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CS460G

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The most difficult part about this assignment was cleanly implementing the production of the graphs in a relatively simple way. I did these using dictionaries that map the weights to text associating their csv file and order. The final models have a learning rate of 0.001 and 10000 epochs.

# Results

1st Order

| | SYNTHETIC 1 | SYNTHETIC 2 | SYNTHETIC 3 |
|---|---|---|---|
| **MSE** | 804.641 | 3413.281 | 152.882 |
| **WEIGHTS** | [4.139, 0.407] | [-3.549, 1.987] | [0.199, -0.011] |

2nd Order

| | SYNTHETIC 1 | SYNTHETIC 2 | SYNTHETIC 3 |
|---|---|---|---|
| **MSE** | 406.756 | 3251.412 | 183.507 |
| **WEIGHTS** | [1.791, 0.258, 1.607] | [-4.324, 1.909, 0.631] | [0.084, -0.017, 0.063] |

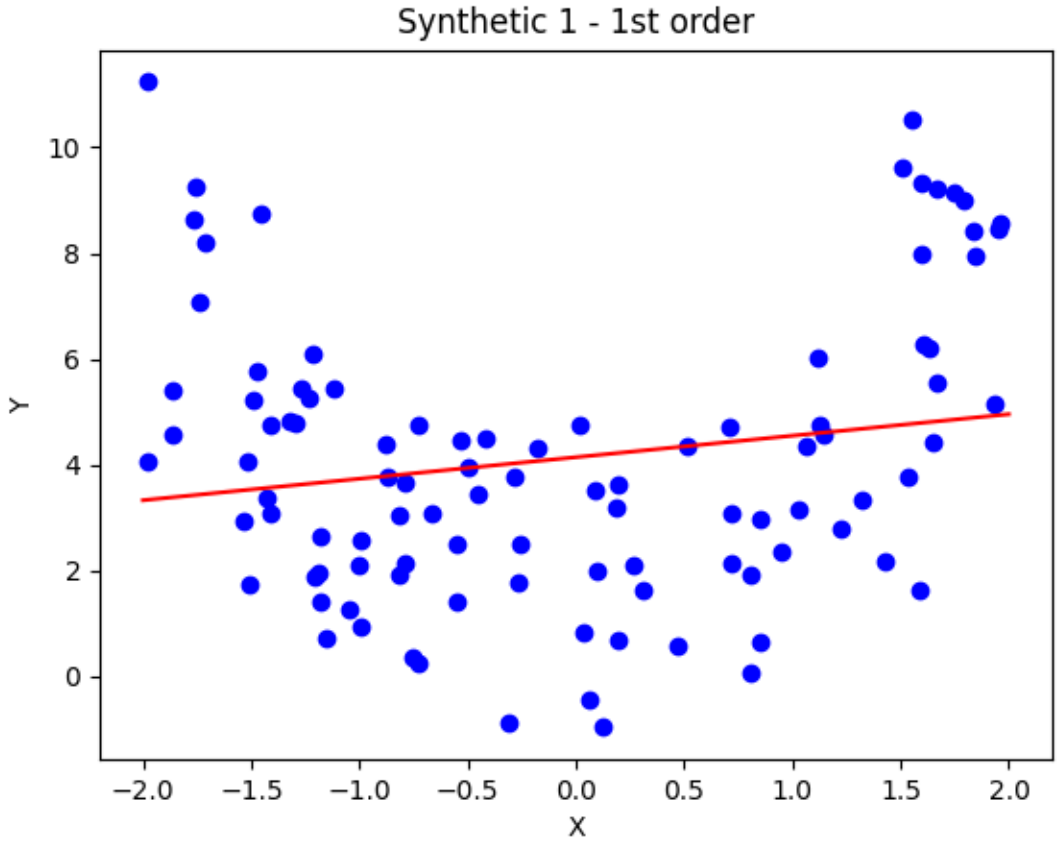
4th Order

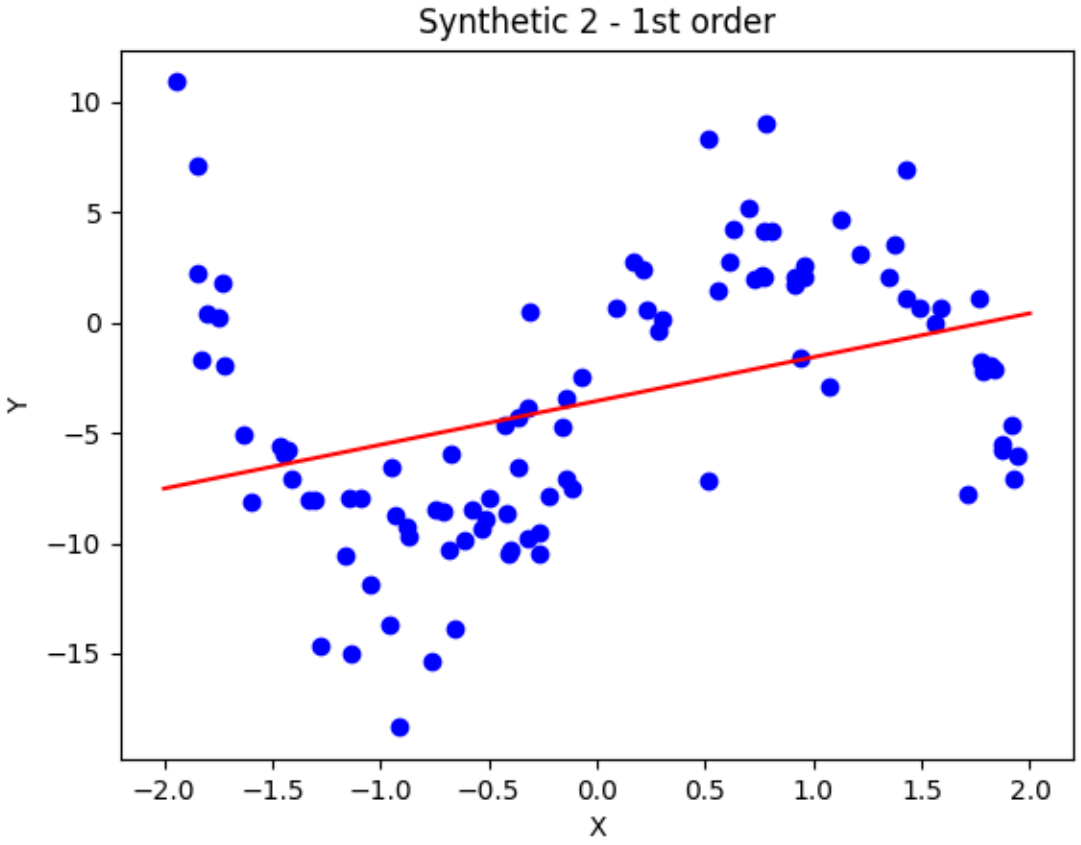
| | SYNTHETIC 1 | SYNTHETIC 2 | SYNTHETIC 3 |
|---|---|---|---|
| **MSE** | 401.967 | 1682.471 | 616.957 |
| **WEIGHTS** | [1.981, 0.077, 1.187, 0.068, 0.119] | [-3.328, 9.568, -1.202, -3.312, 0.615] | [0.522, 1.564, -0.765, -0.543, 0.218] |

