Source: pyimagesearch

Environment Setup

- Anaconda

- Open CV

- Tensorflow

Install anaconda

- Anaconda.org (appropriate python version and OS version)

- Open anaconda prompt

- Type *conda install – c conda-forge opencv*

Virtual environment

- Type *conda create—n environment_name python =version*

- environment_name is your env name and version is 3.6 or 3.7

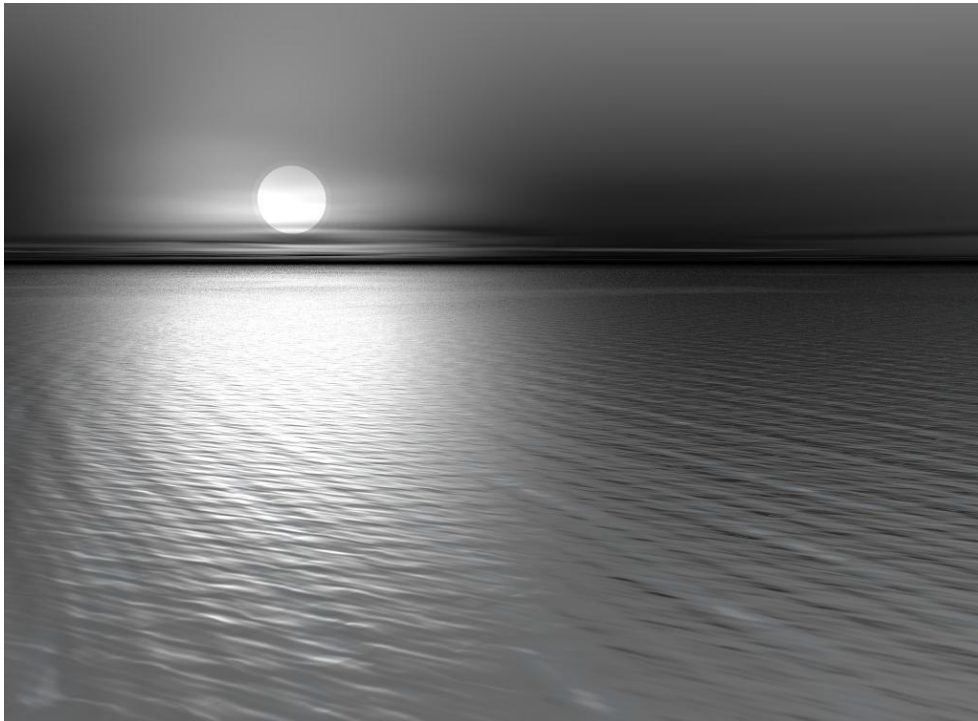- Type *source activate environment_name*

- Type *source deactivate*

Introduction to image processing

Agenda

- Images and pixels

- Resolution

- Bitmap Images

- Lossless and lossy compression

- File formats

- Color spaces

Images

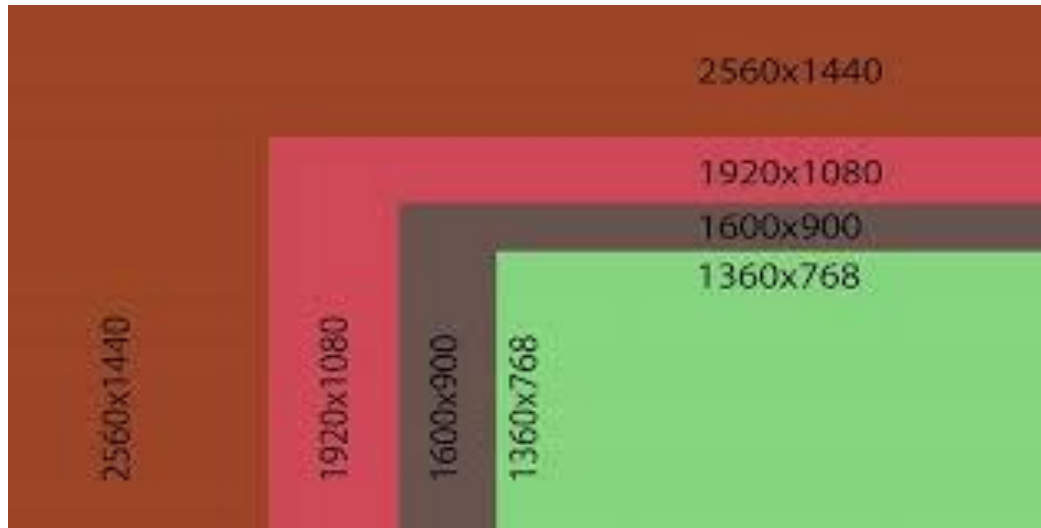Visual representation in a 2 dimensional form is called Image.

Images are collection of pixels

Source: www.freeimages.co.uk

- The samples here are pixels, smallest elements in any digital space.
- Like you zoom any photograph.

