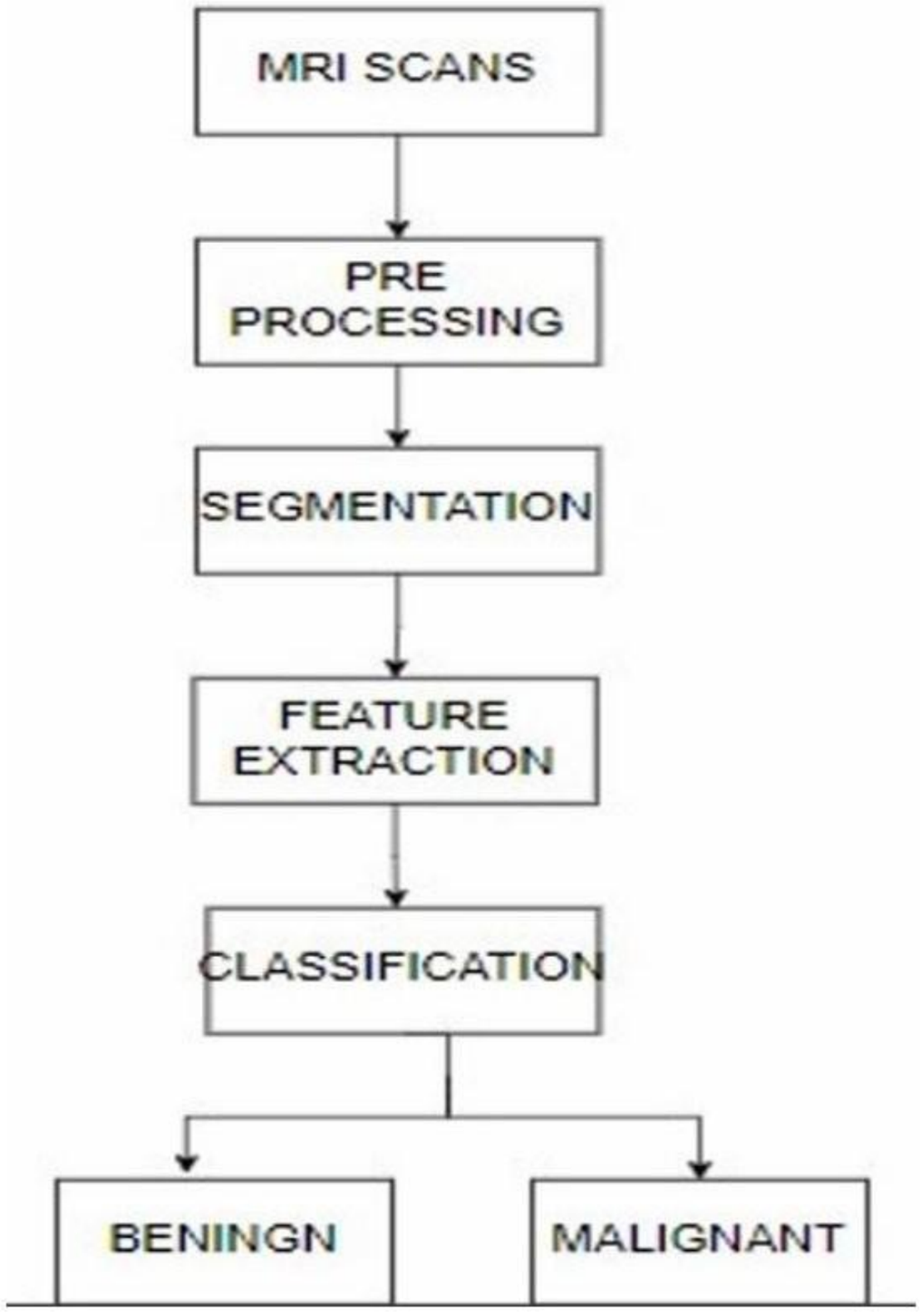
Project Title: Brain Tumor Detection and Classification

OBJECTIVE-

- Our study deals with classification on MRI images
- Normally the anatomy of the brain is analyzed by MRI scans or CT scans.
- Our system aims to detect the tumor from the given MRI scan and then classifies the tumor as malignant or benign.
- The system incorporates image processing, pattern analysis and is expected to improve the sensitivity, specificity, and efficiency of brain tumor screening.

