# Robust Anti Spoofing Algorithm: -

1. Problem: For face recognition and detection we use OpenCV and CNN. In CNN we use images from the captured frames as our training set and process these images using combination of layers to prepare our neural net model. Hence by showing an image to camera an attacker can be recognized. There is no check for how much live the image is.
2. Proposed solutions can be –

Variational Retinex based method +Motion detection + Texture analysis (as the photo printout will have different texture as compared to real).

* Fuzzy logic can also be used{for later stages}
* Variational Retinex based method –
* Motion detection – dividing the image into m x n matrix and then identifying the angle, also Local Gabor Binary Pattern tells us the motion as the transformation of a bit occurs from 0 to 1.
* Texture analysis – using LGBP we can have texture analysis. LGBP (Local Gabor Binary pattern) is an intelligent method of finding the texture and is independent of illumination intensity. In short, image is divided into m x n grids each small grid is further divided into 3 x 3 grids each containing the value corresponding to its illumination, the (1,1) grid is compared with all the other grids, grids having value greater than its value are given 1 bit whereas grids having lesser value are given 0 bit. Moving from first grid i.e. (0,1) then to (0,2), then (1,2), (2,2), to (2,0) then to (1,0) the binary digits are written as a binary number which is called as the LBP(local binary pattern ), upon changing its illumination it remains same as the binary pattern is the relative binary number. This binary number is converted into its equivalent decimal number and stored in a matrix, then these numbers are calculated for all the pixels of the image and a histogram is made.

The training time for this algorithm is high and accuracy is low as it needs to train for 226

Cells which is very time consuming process, also the accuracy calculated is only 76% which is very low. To increase the efficiency and decrease the training time, we can use LGBP-TOP algorithm which is an extension of LGBP algorithm. TOP i.e. three orthogonal planes are considered and LGBP is applied on them. For doing so, the three planes x, y, and t are considered and only the planes intersecting with the central cell are taken and LGBP is applied only on them, which reduces the cell to be trained drastically from 226 to 26, effectively 59.

For classification we use SVM or PCA, neural nets can be used at later stages.

The predictions hence done can be tested using following approach.

1. How to test if the model is robust or not i.e. using confusion matrix. We have performance enhancers namely TP, FP, TN, FN.

TP – true positive (if the correct person is granted access) (CORRECT MODEL)

FP – false positive (if the incorrect person is granted access) (SPOOFING)

TN – true negative (if the incorrect person is not granted access) (ROBUST MODEL)

FN – false negative (if the correct person is not granted access) (NOT TRAINED CORRECTLY)