Image resolution

Image resolution comparison

- Image resolution is number of pixels present in an image.

- More pixels == more quality

- For example if you take 1024 X 768 , that means you have 1024 pixel columns and 768 pixel rows total is 786,432 pix

Bitmap Images

- Ideally pixel values are integers, if we convert range of integers to 0s and 1s like bytes it's called a Bitmap image.

- To convert we make white as 1 and black as zero to represent the image.

- Loss less compression:

  - Reducing the size without losing quality is lossless compression

- Lossy compression:

  - In lossy compression some data would be lost.

Image file formats

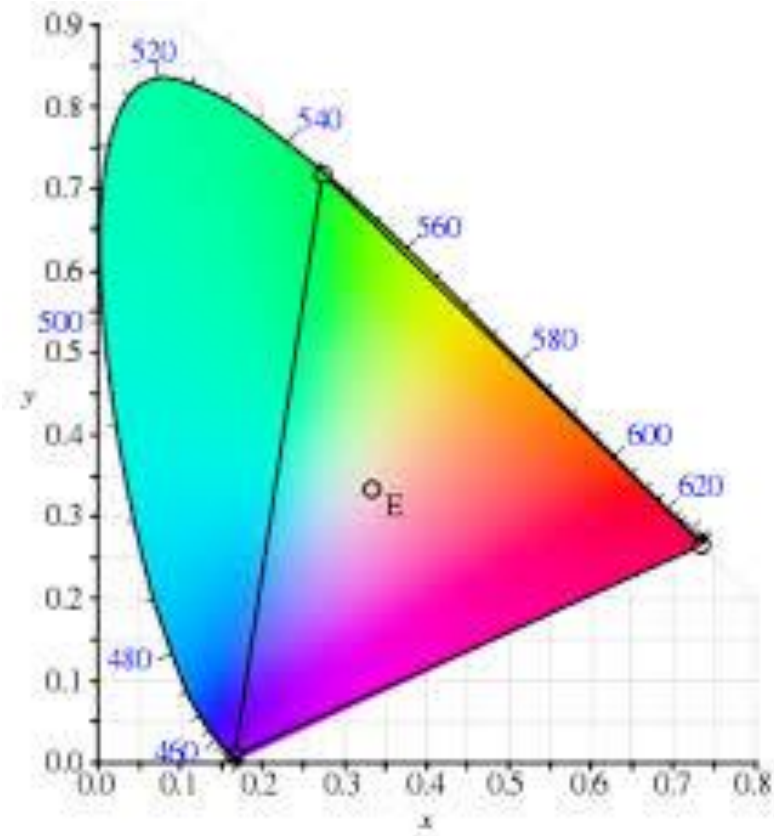| Image Format	Description	Use
JPEG	Lossy compression of raw images	Photos and paints
JPEG2000	Optimized form of JPEG, better compression ratio. (lossless and lossy)	Surveillance
TIFF	lossless compression	Document storage
GIF	bitmap image , animations can be done and lossless compression	gaming and animaition
BMP	independent of display device	windows
PNG	Lossless compression	image transfer over internet
WebP	comparable quality with JPEG	stickers in messaging apps
SVG	for interativity and animation	website development

Color spaces

- The organization of the colors in an image in a specific format is called color space.
- Each and every image uses one of the following color spaces:
  - RGB : Red, Green , Blue
  - XYZ : color in the x ,y and z dimensions
  - HSV/HSL : hue , saturation and value/hue saturation and lightness
  - LAB : luminance, and green – red and blue – yellow color components
  - LCH : lightness, chroma and hue
  - YPbPr : green ,blue and red cables
  - YUV : brightness or chroma or color
  - YIQ : luminance, in-phase parameter and quadrature

RGB Color Space

- Using RGB, the colors are mixed in different ways to make different color combinations.

- Theoretically, we can form any color from these colors. Each intensity is from 0 to 255. (color depth)

- RGB has two more components:
  - White point chromaticity
  - Gamma correction curve

XYZ

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HSV/HSL

- This is alternate representation of RGB color space.
  - Hue
  - Saturation
  - Value
  - Lightness
- Hue explains green, red and magenta or two pure colors red and yellow
- Saturation &Lightness measures intensity of image with respect to Gray and white respectively.
- Value does the same from black.

LAB & LCH

- Luminance

- a which is a green and red color component

- b blue and yellow color component

- This is used for printing textiles

- This uses cylindrical coordinates

- LCH is also similar but this uses rectangular coordinates

YPbPr

- Y – Green cable
- Pb – blue cable
- Pr – red cable

https://en.wikipedia.org/wiki/YPbPr

YUV

- YUV is similar to the previous one , but this works for black and white television as well.

- Y – Represents brightness 0 to 255

- U and V represents color , if they are zeros we get a grayscale image.

- YIQ:

- NTSC television uses this.