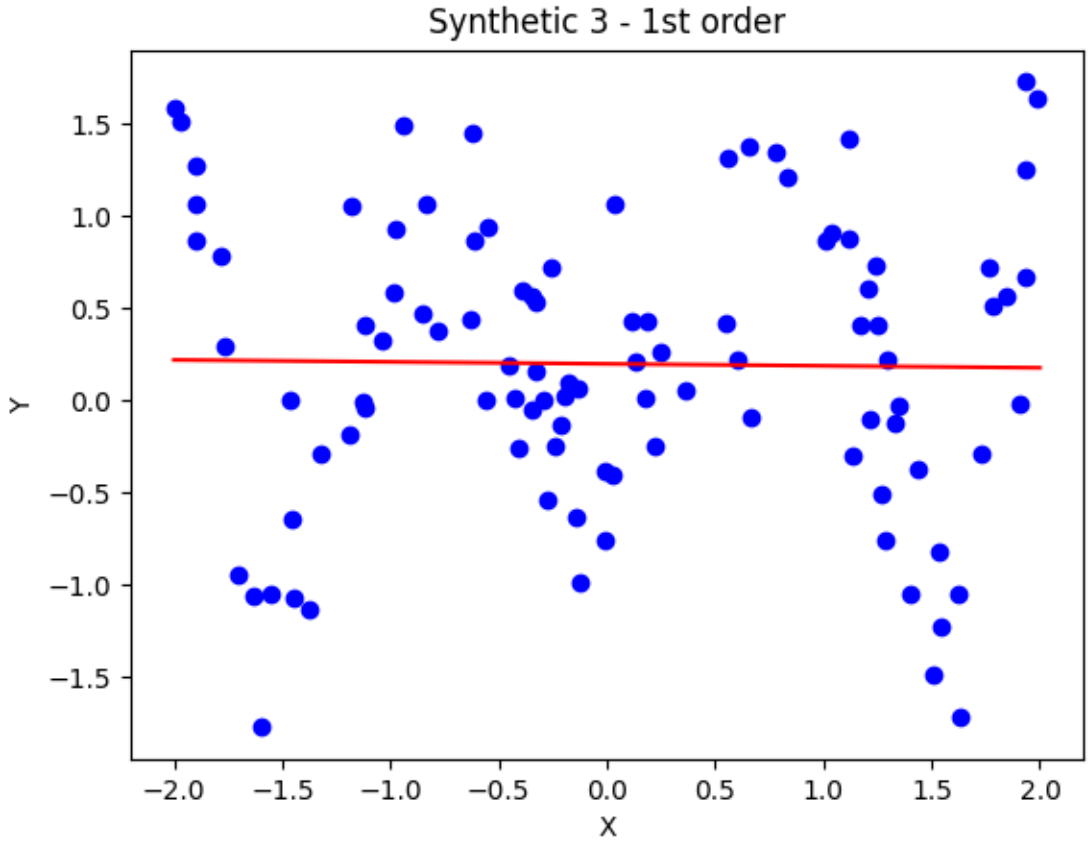
7th Order

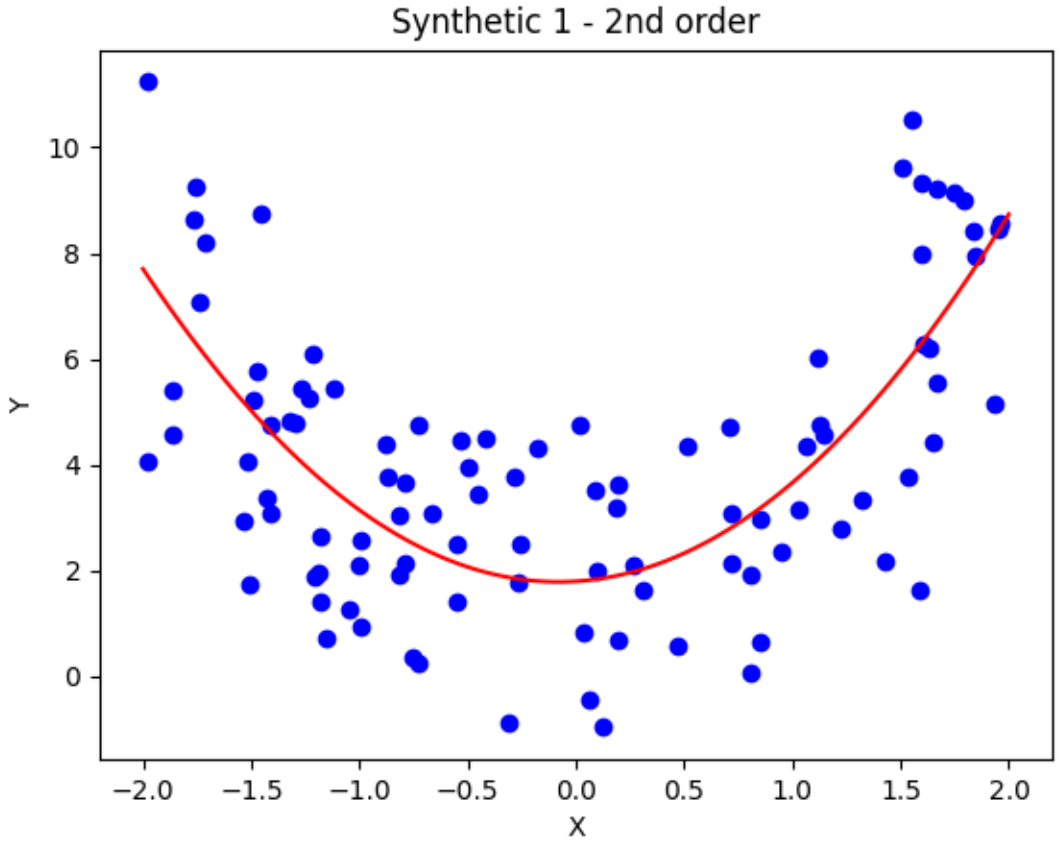
| | SYNTHETIC 1 | SYNTHETIC 2 | SYNTHETIC 3 |
|---|---|---|---|
| **MSE** | 400.503 | 1432.447 | 360.867 |
| **WEIGHTS** | [1.962, -0.103, 0.617, 0.171, 0.693, 0.062, -0.12, -0.023] | [-3.394, 6.812, -0.936, 1.523, 0.375, -1.781, 0.058, 0.163] | [0.597, 1.741, -0.13, -0.429, -0.48, -0.461, 0.147, 0.122] |

