**Principle Component Analysis (PCA)-** PCA is a dimensionality reduction technique that can be used to reduce a large set of (often correlated) variables to a smaller set of (uncorrelated) variables called principle component, which still contains most of the information.

PCA is the projection of higher dimensionality object into a lower dimension. For example- When we watch TV we see the 2D projection of 3D objects.

We rotate the object around its center to find the best orientation.

1. First find the axis so that the object has largest extend in average along the axis.
2. Rotate the object around the first axis to find its perpendicular axis and the object has largest extend in average along this axis.

These two axes are the first and second principle components. This extends in average along the axes are called eigenvalues.

PCA can be applied to high dimension data. Use the covariance matrix to measure the average extend of the data points along any axis.

In PCA we want the projection of the data points and also as much information as we can retain. If we take the example of a teapot then the teapot can be visualized in 2D space by using the two biggest eigenvalues with their eigenvectors.

**Applications-** Visualization of high dimension data, to find essential attributes or variables and dimensionality reduction.

**t- SNE(t-distributed stochastic neighbor embedding)-** t SNE is an unsupervised non linear technique primarily used for data exploration and visualizing high dimensional data. t-SNE gives you a feel of how data is arranged in a high dimensional space.

**Difference between PCA and t-SNE-**

1. PCA is a linear dimensional reduction technique that seeks to maximize the variance and preserves large pairwise distances.
2. t- SNE differs from PCA by preserving only small pairwise distances or local similarities whereas PCA is concerned with preserving large pairwise distances to maximize variance.
3. In PCA the things that are different will be far apart from each other after applying PCA.
4. t-SNE maps multi-dimensional data to two or more dimensions suitable for human observations.