FLOW CHART-

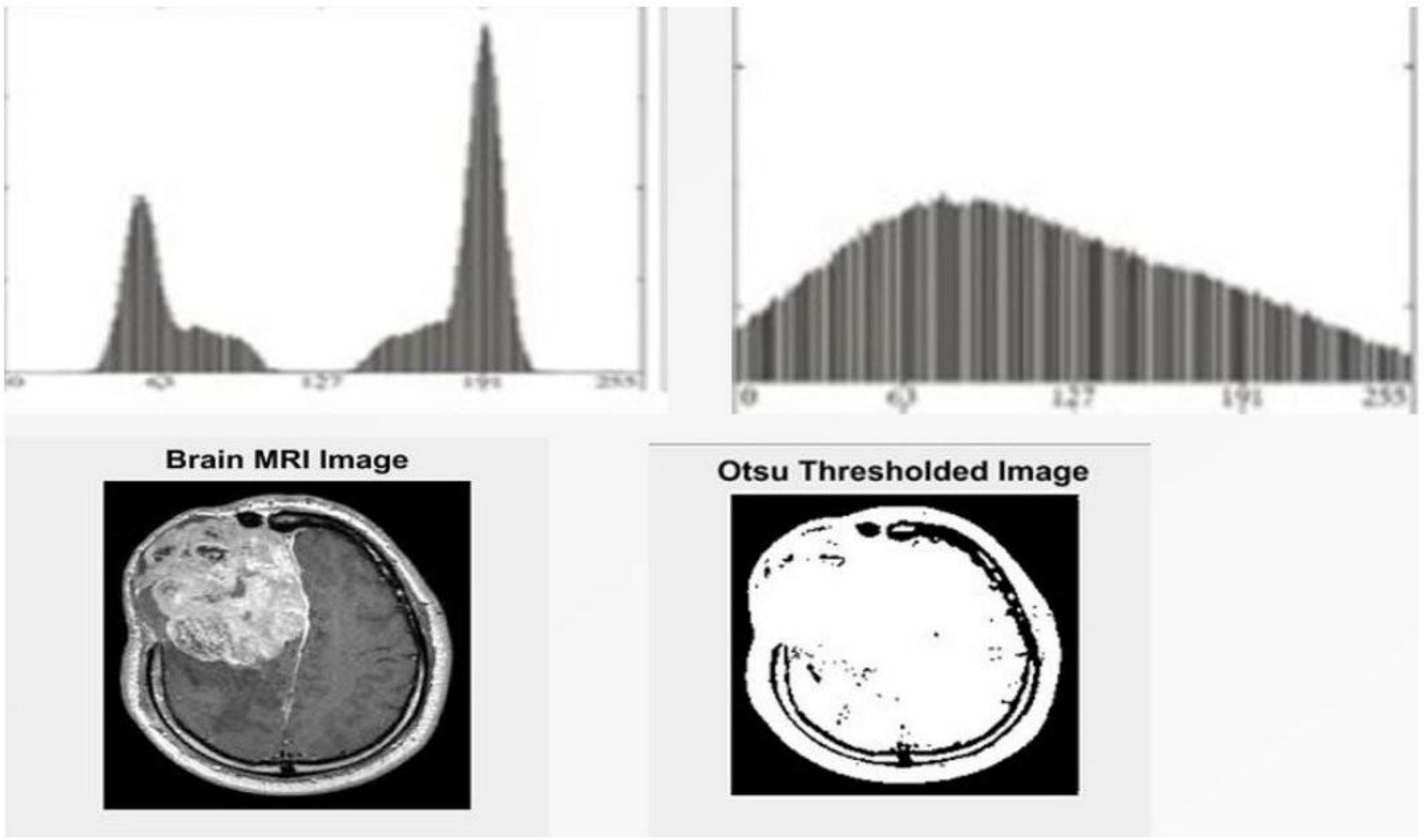


PRE PROCESSING-

- We mainly used Pre processing to cancel out the noise within the images incase it is present within the filtered images.
- It is done using Median filtering process of Matlab.
