

# 제 16 강 Image

# PIL

- **Python Image Library**
- **PIL : python 2.x**
- **Pillow : python 3.x**

# Color

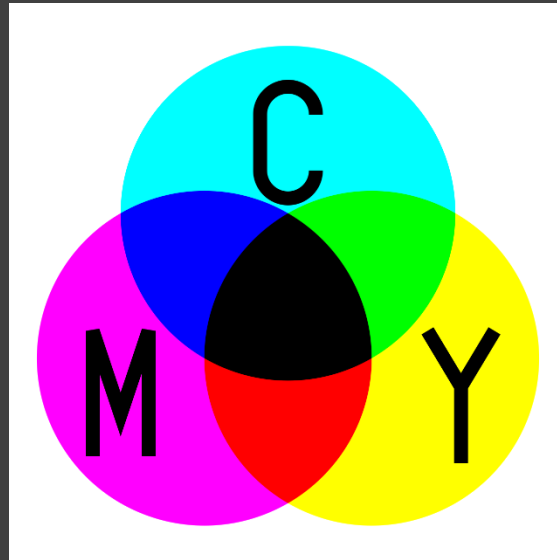
```
from PIL import ImageColor  
  
ImageColor.colormap.keys()  
  
ImageColor.getcolor('red', 'RGBA')  
ImageColor.getcolor('Black', 'RGBA')  
ImageColor.getcolor('red', 'CMYK')
```

# Mode

- **1** (1-bit pixels, black and white, stored with one pixel per byte)
- **L** (8-bit pixels, black and white)
- **P** (8-bit pixels, mapped to any other mode using a color palette)
- **RGB** (3x8-bit pixels, true color)
- **RGBA** (4x8-bit pixels, true color with transparency mask)
- **CMYK** (4x8-bit pixels, color separation)
- **YCbCr** (3x8-bit pixels, color video format)
  - Note that this refers to the JPEG, and not the ITU-R BT.2020, standard
- **LAB** (3x8-bit pixels, the L\*a\*b color space)
- **HSV** (3x8-bit pixels, Hue, Saturation, Value color space)
- **I** (32-bit signed integer pixels)
- **F** (32-bit floating point pixels)

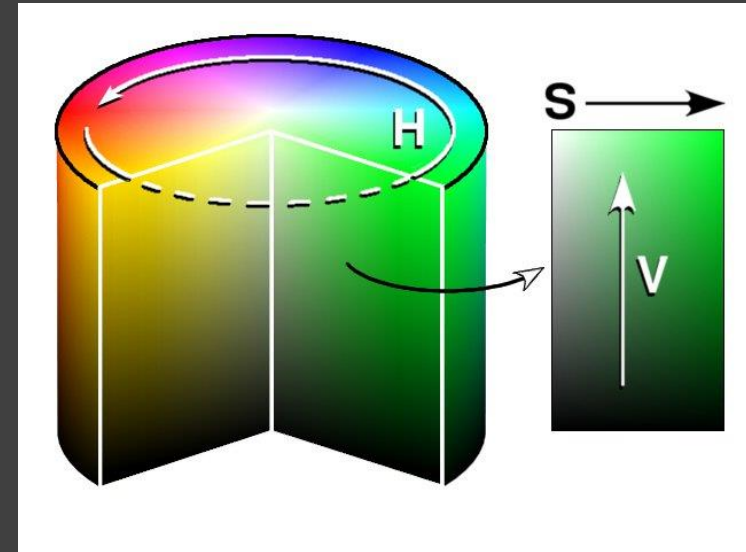
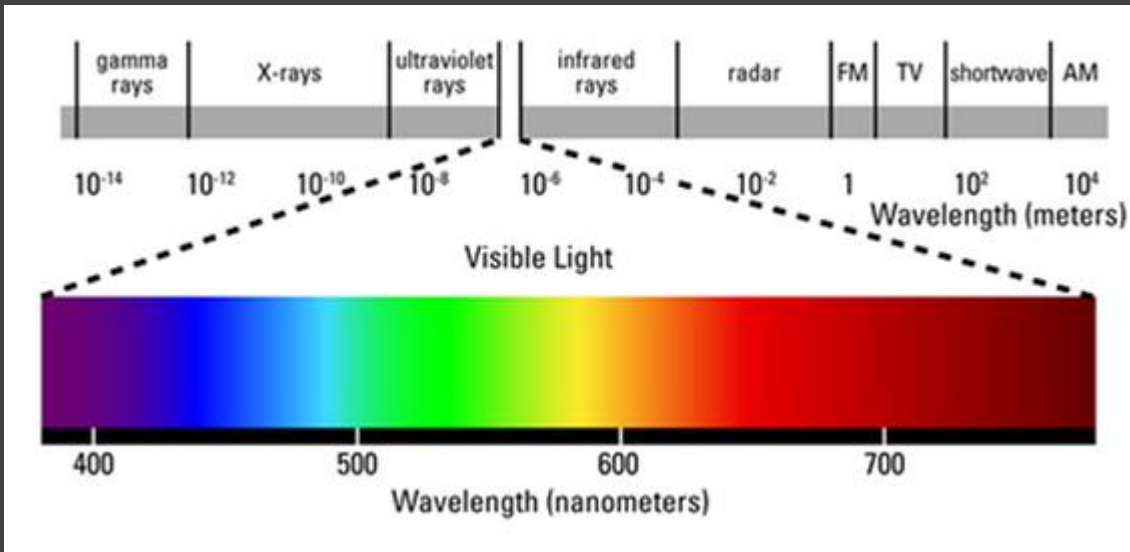
# CMYK

