Lab 3

Machine Learning

Polynomial regression

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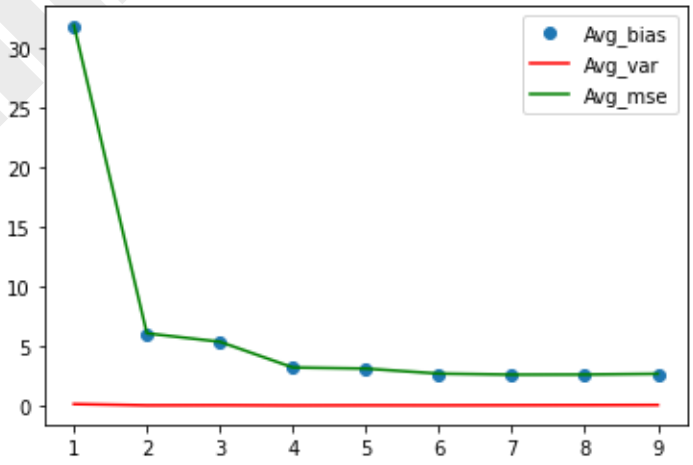
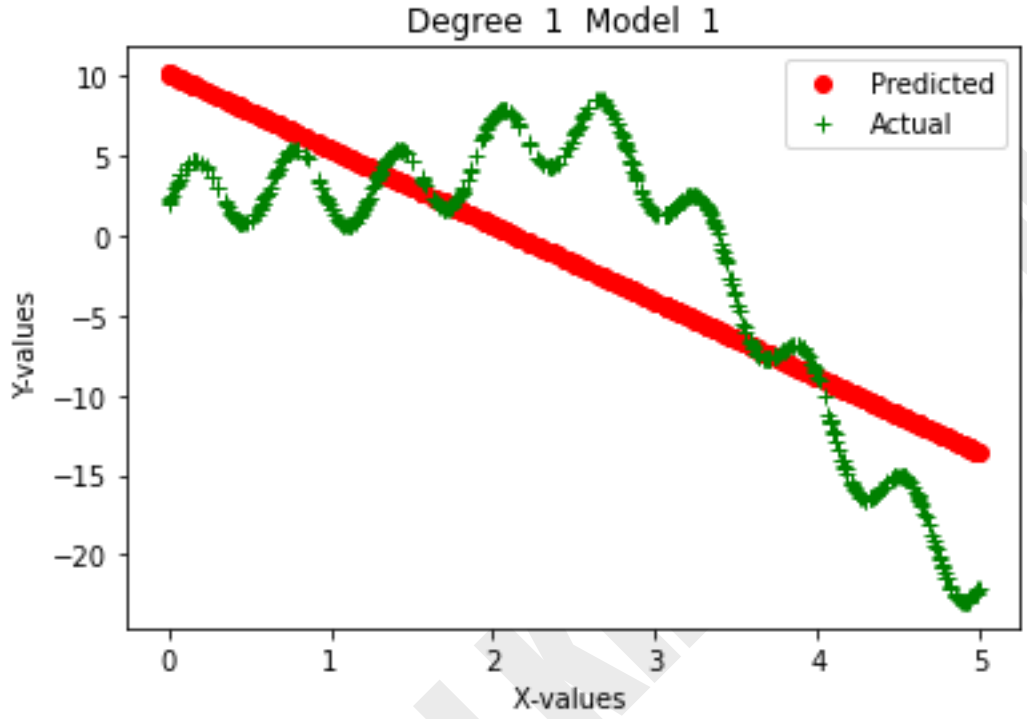
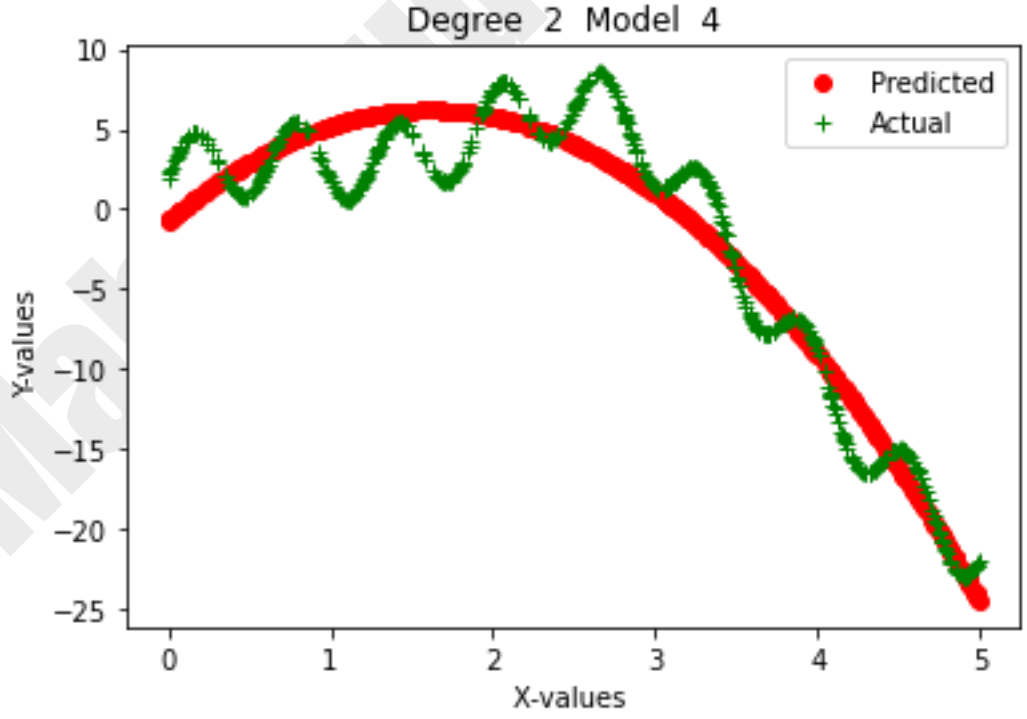
Question 1

