Machine Learning (CSE-475)

Assignment 1: Polynomial Regression and Regularization

Steel expands when the surrounding temperature increases. To calculate how much a length of steel will increase, you need to know two variables including how much the temperature increases and the original length of the steel. Thermal expansion coefficient is a material property that is indicative of the extent to which a material expands upon heating. In current practice, thermal expansion-contraction is assumed to be a linear function of temperature, and a constant thermal coefficient is used. However, the coefficient of thermal expansion of steel is not constant but is a non linear function of temperature up to its melting point.

A list of thermal expansion coefficients of steel is given in the following table according to specific temperature:

Temperature, T Thermal expansion coefficient, $\alpha * E - 06$

Temperature-T	Thermal expansion coefficient $(\alpha * E^{-06})$
80	6.47
60	6.36
40	6.24
20	6.12
0	6
-20	5.86
−40	5.72
−60	5.86
−80	5.43
−100	5.28
−120	5.09
−140	4.91
-160	4.72
-180	4.52
-200	4.30
-220	4.08

-240	3.83
-260	3.58
-280	3.33
-300	3.07
-320	2.76
-340	2.45

Tasks:

1. Find the optimum order of polynomial using polynomial regression model.
2. Determine the changes in the regression model using Ridge and Lasso regularization models.
3. Show the fitting graphs for number 2.