Pre processing step should reject an acceptable amount of non-face windows. The purpose of using pre processing steps in face detection system is to speed up the detection process and

**reducing false positives.**

PRE – PROCESSING STEPS

1. Image Loading

img = cv2.**imread**('path of image', **cv2.IMREAD\_COLOR**)

imread() function to load an image

second parameter : Mode ( run basic channel and depth conversions on the fly.)

Mode: <https://docs.opencv.org/4.1.0/d4/da8/group__imgcodecs.html#ga61d9b0126a3e57d9277ac48327799c80>

cv2.**imshow**(img)

view an image we have the imshow() function

Our color image have **3 channels**: blue, green and red (in this order within OpenCV).

# Example for green channel  
img[:, :, 0]; img[:, :, 2]; cv2.**imshow**(img)

1. Grayscale version

In order to avoid distractions in facial image classification it could be a good idea to use black and white pictures (or maybe not! you can always try both).

Now our image has a single channel!

1. Face and eyes detection

When working on a facial classification problem we might want to do face detection in order to validate (is there a face?), crop and straighten our images

[Haar Feature-based Cascade Classifier for Object Detection](https://docs.opencv.org/2.4/modules/objdetect/doc/cascade_classification.html)

<https://medium.com/analytics-vidhya/facial-recognition-using-open-cv-1d58be3db40b>

In MATLAB, vision.CascadeObjectDetector() function is

used to detect the face.

1. Face straightening
2. Face Cropping
3. Image resizing
4. Normalization :

We can use the [normalize()](https://docs.opencv.org/4.1.0/d2/de8/group__core__array.html#ga87eef7ee3970f86906d69a92cbf064bd) function to apply visual normalization in order to fix very dark/light pictures (can even fix low contrast)

**linear image transform (LIT)** : ignores scanning a number of non-face windows.

**regional minima (RM)** : to reject non-face windows.

**modified adaptive thresholding (ADT) technique** : convert input image into a binary representation and perform an exclusion process on the latter form.

Viola Jones algorithm.

The characteristics of Viola–Jones algorithm which make it a good detection algorithm are:

* Robust – very high detection rate (true-positive rate) & very low false-positive rate always.
* Real time – For practical applications at least 2 frames per second must be processed.
* Face detection only (not recognition) - The goal is to distinguish faces from non-faces (detection is the first step in the recognition process).

**Facial Expression Recognition Using SVM Classifier**

<https://www.researchgate.net/publication/282522466_Facial_Expression_Recognition_Using_SVM_Classifier>

**Facial Expression Recognition Using . . . . .**

<https://www.researchgate.net/figure/Preprocessing-and-feature-extraction-method-Step-1-face-detector-and-border-remover_fig1_260088412>

**Face recognition: synthesis of classification method (Mathematics)**

<https://www.researchgate.net/publication/295859899_Face_recognition_synthesis_of_classification_methods>

**Comparsion between different face detection algo**

<https://datahacker.rs/017-face-detection-algorithms-comparison/>

**BEST :** <https://www.researchgate.net/publication/321292944_Image_Processing_Techniques_To_Recognize_Facial_Emotions>

Outliers

Outliers are data points that are distant from other similar points due to variability in the measurement. Outliers should be excluded from the data set but detecting of those outliers is very difficult which is not always possible