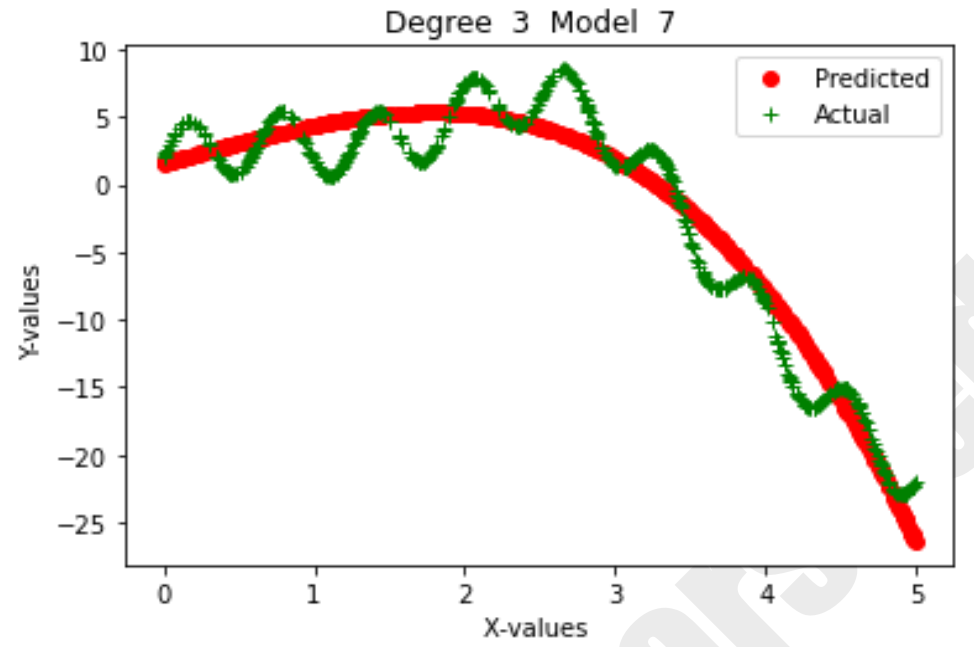
Degree	Bias	Variance
1	31.751675866625327	0.14866990809401534
2	6.034738793871623	0.041014755934911606
3	5.322868899944348	0.0488066332963188
4	3.181483224235673	0.03283505933792262
5	3.078721954241316	0.04099843804470085
6	2.6612519007946553	0.038908396209798586
7	2.5658239651482537	0.048544237405899526
8	2.5665001060159662	0.05645075052697436
9	2.6146137934092426	0.06762718722305777