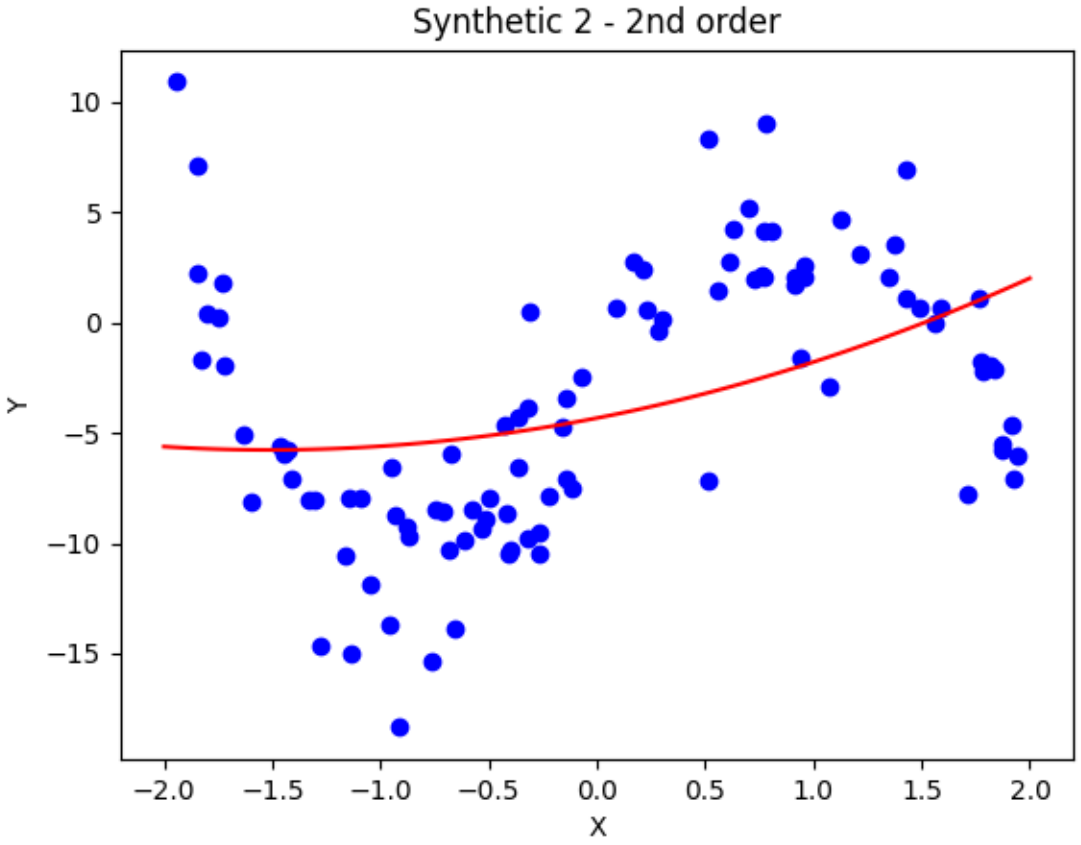
## Regression Lines

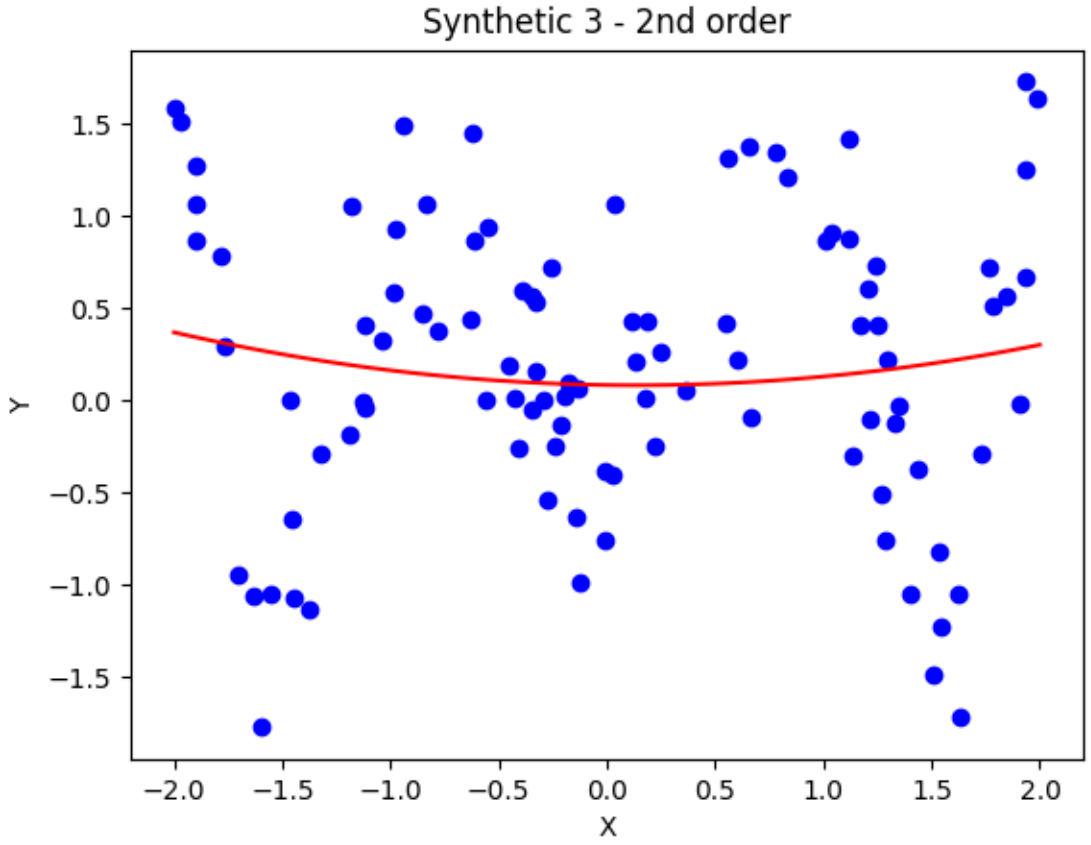

Synthetic 1 - 1st order
Y
X
10
8
6
4
2
0
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0

