

Image Representation  $\rightarrow$  Images stored as array of bytes.

1 byte = 8 bits  $\rightarrow$   $[0, 255]$  (range value)

Three major image formats  $\rightarrow$

1) RGB  $\rightarrow$   $h \times w \times 3$  (red, green, blue)  
- use when

1) Color value of an image is important.

Ex - Predict if food is fresh or not.  
- object segmentation.  
- Expensive with processing & slow.

2) HSV  $\rightarrow$  hue  $\rightarrow$  Color (r, g, b)

Saturation  $\rightarrow$  Intensity of color

Value  $\rightarrow$  Pixel value (brightness)

- Easier to filter & detect specific colors.

- reduced search space to find colors compared to rgb.

3) Gray scale  $\rightarrow$  Two dimensional image array.  
- black and white colors.

- faster processing & computationally less expensive.

- use when structure & shape in image are important.

Ex 1) Edge detection.

2) Medical imaging

Literacy & skimage & scikit-image.  
pip install scikit-image.

from skimage import io, color & Change image format.  
& Input image to library.

Ex image = io.imread(filename)

color.rgb2hex(image)

color.rgb2gray(image)

1) Resizing & Rescaling  $\rightarrow$

Why to do it?  $\rightarrow$  1) To bring image to a standard format.

2) ML algorithms accept images in pre-defined format only. (input image size is fixed)

Resizing & Varying the # of pixels in an image.

$\rightarrow$  Crop image  $\rightarrow$

from skimage import transform  $\rightarrow$  new image shape  
transform.resize(image, (x, y))  
& original image

Rescaling & Shrinking are Enlarging by a scale factor of not dimensionally literally.

transform.rescale(image, scale = 0.9, channel\_axis = -1)

But, color channel is the last dimension in array.

## 2) Rotation & Flipping $\rightarrow$

why?  $\rightarrow$

$\rightarrow$  To generate synthetic images.

- More images for algorithm to be trained on.

- Makes the algorithm more robust.

transform.rotate(image, rotate= degree, rescale= True)

np.fliplr(image)

np.flipud(image)

## 3) Intensity $\rightarrow$ $\rightarrow$ gray scale & pixel value.

2) RGB & brightness are intensity.

why play with intensity?

a) Algorithms sensitive to intensity.

b) Standardize images based on intensity.

c) Improve image quality.

$\rightarrow$  intensity for skimage for gray scale is 0 to 1 instead of 0-255.

from skimage import exposure & Intensity.

exposure.rescale\_intensity(image, in\_range=(P1, P98))

exposure.adjust\_gamma(image, gamma= 0.4)

- brightness

## 4) Edge Detection $\rightarrow$ To detect structure in the image.

- Identify boundaries or contours & where pixel values change sharply.

from skimage import filters

filters.sobel\_hybrid(image)

