



## Tutorial 04

### **Problem Statement:** Predicting Equipment Performance

You are an engineer working for a manufacturing company that produces a particular type of machinery. The performance of this machinery is influenced by various factors, such as operating temperature, pressure, and time in service. The management is keen on optimizing the machinery's performance to enhance its reliability and efficiency.

Your task is to develop a predictive model using polynomial regression to estimate the machinery's performance based on the operating temperature. The historical data provided includes measurements of the machinery's performance at different temperatures.

Collected data provided as .csv file in studip. - machinery\_data.csv

### **Task 1:**

Implement Polynomial regression using sklearn library to find best possible model.

**Steps:** Import data > split data into test and train (Optional) > create polynomial regression model > fit the curve with data > predict > calculate error (Optional) > plot data and prediction model.

### **Problem Statement:**

The success of a student on an exam is influenced by two factors: the number of hours spent studying and the number of hours slept the night before the exam.

Objective:

Build a logistic regression model to predict whether a student will pass or fail the exam based on the hours of study and sleep.

$$Z = \theta_0 + \theta_1 \times X_1 + \theta_2 \times X_2$$

$$\sigma(z) = h_{\theta}(x) = \frac{1}{1 + e^{-\theta^T x}}$$

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$$J(\theta) = -\frac{1}{m} \sum_{i=1}^m \left[ y^{(i)} \log(h_{\theta}(x^{(i)})) + (1 - y^{(i)}) \log(1 - h_{\theta}(x^{(i)})) \right]$$

$$\theta_j := \theta_j - \alpha \frac{1}{m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)}) x_j^{(i)}$$

### **Task 2:**

Implement logistic regression using Gradient descent method to find best possible model.

Collected data provided as .csv file in studip. - Task\_2.csv

**Steps:** Import data > Initialize hyper-parameter > use gradient descent algorithm to update coefficients > check for convergence (Optional) > make prediction > calculate accuracy and intercepts (Optional) > plot

### **Problem Statement:**

In addition to task 2, the success of a student on an exam is influenced by one more factors, which is Number of practice tests given by students.

### **Task 3:**

Implement logistic regression using libraries to find best possible model.

Collected data provided as .csv file in studip. - Task\_3.csv

**Steps:** Import data > split the data into train and test (Optional) > creat model > fit > predict > calculate accuracy (Optional) > plot



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### **Problem Statement:**

In task 4, we have multi-class problem. Depending on 2 influencing factor for the success of the student, we get status of student as Pass, Fail or retest.

### **Task 4:**

Implement logistic regression using libraries to find best possible model.

(Hint- one VS all method)

Collected data provided as .csv file in studip. - Task\_4.csv

**Steps:** Import data > split the data into train and test (Optional) > creat model > fit > predict > calculate accuracy (Optional) > plot