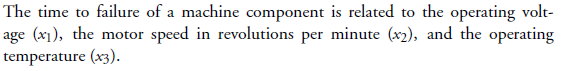
**Data analysis tools for Experimental research/DOE and data analysis Class work\_1**

**Multiple regression (3-factor)- Plotting surface function [ keeping one factor constant]**





1. Estimate the **10 parameters** assuming linear terms, quadratic terms and interaction terms.
2. Plot the time for failure of the machine component as a function of operating voltage and motor speed for a constant operating temperature of 140.
3. Plot the time for failure of the machine component as a function of operating voltage and temperature for a constant motor speed of 1000.
4. Plot the time for failure of the machine component as a function of operating voltage and motor speed for a constant operating temperature of 140, when the interaction terms X1. X2 and X1. X3 is neglected are neglected.
5. Show the goodness of fit analysis: Plot the residual plot for two models and calculate the RMSE. Also plot the parity plot [ x axis-experimental points, y-axis- simulated points for the time of failure of machine component.

***Code Hints:***

import pandas as pd

import numpy as np

import inspect

from sklearn.linear\_model import LinearRegression as regress

from sklearn.preprocessing import PolynomialFeatures

data = pd.read\_excel('tutorial1.xlsx')

print(data)

Y = data.iloc[:,0].values

x1 = data.iloc[:,1].values #Operating voltage

x2 = #Motor speed

x3 = #Operating Temperature

ones\_col = np.ones(np.size(x1))

#Calculation of coefficients for linear terms

XL = np.column\_stack((x1,x2,x3))

model = regress().fit(XL,Y)

b0 = model.intercept\_

linear = model.coef\_

b1 = linear[0]