- Cyan Magenta Yello Black 을 base color 로 하는 색공간
- 주로 인쇄용으로 많이 사용됨.
- 흰색을 표현할 수 없음.



# HSV

- 색상(Hue), 채도(Saturation), 명도(Value)의 세 종류 값으로 색을 표현
- 색상 : 가시광선 영역의 색상을 0-360의 각도로 표현(빨,주,노,초,파,남,보)
- 채도 : 색이 진한 정도, 선명도
- 명도 : 색의 밝기



# Open image

```
cat_img = Image.open('zophie.png')  
cat_img.size  
cat_img.filename  
cat_img.format  
cat_img.format_description  
cat_img.info  
cat_img.show()  
  
cat_img.save('zophie.jpg')
```

# Show Image Tkinter – viewer.py

```
from tkinter import *
from tkinter.ttk import *
from PIL import ImageTk, Image

def show_image(img):
    window = Tk()
    tk_image = ImageTk.PhotoImage(img)
    Label(window, image=tk_image).pack()

    def stop(event=None):
        window.destroy()

    window.bind('<Escape>', stop)
    window.bind('q', stop)
    window.mainloop()
```



# Image Enhancement

```
from PIL import ImageEnhance

cat_img = Image.open('zophie.png')

bright = ImageEnhance.Brightness(cat_img)
bright_cat_img = bright.enhance(1.5)

viewer.show_images(cat_img, bright_cat_img)

colored_cat_img = ImageEnhance.Color(cat_img).enhance(5.5)
viewer.show_images(cat_img, colored_cat_img)

colored_cat_img = ImageEnhance.Color(cat_img).enhance(0)
viewer.show_images(cat_img, colored_cat_img)

contrasted_cat_img = ImageEnhance.Contrast(cat_img).enhance(1.5)
viewer.show_images(cat_img, contrasted_cat_img)

sharpened_cat_img = ImageEnhance.Sharpness(cat_img).enhance(3.0) # sharpened
viewer.show_images(cat_img, sharpened_cat_img)
```