- Though the images used in the simulation was found to be without any noise so it is not necessary.

SEGMENTATION-

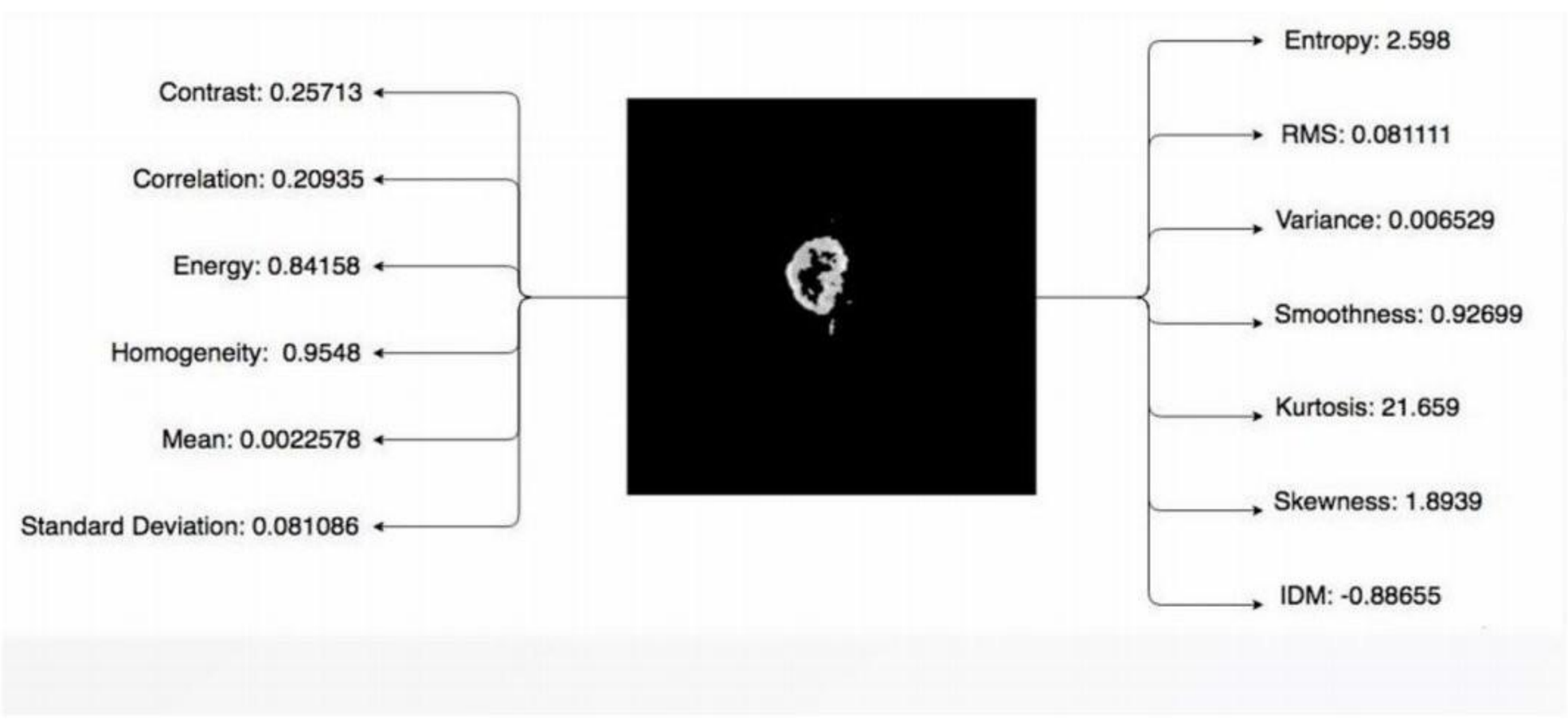
- The segmentation mainly used in this process is the Otsu's threshold method.
- The work process is like this:



