

# Image Processing for Computer Vision

## Session 3

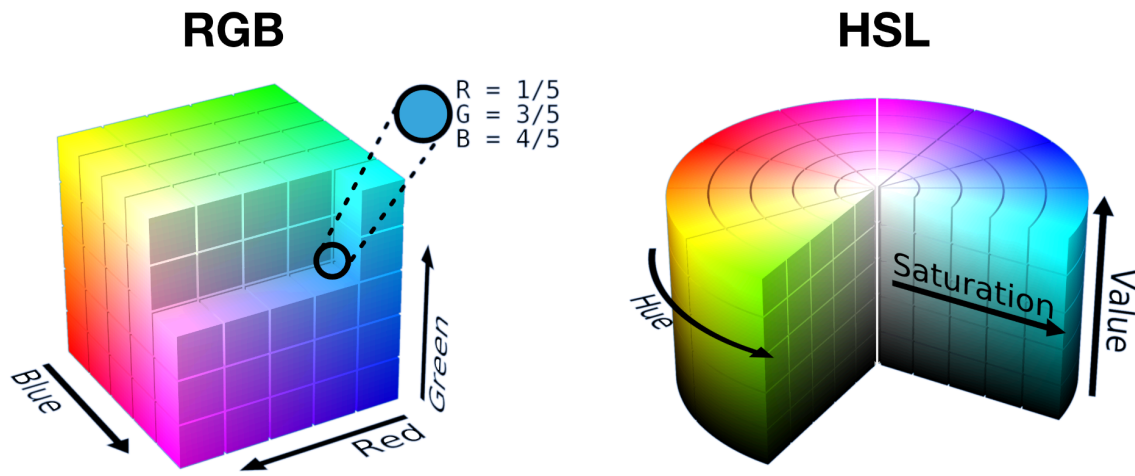


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## Topics

- Color Space
- Image Formats
- Libraries for working with image
- Loading images
- Color Space Conversion

# Color Space



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A **color space** is a specific organization or representation of colors, describing how colors are encoded as numerical values. It defines a range of colors and how they can be represented in a digital image.

Each color space is suited to specific applications, and the choice of color space significantly impacts image processing tasks.

## Common Color Spaces

1. RGB (Red, Green, Blue)
2. RGBA (A- Alpha)
3. Grayscale
4. HSV (Hue, Saturation, Value)
5. CMYK (Cyan, Magenta, Yellow, Key/Black)
6. YUV / YCbCr
7. Lab (CIE-Lab) L: Lightness a: Green-to-red. b: Blue-to-yellow.

## Why Use Different Color Spaces?

1. **Image Processing:**
  - Tasks like edge detection or filtering often work better in Grayscale.
  - HSV is useful for isolating colors.
2. **Compression:**
  - YUV reduces data by focusing on luminance over chrominance.
3. **Perceptual Accuracy:**
  - Lab is used when human perception matters.

# Image Formats



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Images come in various formats, each with unique properties suited for specific use cases. JPEG and PNG are the most commonly used formats.

## Necessary Libraries for Image in python:

There are many libraries in python to work with images. Most common libraries are: OpenCV, Matplotlib, Pillow, Skimage etc.

**OpenCV:** used for computer vision and image processing, transformations, edge detection, feature extraction etc.

**Matplotlib:** Visualization and plotting library, with support for displaying images, annotating, adding overlays etc.

**Pillow:** General-purpose image manipulation.

**Scikit-Image (skimage):** image processing and feature extraction

# Image Loading Using OpenCV

**Syntax:** `cv2.imread(<image_path>)`

Image path: location of the image

There are two types of paths that you can use:

1. Relative path: location of your image relative to your working/current directory
2. Absolute path: location of your image on the system

## Displaying loaded image:

For plotting the loaded image we will use matplotlib.

## Keep in mind:

1. Be sure about the image location you are trying to load
2. Image is loaded as numpy array
3. OpenCV loads an image in BGR format by default
4. Matplotlib show an image in 'Viridis' color map by default

# Color Space conversion

RGB image



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Grayscale image



**Syntax:** `image_cs = cv2.cvtColor(<image>, <conversion_code>)`

Here image is the loaded image array and image\_cs color space converted image.

**Example:** `COLOR_BGR2RGB` this is used to convert the BGR image to RGB

Most commonly used conversion codes are:

`COLOR_BGR2RGB`

`COLOR_RGB2GRAY`

`COLOR_BGR2GRAY`

You will find a list of all conversion codes for openCV [here](#).