PA2 Report

For both the wine quality data set and the synthetic data sets, I used batch gradient descent.

For the wine quality dataset, I modified the data by dividing them either 10, 100, or 1000, so all of them will be below 1. I tried lr 0.01 and 0.001, and have 1000 iterations. The final mse is 3.272328433849802. And the bias is 1.652710644240258, the slope from fixed acidity to alcohol is [ 0.25266586 0.06328777 0.42184934 0.34955275 -0.04678648 -0.05517079

-0.28503122 0.6869916 0.04786785 0.47284625 0.864286 ]. Since I used batch gradient descent, the running time is really long, I will attached a full output report generated by pycharm in another file.

For synthetic data set 1, polynomial 2, I did 1000 iteration, lr = 0.005, the final mse is 30.4053899159646. The final slope for x is 1.9002602404523208, for x^2 is 0.6768219032838251, the intercept (bias) is -4.420532100072694.

图表, 散点图

描述已自动生成

For synthetic data set 1, polynomial 3, I did 1000 iteration, lr = 0.001, the final mse is 8.938301388620973. Slope for x is 11.149272193503371, slope for x^2 is 0.8770271112977723, slope for x^3 is -3.8329229091047097, the intercept is -3.9566059199780375.

图表

描述已自动生成

For synthetic data set 1, polynomial 5, I did 10000 iteration, lr = 0.0001, the final mse is 8.282775479509166. Slope for x is 10.801105213640263, for x^2 is -1.620101409437992, for x^3 is -3.3579800783075098, for x^4 is 0.735766446191969, for x^5 is -0.12769406189362612, the intercept is -3.0236607296066724.

图表

描述已自动生成

图表, 散点图

描述已自动生成For synthetic data set 2, polynomial 2, I did 1000 iteration, lr = 0.005, the final mse is 0.3276429479455291. The final slope for x is -0.0478094705500752, for x^2 is -0.17884705518681787, the intercept (bias) is 0.3702494372870867

图表, 散点图

描述已自动生成For synthetic data set 2, polynomial 3, I did 1000 iteration, lr = 0.001, the final mse is 0.32761960364296255. Slope for x is -0.057705076000855275, slope for x^2 is -0.17811545973125417, slope for x^3 is 0.0045544581794053135, the intercept is - 0.3694769011105128.

For synthetic data set 2, polynomial 5, I did 10000 iteration, lr = 0.0001, the final mse is 0.3019114294273261. Slope for x is -0.3666164331426872, for x^2 is -0.5299020574687464, for x^3 is 0.3178016371861907, for x^4 is 0.11060801244431584, for x^5 is -0.06416490687202381, the intercept is 0.48485743252988167.

图表, 散点图

描述已自动生成