FEATURE EXTRACTION-

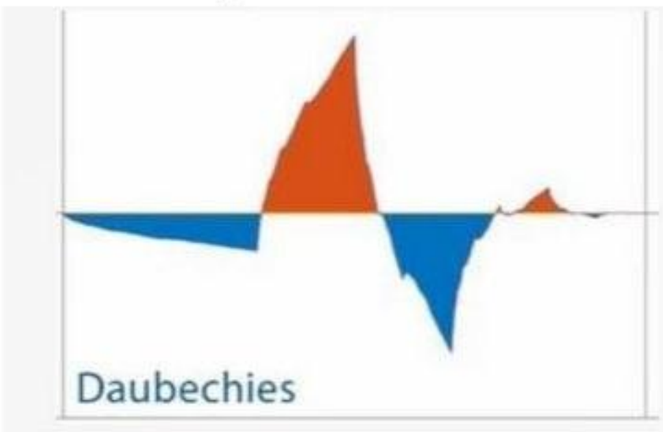
- This is mainly required for extracting the features through which we can form a basis on further classification of the images.
- This is achieved through two techniques, DWT (Discrete Wavelet Transform) and PCA (Principal Component Analysis).
- We extracted almost 13 features to make the decision on it.

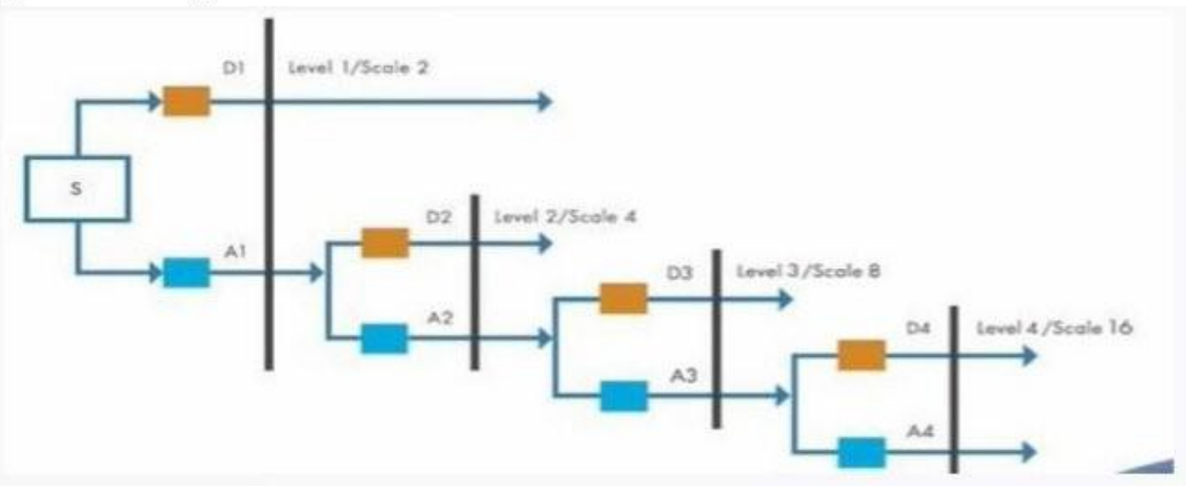
- The two techniques were used to either reduce the dimensionality along with compressing images for easier feature extraction on the PCA