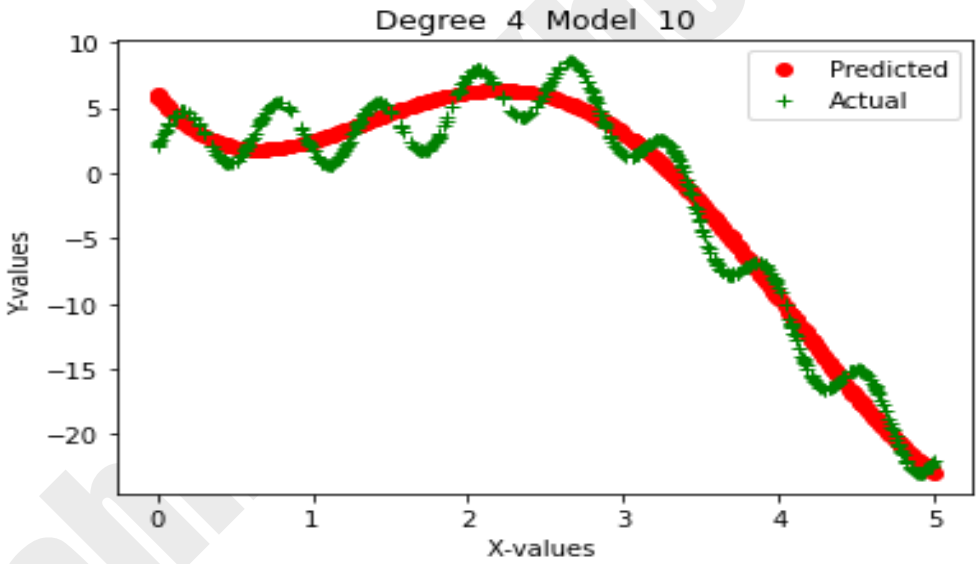


Plots of Predicted and Test









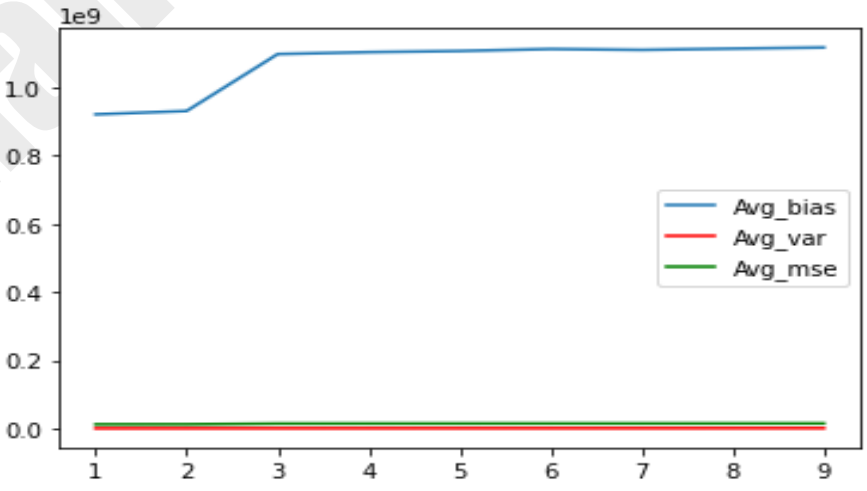
-When complexity increases (Degree of polynomial) the bias decreases because we could increase attributes.

--When complexity increases (Degree of polynomial) the variance decreases then slightly increases because of overfitting.

