SNS COLLEGE OF ENGINEERING

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Artificial Intelligence & Machine Learning

Regression

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Regression

- Supervised learning wherein the algorithm is trained with both input features and output labels.

- It helps in establishing a relationship among the variables by estimating how one variable affects the other.

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Regression in Machine Learning

Regression in machine learning consists of mathematical methods that allow data scientists to predict a continuous outcome (y) based on the value of one or more predictor variables (x).

- Linear Regression
- Multivariate Regression

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Linear Regression

Linear regression is probably the most popular form of regression analysis because of its ease-of-use in predicting and forecasting.

Evaluating a Regression Algorithm

Variance

Variance is the amount by which the estimate of the target function changes if different training data were used.

Bias

Bias is the algorithm's tendency to consistently learn the wrong thing by not taking into account all the information in the data. For the model to be accurate, bias needs to be low.

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If the model performs well on the test data but with low accuracy on the training data, then this leads to underfitting.

Underfitting   Ideal   Overfitting

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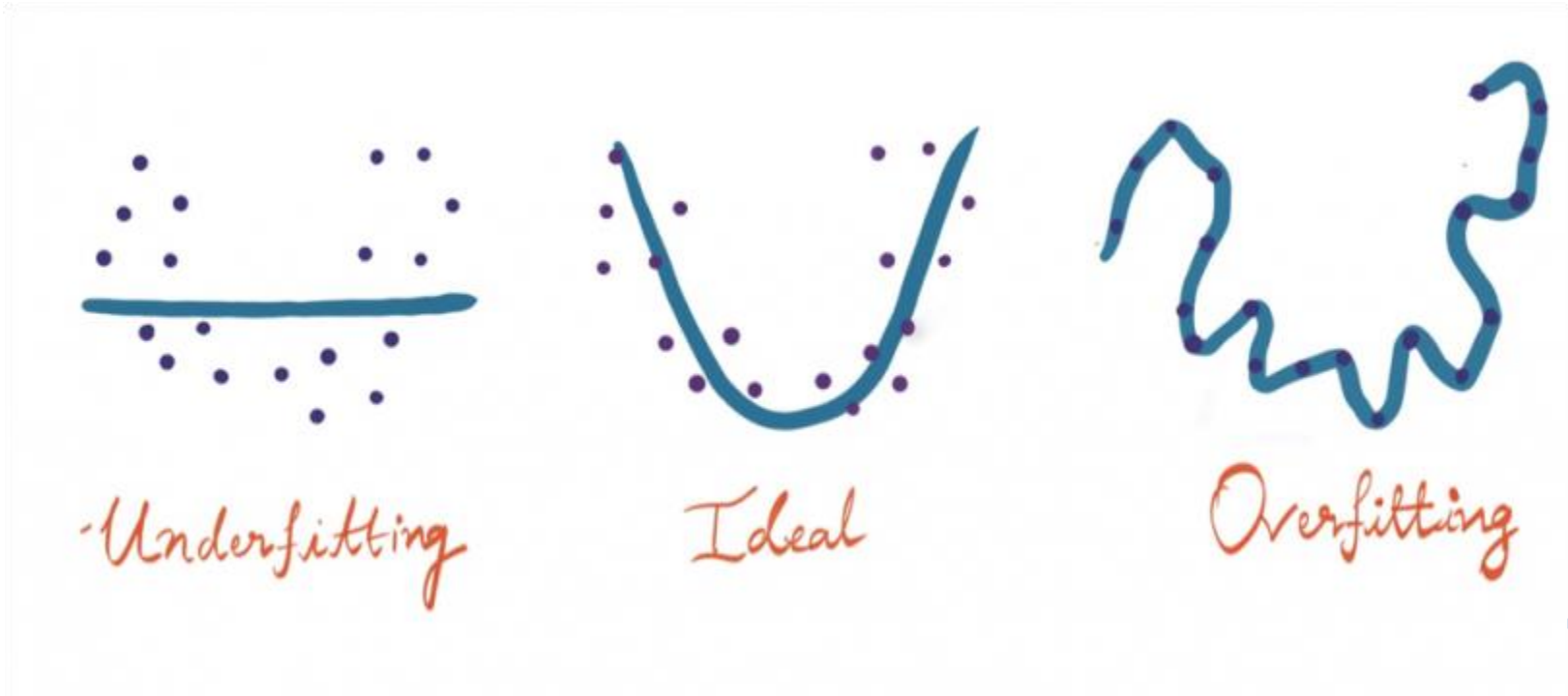
Linear Regression

Linear regression finds the linear relationship between the dependent variable and one or more independent variables using a best-fit straight line. Generally, a linear model makes a prediction by simply computing a weighted sum of the input features, plus a constant called the bias term (also called the intercept term).