DISCRETE WAVELET TRANSFORM:

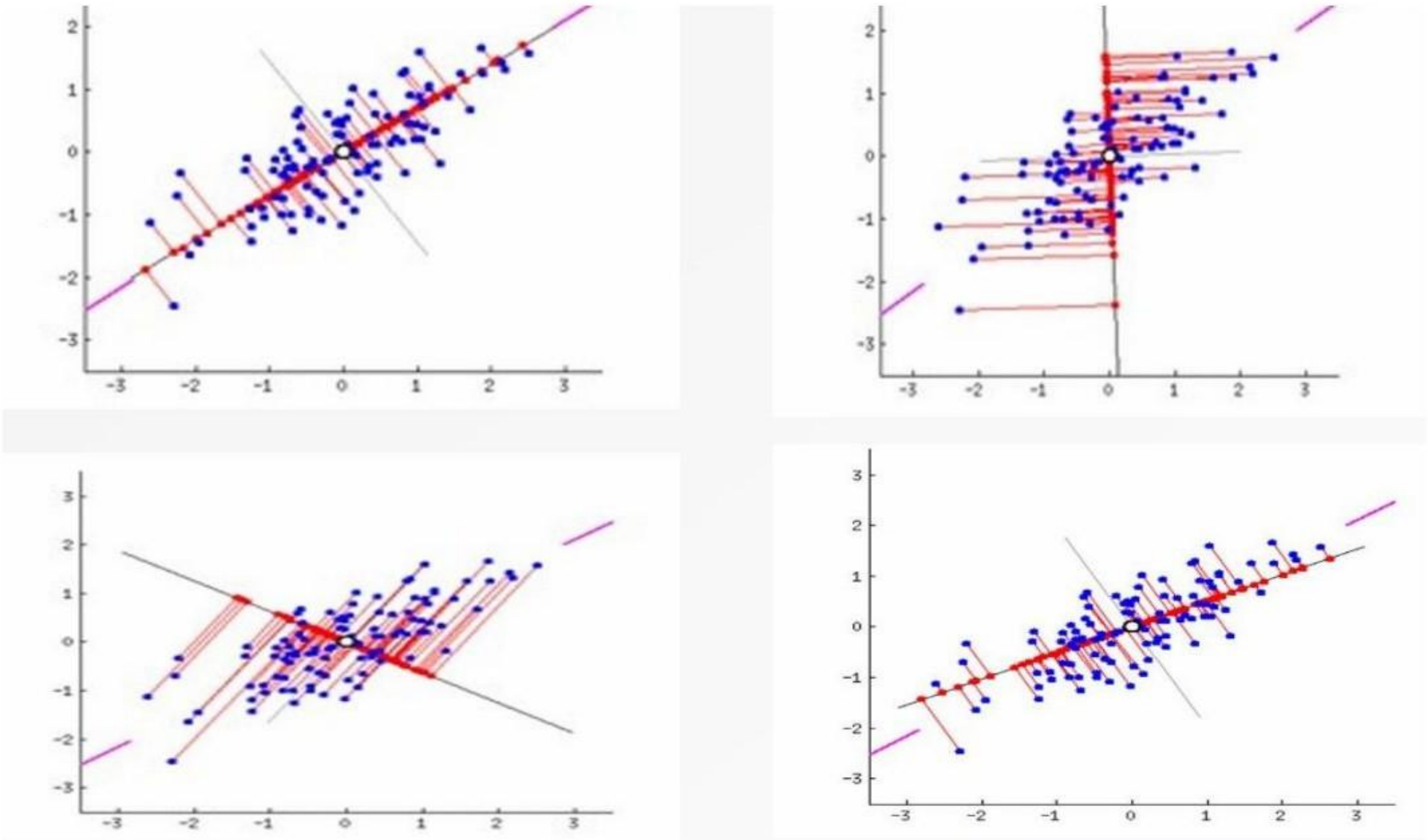
- Real images have an issue with abrupt changes. But fourier transform can't give a proper depiction on it .
- With a wavelet we can easily solve this issue.
- Discrete wavelet is mainly used for denoisiify and compress the images for magnified image procession
- Here mainly Daubechies wavelet for performing the task