# Image Filter

```
from PIL import ImageFilter

blurred_cat_img = cat_img.filter(ImageFilter.GaussianBlur(radius=5))
viewer.show_images(cat_img, blurred_cat_img)

filtered_cat_img = cat_img.filter(ImageFilter.FIND_EDGES)
viewer.show_images(cat_img, filtered_cat_img)

filtered_cat_img = cat_img.filter(ImageFilter.CONTOUR)
viewer.show_images(cat_img, filtered_cat_img)

filtered_cat_img = cat_img.filter(ImageFilter.DETAIL)
viewer.show_images(cat_img, filtered_cat_img)

filtered_cat_img = cat_img.filter(ImageFilter.SMOOTH)
viewer.show_images(cat_img, filtered_cat_img)

filtered_cat_img = cat_img.filter(ImageFilter.SMOOTH_MORE)
viewer.show_images(cat_img, filtered_cat_img)

filtered_cat_img = cat_img.filter(ImageFilter.EMBOSS)
viewer.show_images(cat_img, filtered_cat_img)

filtered_cat_img = cat_img.filter(ImageFilter.SHARPEN)
viewer.show_images(cat_img, filtered_cat_img)
```

# 새 이미지 만들기

```
im = Image.new('RGBA', (100, 200), 'pink')  
im.save('pink.png')  
im2 = Image.new('RGBA', (20, 20))  
im2.save('transparent.png')
```

# 이미지 크롭

```
face = cat_img.crop((335,345,565,560))  
viewer.show_image(face)
```

# 이미지 붙이기

```
# pasting image

cat_img_copy.paste(face, (0,0))
viewer.show_image(cat_img_copy)


# pasting image with transparent

cat_img_copy = cat_img.copy()
cat_logo_img = Image.open('catlogo.png').resize((100, 100))
cat_img_copy.paste(cat_logo_img, (100, 100), cat_logo_img)
viewer.show_image(cat_img_copy)
```

# 이미지 사이즈 조절, 회전, 반전

```
width, height = cat_img.size  
cat_img_small = cat_img.resize((width//2, height//2))  
viewer.show_image(cat_img_small)
```

```
new_img = cat_img.rotate(90, expand=True)  
viewer.show_image(new_img)
```

```
new_img = cat_img.rotate(45, expand=True)  
viewer.show_image(new_img)
```

```
new_img = cat_img.transpose(Image.FLIP_LEFT_RIGHT)  
viewer.show_image(new_img)
```

```
new_img = cat_img.transpose(Image.FLIP_TOP_BOTTOM)  
viewer.show_image(new_img)
```

# 픽셀 액세스

```
cat_img.getpixel((0,0))  
cat_img.putpixel((100,102), ImageColor.getcolor('RED', 'RGBA'))  
viewer.show_image(cat_img)
```

# 드로잉

```
from PIL import ImageDraw
im = Image.new('RGBA', (200, 200), 'white')
draw = ImageDraw.Draw(im)
draw.point([(0, 0), (199, 0), (199, 199), (0, 199), (0, 0)], fill='black')
draw.line([(0, 0), (199, 0), (199, 199), (0, 199), (0, 0)], fill='black')
draw.line([(0, 0), (199, 0), (199, 199), (0, 199), (0, 0)], fill='black', width=5)

draw.rectangle((20, 30, 60, 60), fill='blue')
draw.rectangle((20, 30, 60, 60), fill='blue', outline='red')
draw.ellipse((120, 30, 160, 60), fill='red')
draw.polygon(((57, 87), (79, 62), (94, 85), (120, 90), (103, 113))), fill='brown')
for i in range(100, 200, 10):
    draw.line([(i, 0), (200, i - 100)], fill='green')

viewer.show_image(im)
```



# 폰트 렌더링

```
from PIL import ImageFont
import os
im = Image.new('RGBA', (200, 200), 'white')
draw = ImageDraw.Draw(im)
draw.text((20, 150), 'Hello', fill='purple')
fontsFolder = 'c:/Windows/Fonts'
arialFont = ImageFont.truetype(os.path.join(fontsFolder, 'arial.ttf'), 32)
draw.text((100, 150), 'Howdy', fill='gray', font=arialFont)
viewer.show_image(im)
```