**Feature Engineering**

1. **Feature Transformation**
   1. Missing values imputation
   2. Handling categorical features
   3. Outlier detection
   4. Feature Scaling
2. **Feature Construction**
   1. Feature splitting
3. **Feature Selection**
   1. Forward selection
   2. Backward selection
4. **Feature Extraction**
   1. PCA
   2. LDA
   3. Tsne

*Feature Construction*: is a manual process its not like mathematical formula. It shows how much of your dataset is understood by. You will create feature on the basis of your understanding to the dataset.

*Feature Splitting*: is the process of splitting features intimately into two or more parts and performing to make new features. This technique helps the algorithms to better understand and learn the patterns in the dataset.

**Curse of Dimensionality**

In ML we have features which are also called dimensions. In ML if we will increase more than the optimal number of features it will bring no improvement in the algo. It may decrease the improvement. It is called curse of dimensionality.

Note: if you take less features or more than optimal features than it will be the curse of dimensionality.

To reduce curse of Dimensionality what we do is called **dimensionality reduction**. For dimensionality reduction we have two methods. **Feature Selection and Feature extraction.**

**Dimensionality Reduction:**

* **Feature Extraction:** 
  + **PCA (Principal component analysis):** It is unsupervised ML technique. Main goal of PCA is to reduce the Curse of dimensionality. PCA tries to reduce the dimension of the higher dimension space with the best lower dimension space.
  + **Definition:** PCA is technique which transforms the higher dimension data to lower dimension while keeping the essence of data.

**Co-variance**: **Covariance** is a measure of the relationship between two random variables and to what extent, they change together. Or we can say, in other words, it defines the changes between the two variables, such that change in one variable is equal to change in another variable. This is the property of a function of maintaining its form when the variables are linearly transformed. Covariance is measured in units, which are calculated by multiplying the units of the two variables.

**Types of Covariance:**

1. **Positive covariance**
2. **Negative covariance**