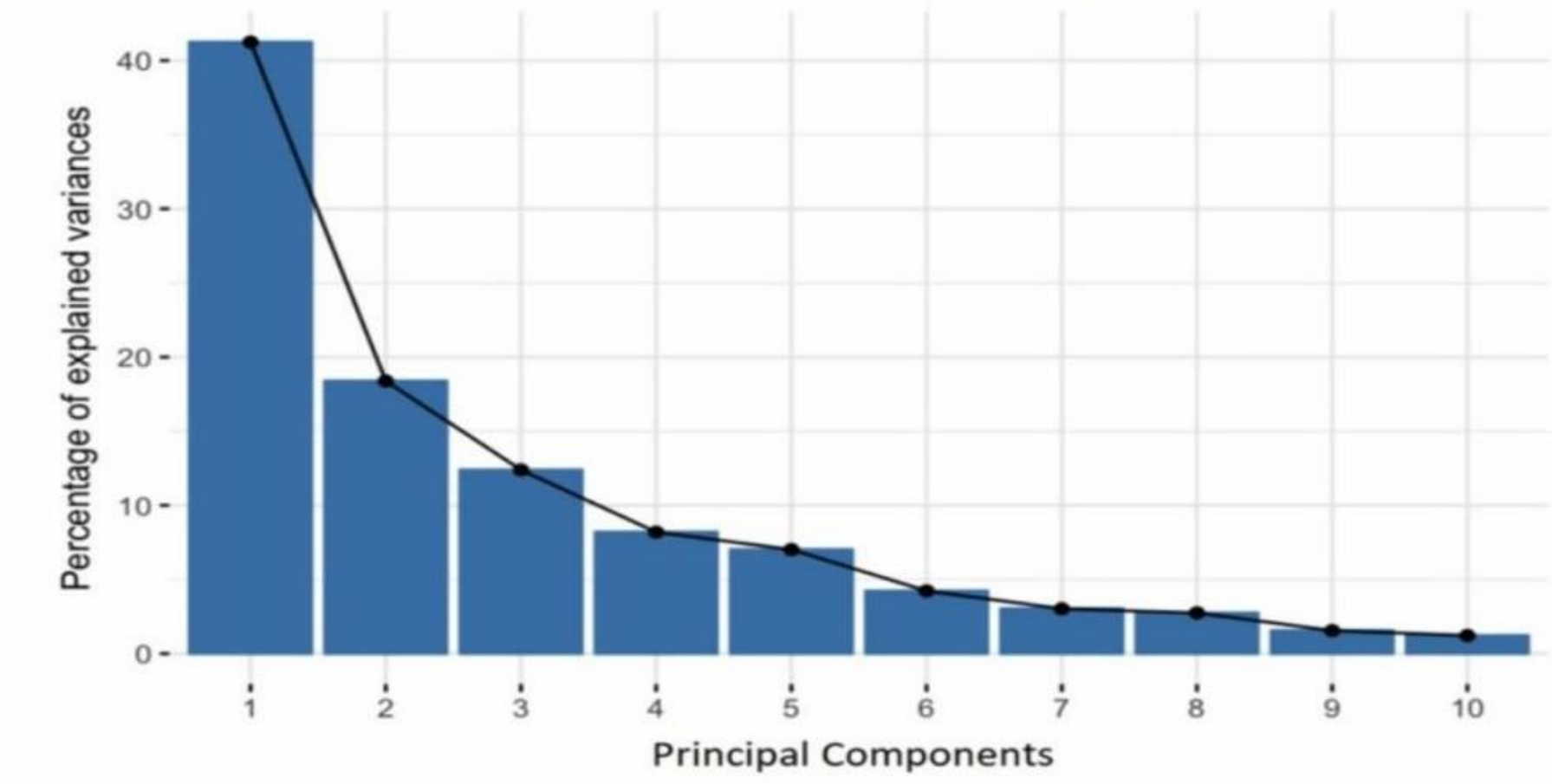




PRINCIPAL COMPONENT ANALYSIS-

- Principal Component Analysis, or PCA, is a dimensionality-reduction method.
- Reducing the number of variables of a data set naturally comes at the expense of accuracy, but the trick in dimensionality reduction is to trade a little accuracy for simplicity.