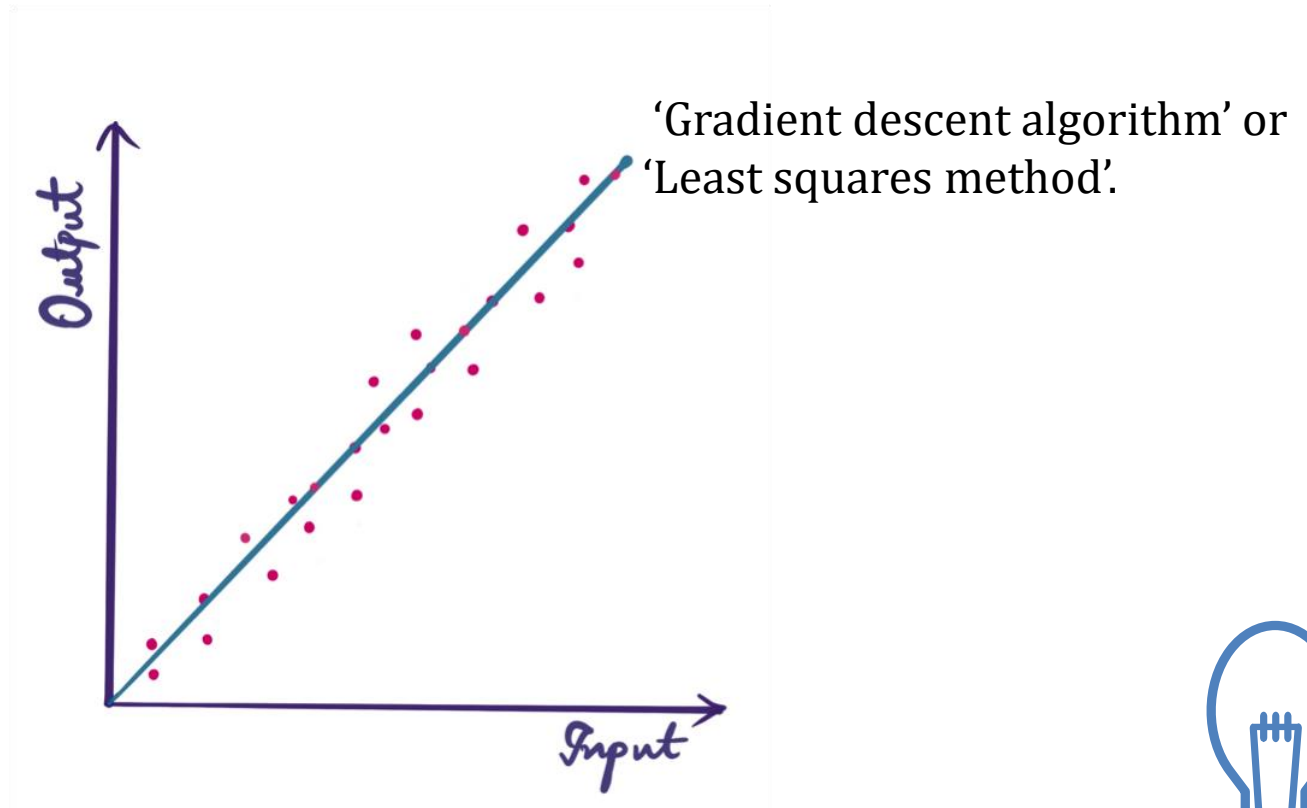**P.Ramya/AI & Machine Learning/19EC503/Regression**

THE BIAS-VARIANCE TRADE-OFF

•Bias and variance are always in a trade-off. When bias is high, the variance is low and when the variance is low, bias is high.

•We require both variance and bias to be as small as possible

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DRAWING THE BEST-FIT LINE

Linear regression adjusts the line between the data for accurate predictions.

'Gradient descent algorithm' or 'Least squares method'.

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LEAST SQUARES METHOD

First, calculate the error/loss by subtracting the actual value from the predicted one. Since the predicted values can be on either side of the line, we square the difference to make it a positive value. The result is denoted by 'Q', which is known as the sum of squared errors.

GRADIENT DESCENT

Gradient descent is an optimization technique used to tune the coefficient and bias of a linear equation.

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Multivariate Linear Regression

Multivariate linear regression deals with multiple output variables. For example, if a doctor needs to assess a patient's health using collected blood samples, the diagnosis includes predicting more than one value, like blood pressure, sugar level and cholesterol level.

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