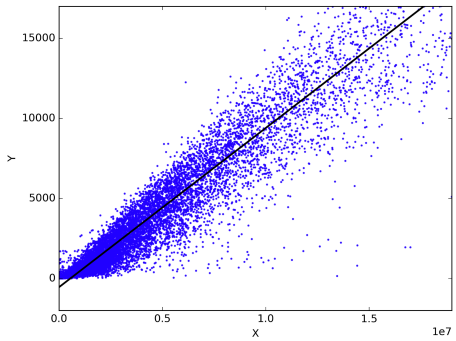
Regression in Machine Learning



Regression models are used to predict a continuous value.
Predicting prices of a house given the features of house like size, price Or Predicting tip depends on Bill amount of restaurant etc are the common examples of Regression.
It is a supervised technique.

Types of Regression

- Simple Linear Regression
- Polynomial Regression
- Support Vector Regression
- Decision Tree Regression
- Random Forest Regression

Simple Linear Regression

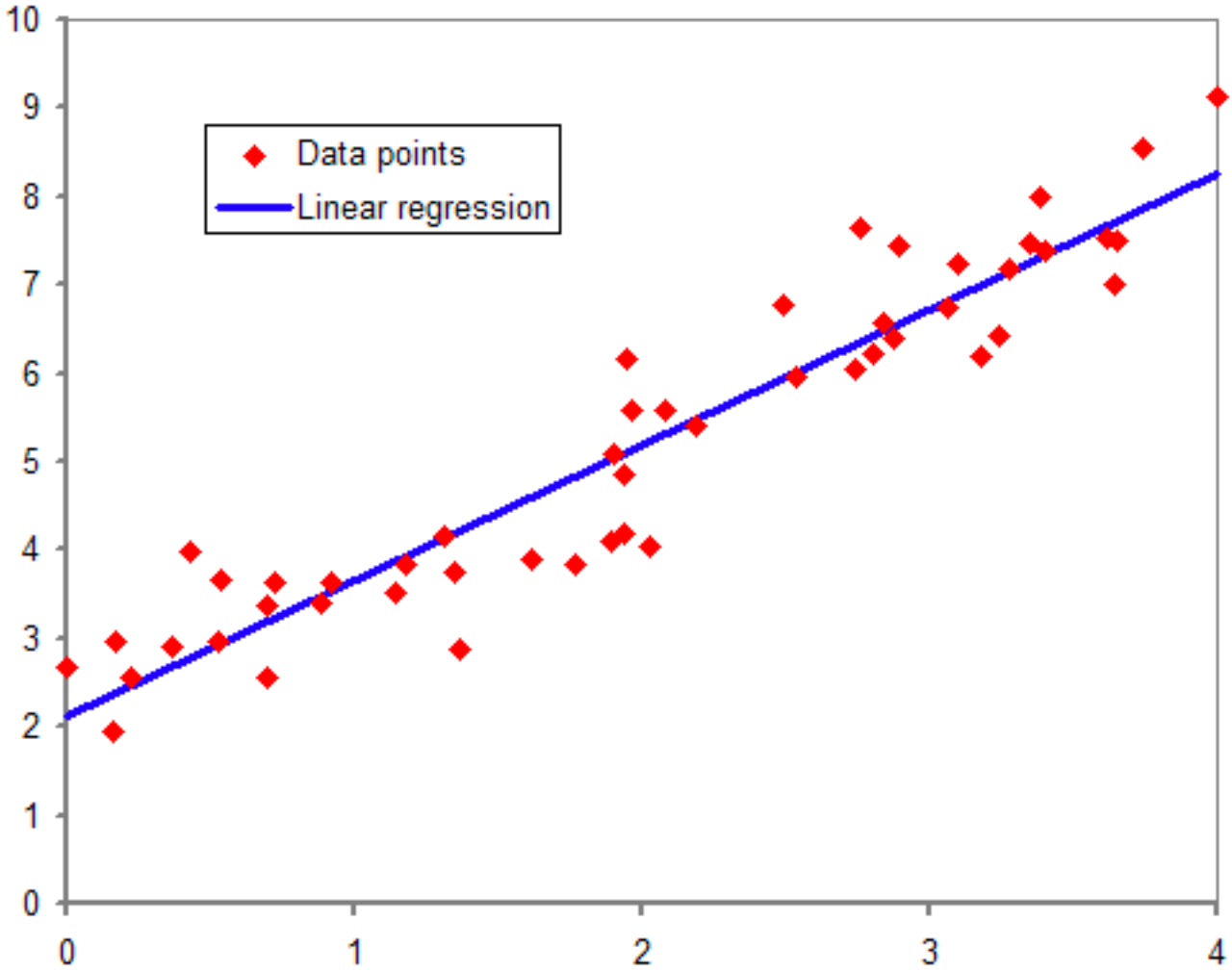
This is one of the most common and interesting type of Regression technique.
Here we predict a target variable Y based on the input variable X.
A linear relationship should exist between target variable and predictor and so comes the name Linear Regression.
Consider predicting the salary of an employee based on his/her age.
We can easily identify that there seems to be a correlation between employee's age and salary (more the age more is the salary). The hypothesis of linear regression is

Y = mX + c

Y represents salary, X is employee's age and m and c are the coefficients of equation.
So in order to predict Y (salary) given X (age), we need to know the values of m and c (the model's coefficients).

While training and building a regression model, it is these coefficients which are learned and fitted to training data.
The aim of training is to find a best fit line such that cost function is minimized.
The cost function helps in measuring the error.
During training process we try to minimize the error between actual and predicted values and thus minimizing cost function.

In the figure, the red points are the data points and the blue line is the predicted line for the training data.
To get the predicted value, these data points are projected on to the line.



To summarize, our aim is to find such values of coefficients which will minimize the cost function.
The most common cost function is Mean Squared Error (MSE) which is equal to average squared difference between an observation's actual and predicted values.
The coefficient values can be calculated using Gradient Descent approach which will be discussed in detail in later articles.
To give a brief understanding, in Gradient descent we start with some random values of coefficients, compute gradient of cost function on these values, update the coefficients and calculate the cost function again.
This process is repeated until we find a minimum value of cost function.