650: 397.665185075

Loss iteration 750: 397.665185075

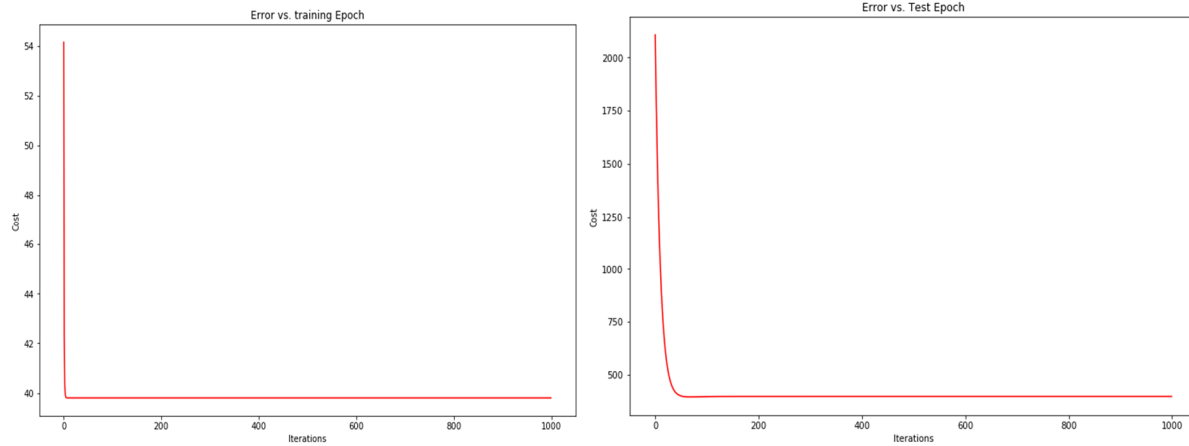
Loss iteration 850: 397.665185075

Loss iteration 950: 397.665185075

3)Errors

Error in Training data:

Training error is... 39.8000521106



Error in Testing data:

1) size of batch = 5:

Testing error is... 395.958499278

2) size of batch = 23:

Testing error is... 426.025571194

3) size of batch = 50:

Testing error is... 397.665185075

Therefore, as the size of the mini-batch becomes bigger, the speed becomes slower and the testing error decreases.