Dimension Reduction in Machine learning

Dimension Reduction is also called as Dimensionality Reduction which is transformation of high dimensional data into low dimensional data. so that the low dimensional data contains some meaningful properties which is further used to improve accuracy.

Components of Dimension Reduction:

1.Feature Extraction:

This converts high dimensional space to a lower dimensional space

2. Feature Selection:

In the Feature Selection we take the subset of the data from the original dataset to build the model. and there are different ways to do it.

1.Filter methods:

it measures the correlation with the dependent variables.

eg: chi square test,Pearson correlation.

2.Wrapper methods:

It finds the subset features from the original features by based on the classifier performance.

1.RFE- Recursive feature Elimination

2.Backward elimination

3.forward selection.

3.Embedded Methods

it is the combination of both filter and wrapper methods

eg -L1 (Lasso regularization)

There are various methods in Dimensionality Reduction. some of them are

1. PCA (Principal Component Analysis)

2. LDA (Linear Discriminant Analysis)

1. PCA:

-->Principal Component Analysis is an unsupervised, non-parametric statistical technique used for dimensionality reduction in machine learning.

-->if there is high dimension data then there will be a problem of overfitting this is called "Dimensionality Curse".

--> pca can also used for the to filter the noise in the data.

--> pca makes maximum variability in the dataset more visible by rotating the axes.

--> The first principal components (PC1) is a synthetic variable constructed as a linear to determine the magnitude and the direction of the maximum variance in the dataset. This component has the highest variability of all the components and and contains most of the information in the pc1 axes.

-->The second principal component (PC2) is also a synthetic linear c which captures the remaining variance in the data set and is not correlated with PC1.

and the pc2 is perpendicular to the pc1.

--> and the principal component will be formed until the data has completed.

--> with the help of the eigen values and eigen vectors we derive the magnitude and direction of the axes.

--> eigen vectors describes the axes or the direction of the principal component.

--> eigen values gives the magnitude of the variance in the data in the axis.

2.LDA

-->Linear Discriminant Analysis used as a pre-processing step in Machine Learning .

--> The goal of LDA is to project the features in higher dimensional space onto a lower-dimensional space in order to avoid the dimensionality curse.

--> LDA is a supervised algorithm where PCA is the unsupervised algorithm.

--> LDA maximizes the axes for class separation where the PCA maximizes the variance in it.