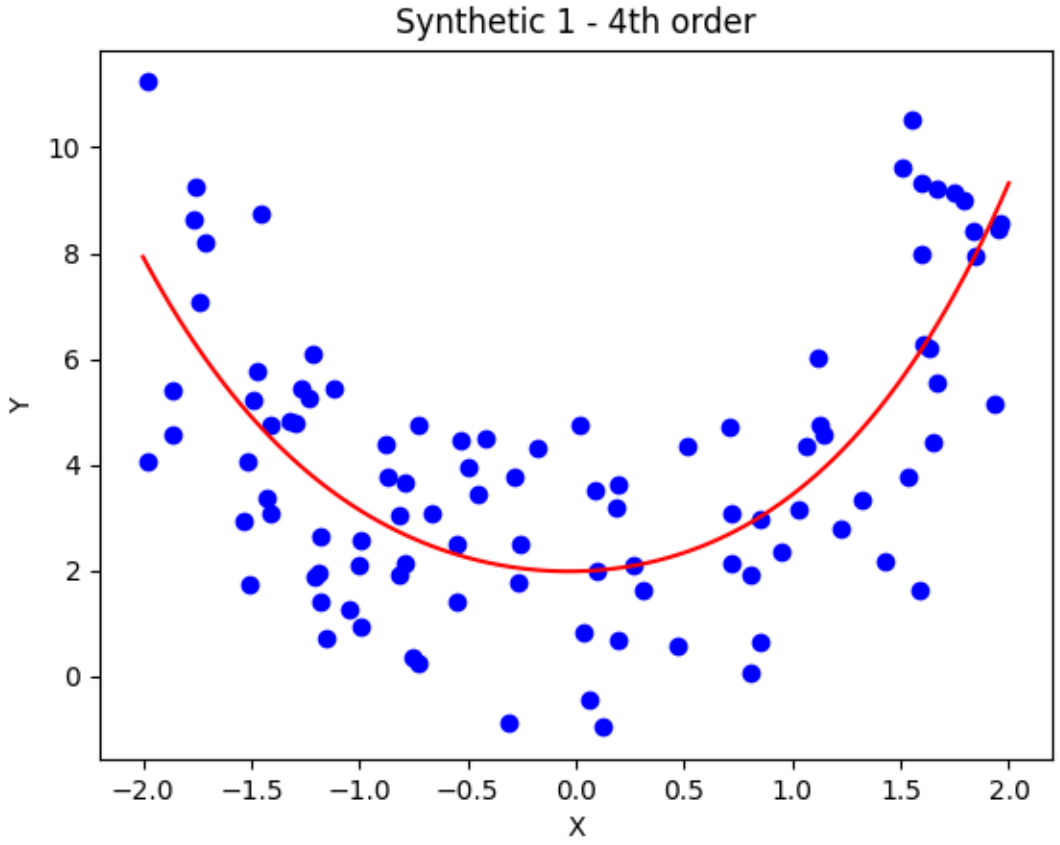

Synthetic 2 - 1st order
10
5
0
−5
−10
−15
Y
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
X