- The basic approach is to compute the Eigen vectors of the covariance matrix of the original data and approximate it by a linear combination of the leading eigenvectors





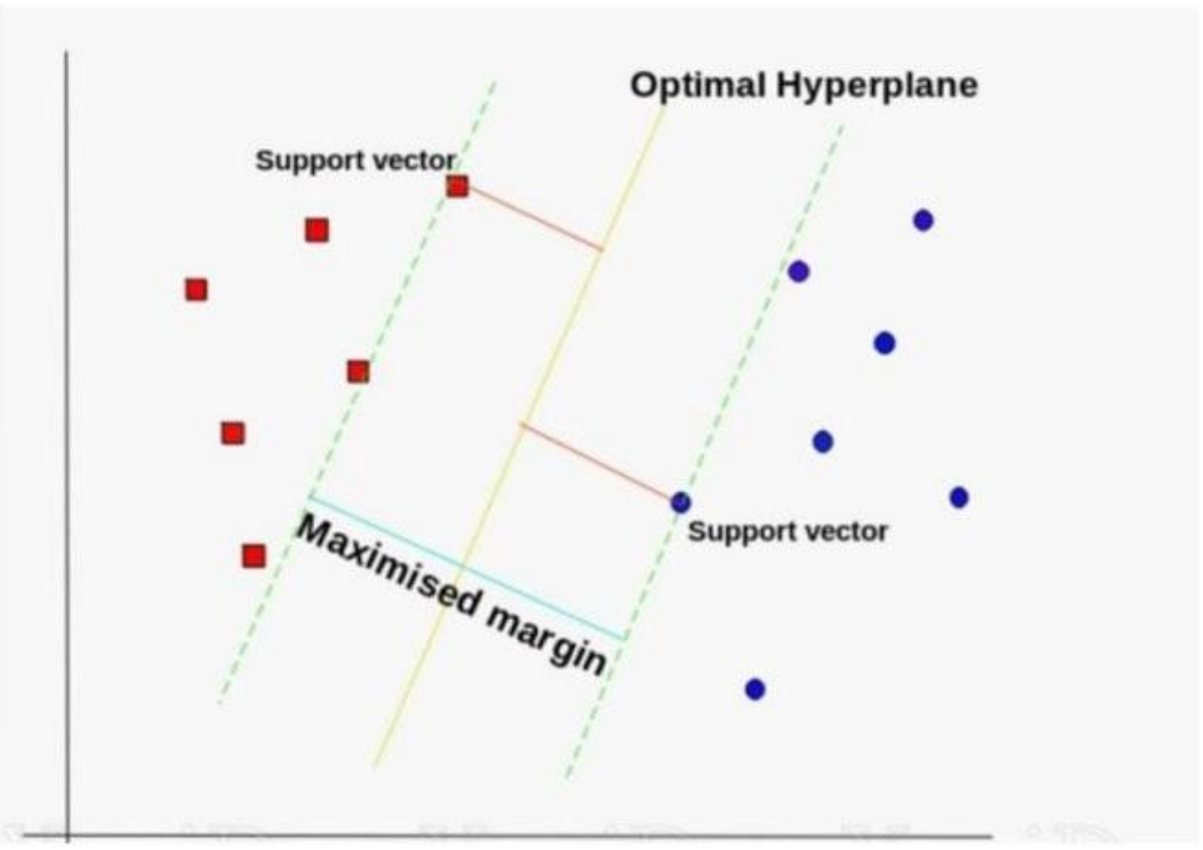
CLASSIFICATION-

- We use Support Vector Machine (SVM) to classify the Malignant and Benign tumors.