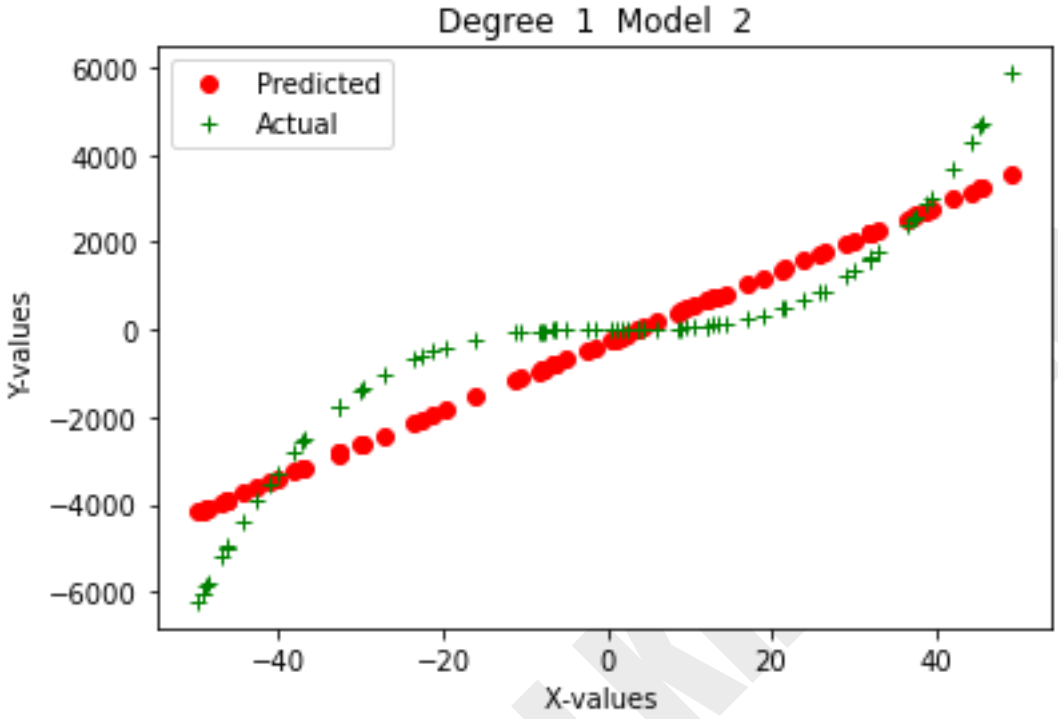
The best model at Degree 4

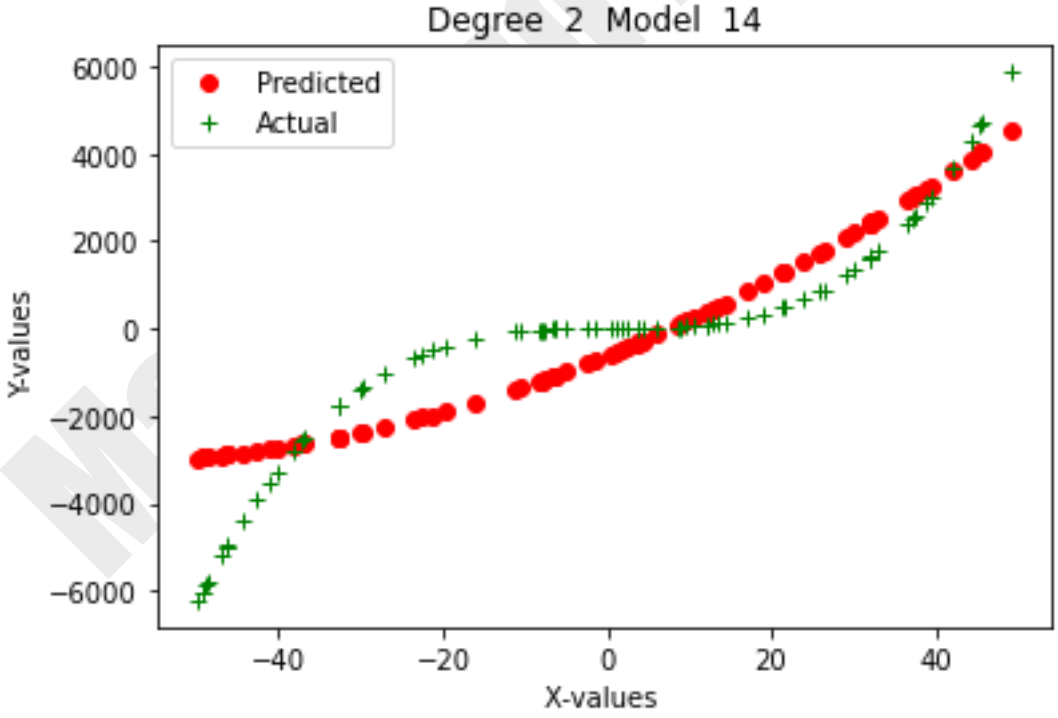
Question 2

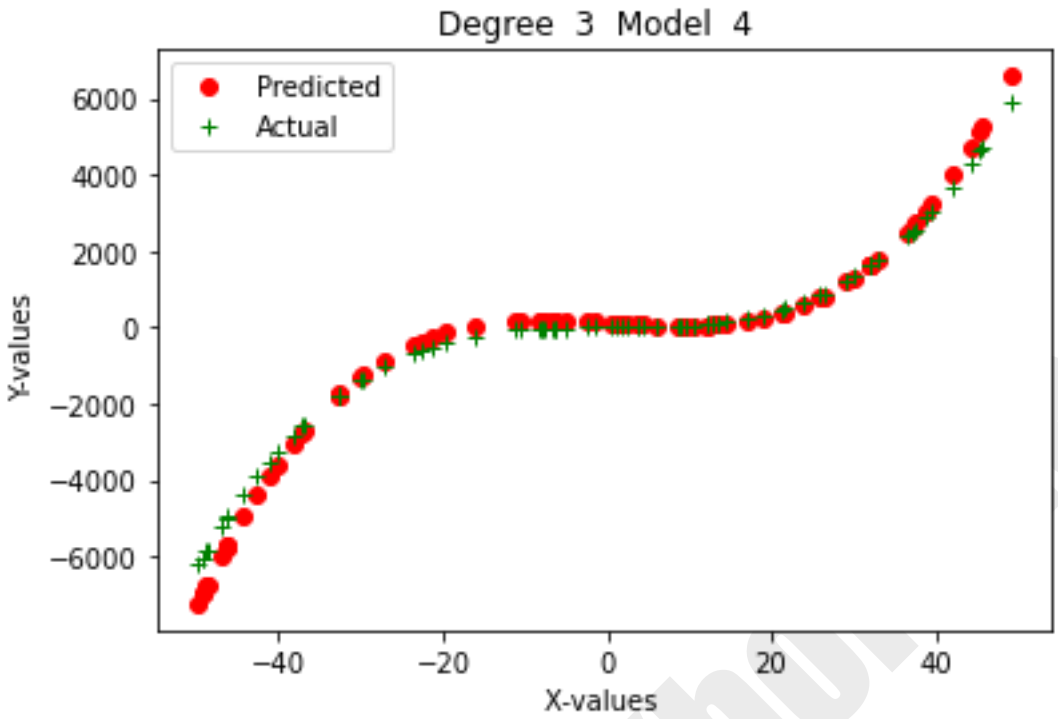
Degree	Bias	Variance
1	921656835.9753215,	73416.15180041666,
2	931510573.7927631,	121586.32841038969,
3	1098625292.8126748,	148540.68949941322,
4	1104236756.5193548,	197414.71854647138,
5	1107652823.7156606,	242468.45355755152,
6	1113449362.0527148,	290435.47326134716,
7	1110880561.488425,	335598.72327596135,
8	1114561899.0821908,	385481.82362030714,
9	1117934103.4136217	450362.5353038901