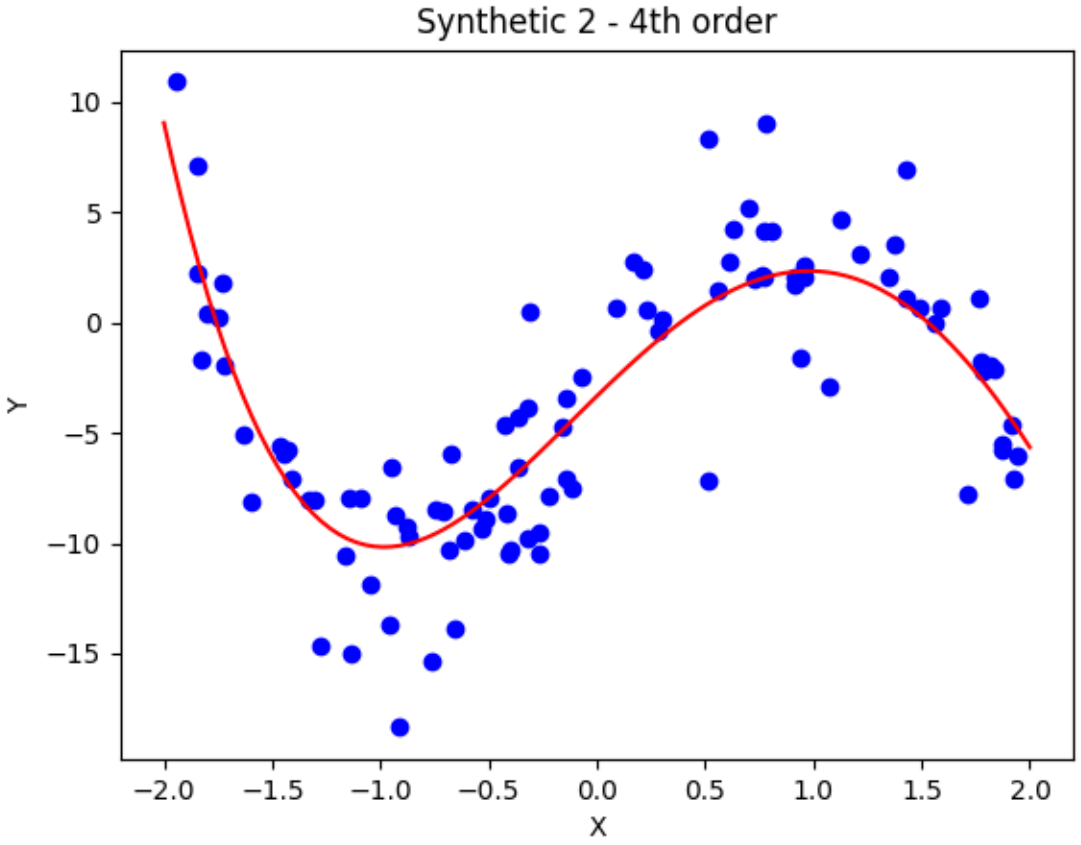

Synthetic 3 - 1st order
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
Y
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
X

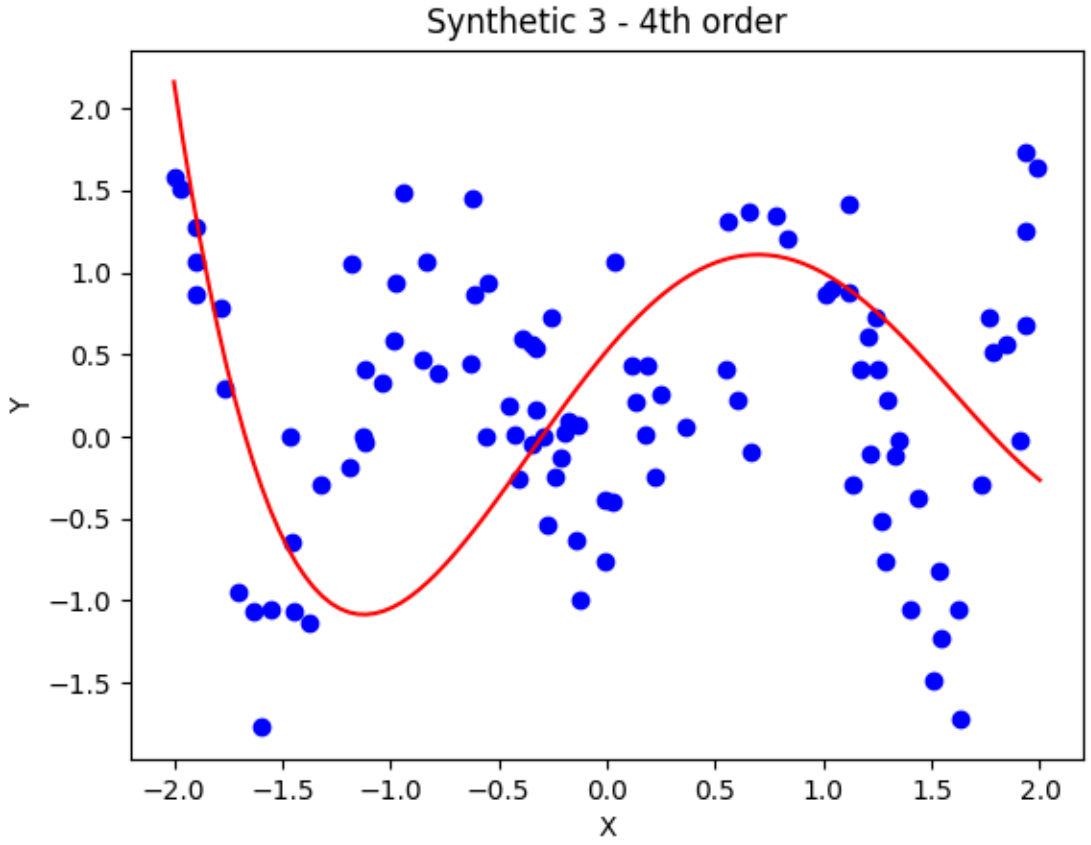

Synthetic 1 - 2nd order
Y
X
10
8
6
4
2
0
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0