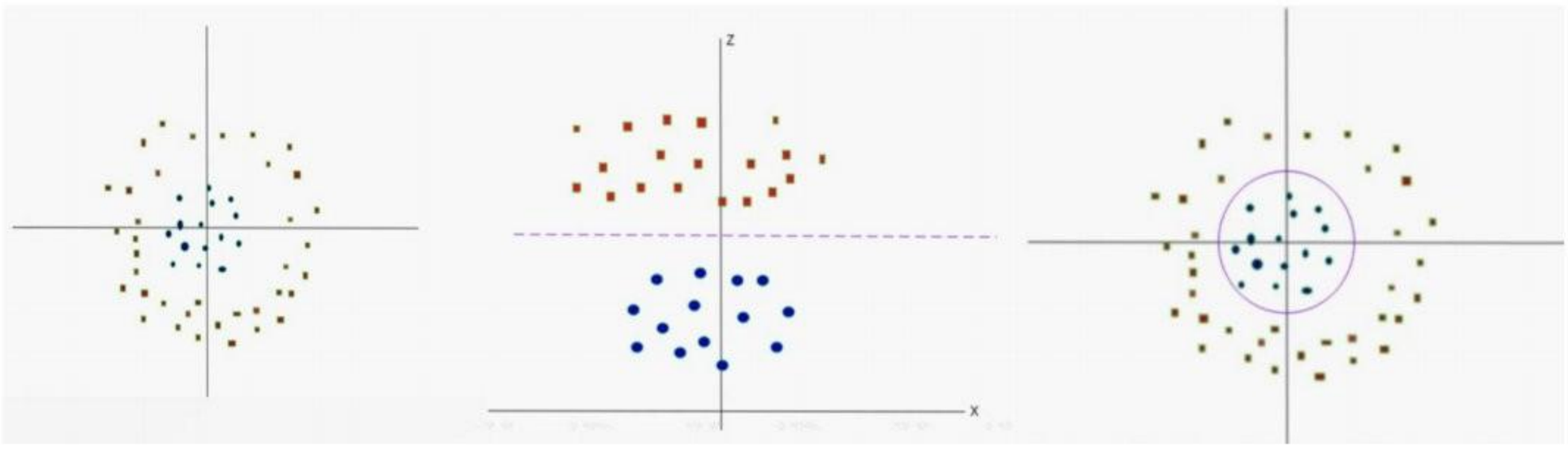
- Support Vector Machine is a linear model for classification and regression problems. It can solve linear and non-linear problems and work well for many practical problems
- A SVM takes the set of feature vectors as input, generates a training model after scaling, selecting and validating, and generates a training model as the output.
- This training model is then used to classify the image as either benign or malignant based on the features generated from the feature extraction step. The accuracy relies completely on the accuracy of features extracted during training and testing.

SUPPORT VECTOR MACHINE-

- Support Vector
- Hyper Plane
- Maximized Margin
- Optimal Hyperplane



For Non Linear data sets, we use higher dimension to separate them. Then we draw the hyper plane. And we again come back to the lower dimension to get the classified data.



We use different SVM functions to test the accuracy.

- Linear
- Quadratic
- Polynomial
- RBF (Radial Basis Function)

For each test, we run 100 iteration and perform the cross validation. Cross validation is a technique for assessing how the statistical analysis generalizes to an independent data set. It is a technique for evaluating machine learning models by training several models on subsets of the available input data and evaluating them on the complementary subset of the data. Using cross-validation, there are high chances that we can detect over-fitting with ease.


THANK YOU!