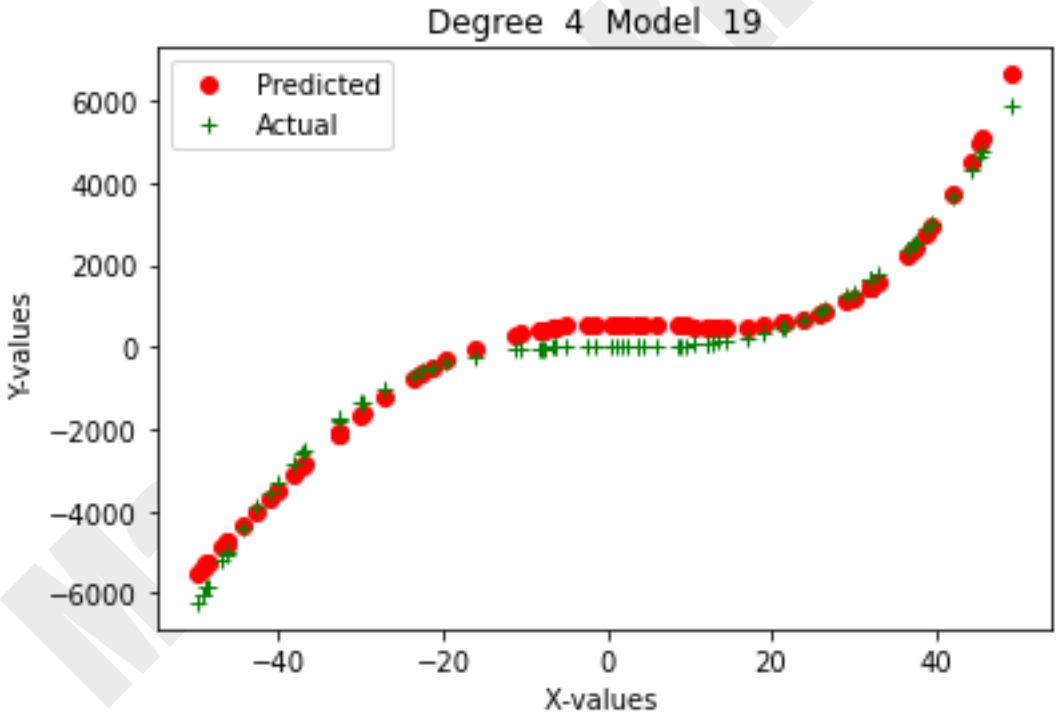


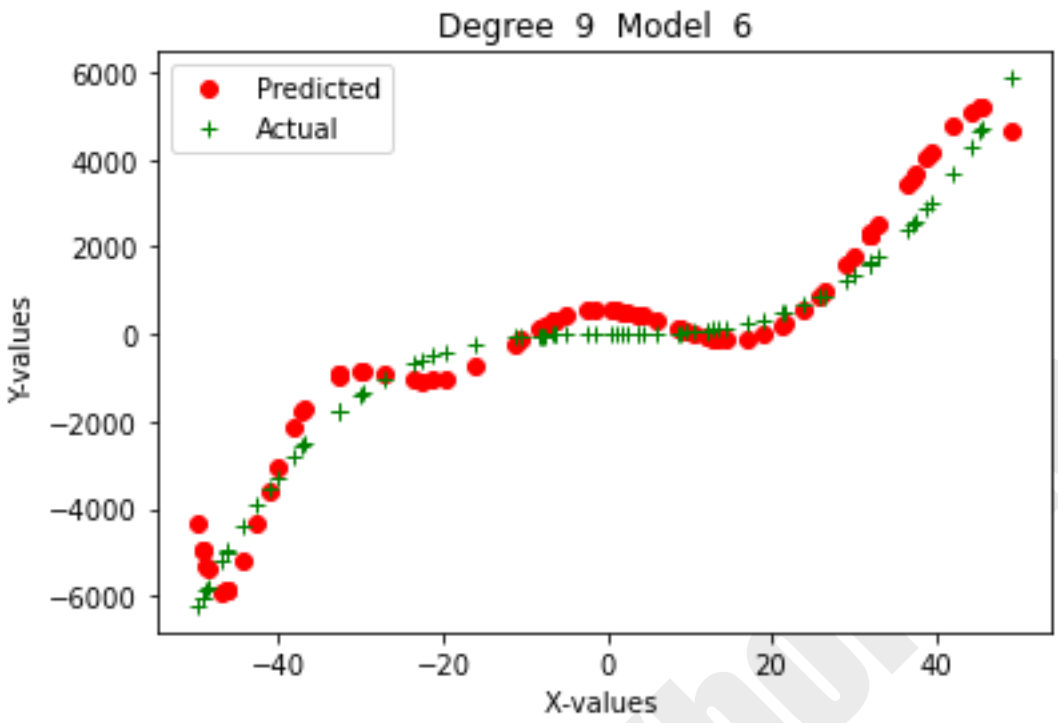
Plots of Predicted and Test






Degree 3 Model 4
Predicted
Actual
6000
4000
2000
0
−2000
−4000
−6000
Y-values
−40
−20
0
20
40
X-values


Degree 4 Model 19
Predicted
Actual
6000
4000
2000
0
−2000
−4000
−6000
Y-values
−40
−20
0
20
40
X-values



The best model at Degree 3