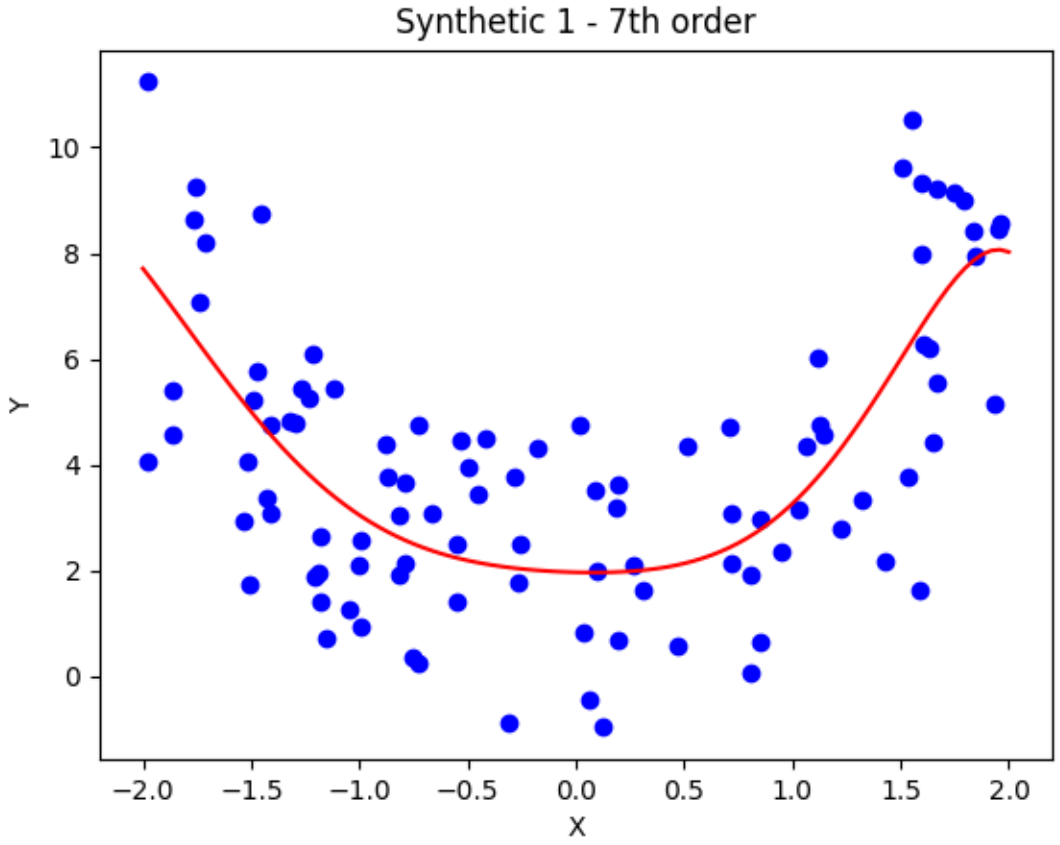

Synthetic 2 - 2nd order
10
5
0
−5
−10
−15
Y
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
X

