# Classification Method

## Decision tree

A decision tree is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. It is one way to display an algorithm that only contains conditional control statements.

A decision tree is a flowchart-like structure in which each internal node represents a “test” on an attribute (e.g. whether a coin flip comes up heads or tails), each branch represents the outcome of the test, and each leaf node represents a class label (decision taken after computing all attributes). The paths from root to leaf represent classification rules.

# Feature Extraction

## Linear Discriminant Analysis (LDA)

LDA is supervised learning dimensionality reduction technique and Machine Learning classifier.

LDA aims to maximize the distance between the mean of each class and minimize the spreading within the class itself. LDA uses therefore within classes and between classes as measures. This is a good choice because maximizing the distance between the means of each class when projecting the data in a lower-dimensional space can lead to better classification results (thanks to the reduced overlap between the different classes).

When using LDA, is assumed that the input data follows a Gaussian Distribution (like in this case), therefore applying LDA to not Gaussian data can possibly lead to poor classification results.

# Data Preprocessing

Originally class was of 3 columns. After preprocessing it is reduced to 1 column since it was Multi-Class Problem.

# Top-1 Accuracy

Top-1 accuracy is the conventional accuracy, which means that the model answer (the one with the highest probability) must be exactly the expected answer.

# Results

Training time without feature extraction: 34.31341814994812

Model Accuracy : 63.91240022020369 %

Top-1 Accuracy without feature extraction: 85.0827067669173 %

Training time with feature extraction: 0.20445919036865234

Top-1 Accuracy with feature extraction: 95.31328320802005 %

# Screenshot from Console