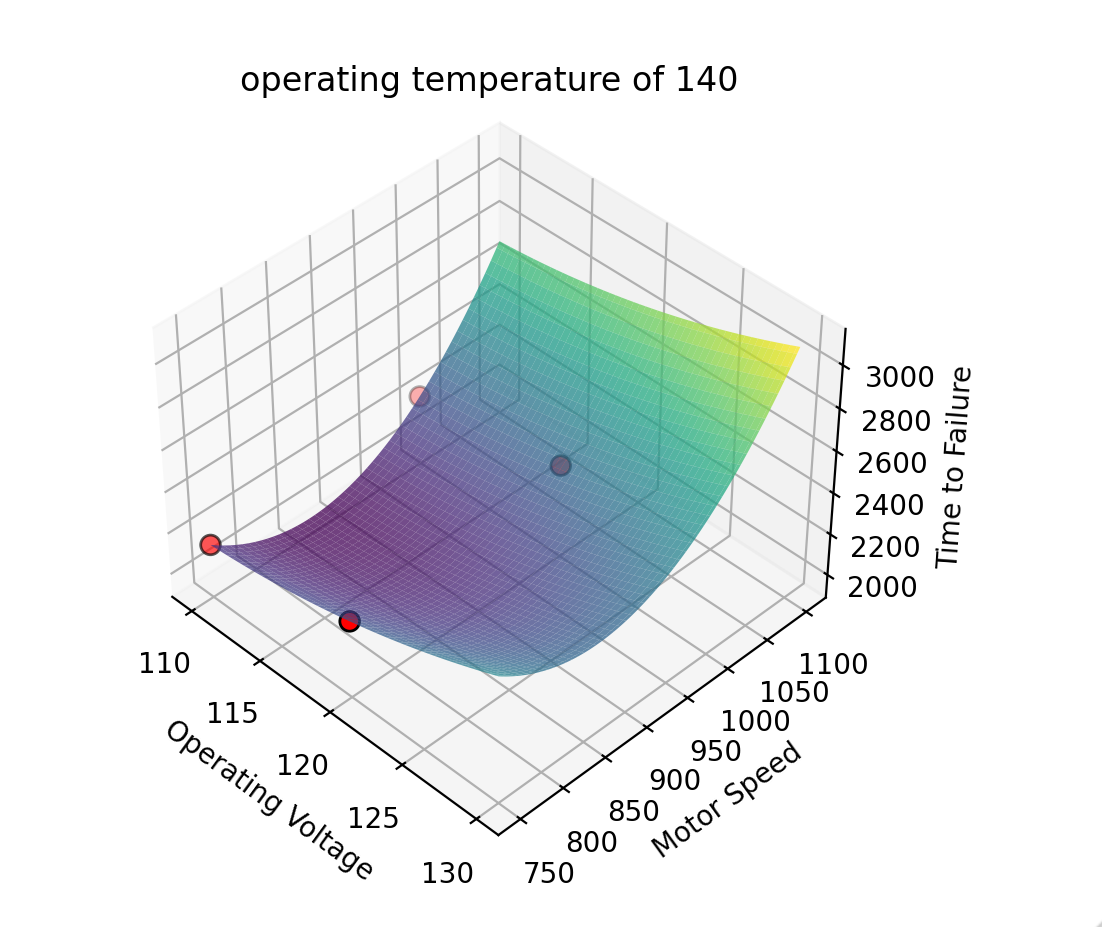
b2 =

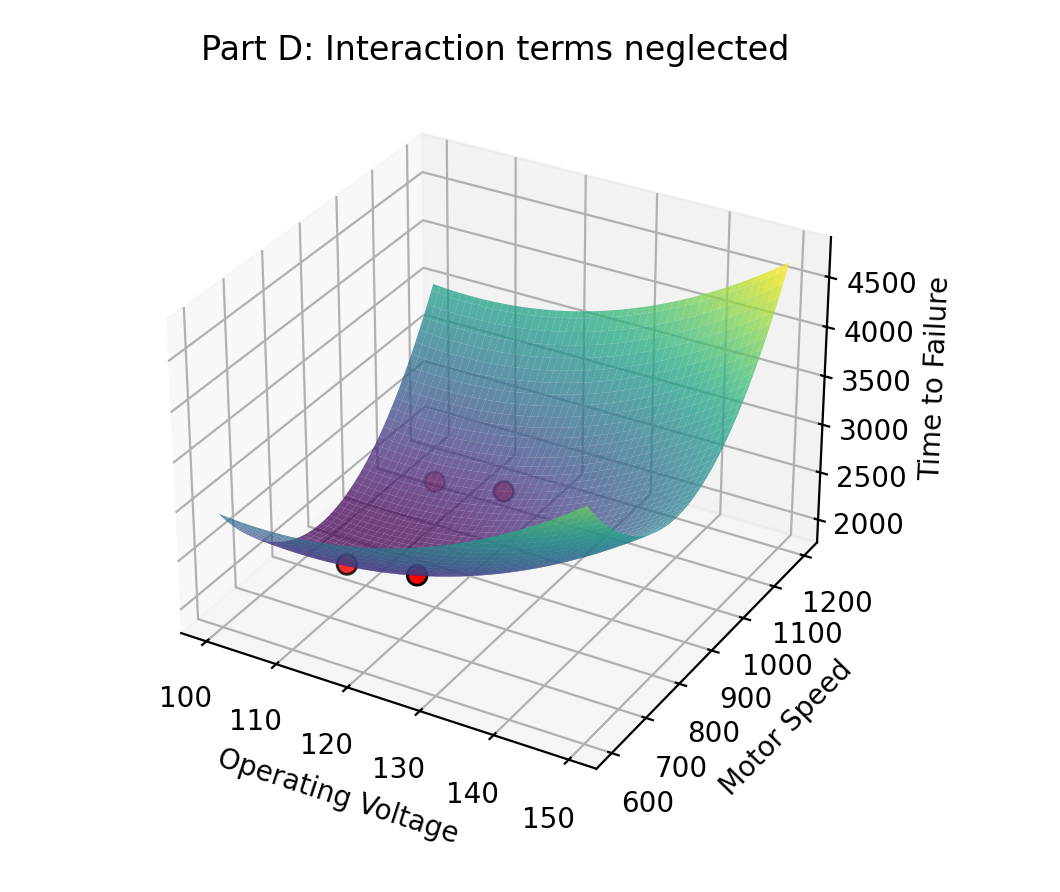
b3 =

linear\_coeff = [b0,b1,b2,b3]

print('The coefficients for the linear model are: \n b0 = {} \n b1 = {} \n b2 = {} \n b3 = {} \n\n'.format(b0,b1,b2,b3))

print('The equation is: \n Y = {} + {}\*X1 + {}\*X2 + {}\*X3'.format(b0,b1,b2,b3))

 A graph of a motor speed

Description automatically generated  A graph of a number of graphs

Description automatically generated with medium confidence

A close-up of a graph

Description automatically generated