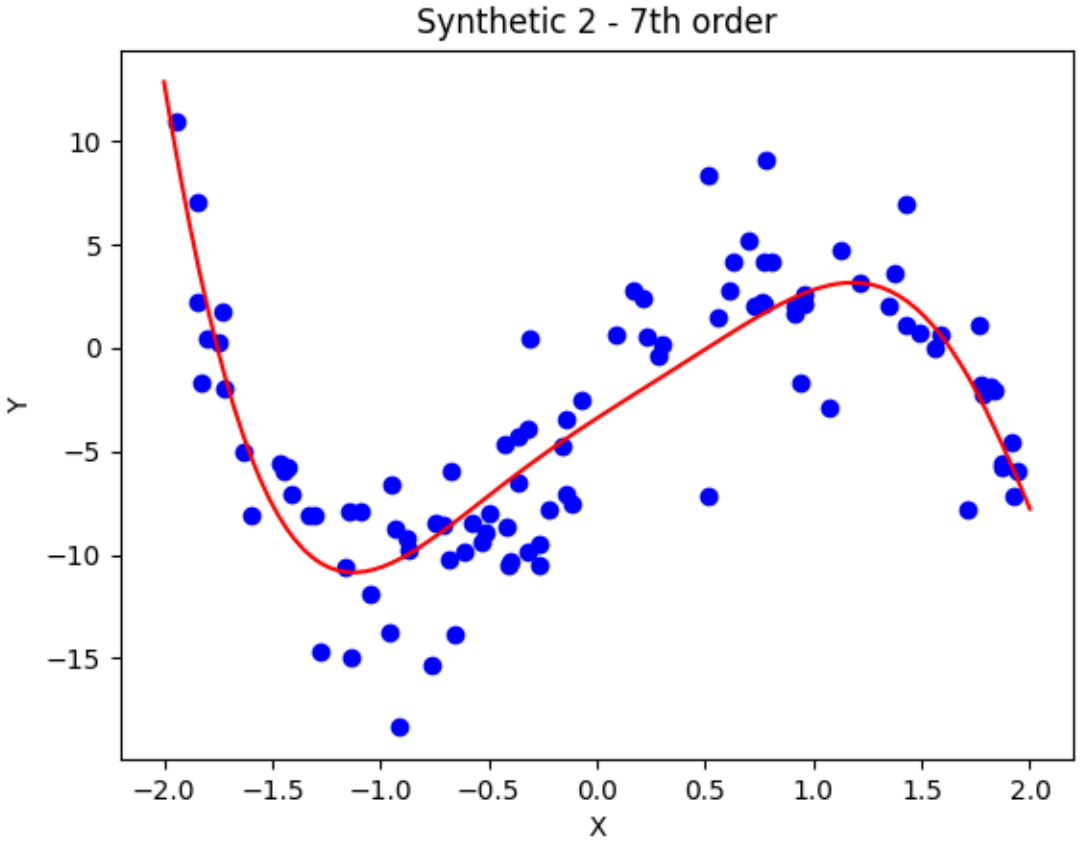

Synthetic 3 - 2nd order
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
Y
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
X

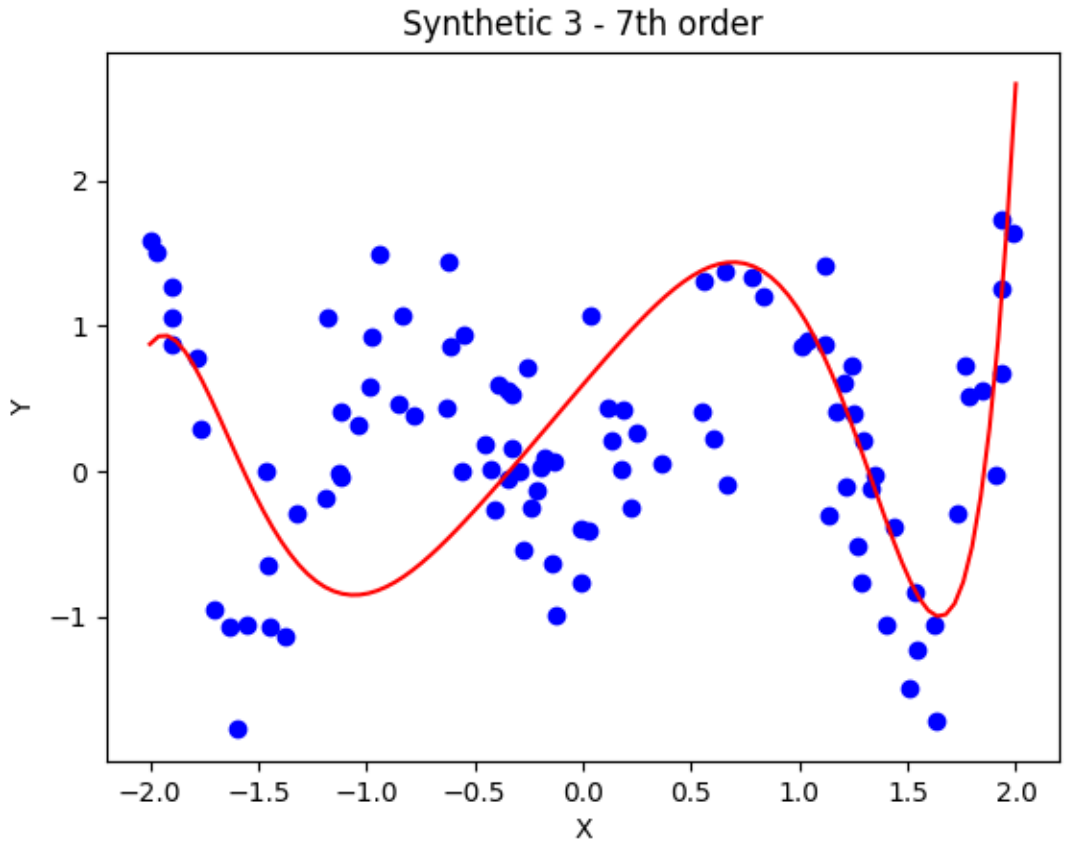

Synthetic 1 - 4th order
Y
X
10
8
6
4
2
0
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0


Synthetic 2 - 4th order
10
5
0
−5
−10
−15
Y
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
X


Synthetic 3 - 4th order
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
Y
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
X


Synthetic 1 - 7th order
Y
X
10
8
6
4
2
0
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0


Synthetic 2 - 7th order
10
5
0
−5
−10
−15
Y
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
X


Synthetic 3 - 7th order
Y
X
2
1
0
−1
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0