

Images and NumPy

In [1]:

```
import numpy as np
import matplotlib.pyplot as plt
from PIL import Image
```

Out [1]:

In [2]:

```
pic=Image.open("08-puppy.jpg")
pic
```

Out [2]:

In [3]:

```
type(pic)
```

Out [3]: `PIL.JpegImagePlugin.JpegImageFile`

In [4]:

```
pic_arr=np.asarray(pic)
```

Out [4]:

In [5]:

```
pic_arr
```

Out [5]:

```
array([[95, 81, 78],
       [97, 82, 86],
       [98, 84, 81],
       ...,
       [25, 27, 22],
       [25, 27, 22],
       [25, 27, 22]],
      [[95, 81, 78],
       [96, 82, 78],
       [96, 82, 75],
       ...,
       [25, 27, 22],
       [25, 27, 22],
       [25, 27, 22]],
      [[95, 81, 78],
       [94, 88, 77],
       [94, 88, 77],
       ...,
       [25, 27, 22],
       [25, 27, 22],
       [25, 27, 22]],
      ...,
      [[19, 29, 20],
       [28, 38, 21],
       [28, 38, 21],
       ...,
       [23, 38, 22],
       [24, 31, 23],
       [24, 31, 23]],
      [[28, 38, 21],
       [28, 38, 21],
       [19, 29, 20],
       ...,
       [23, 38, 22],
       [24, 31, 23],
       [24, 31, 23]],
      [[28, 38, 21],
       [19, 29, 20],
       [19, 29, 20],
       ...,
       [23, 38, 22],
       [24, 31, 23],
       [24, 31, 23]]], dtype=uint8)
```

Out [5]:

In [6]:

```
type(pic_arr)
```

Out [6]: `numpy.ndarray`

In [7]:

```
pic_arr.shape
```

Out [7]: `(1388, 1958, 3)`

In [8]:

```
plt.imshow(pic_arr)
```

Out [8]: `<matplotlib.image.AxesImage at 0x21280fee438>`

In [9]:

```
# R G B
plt.title('Red')
plt.imshow(pic_arr[:, :,0])
```

Out [9]: `<matplotlib.image.AxesImage at 0x212819a47f8>`

In [10]:

```
plt.title('Green')
plt.imshow(pic_arr[:, :,1])
```

Out [10]: `<matplotlib.image.AxesImage at 0x212819a4a38>`

In [11]:

```
plt.title('Blue')
plt.imshow(pic_arr[:, :,2])
```

Out [11]: `<matplotlib.image.AxesImage at 0x2128118c78>`

In [12]:

```
plt.imshow(pic_arr[:, :,3])
```

Out [12]: `<matplotlib.image.AxesImage at 0x212819a6c78>`

In [13]:

```
plt.subplot(2, 3, 1)
plt.title('Red')
plt.xticks(rotation=45)
plt.imshow(pic_arr[:, :,0])
plt.subplot(2, 3, 2)
plt.title('Green')
plt.imshow(pic_arr[:, :,1])
plt.subplot(2, 3, 3)
plt.title('Blue')
plt.xticks(rotation=45)
plt.imshow(pic_arr[:, :,2])
plt.subplot(2, 3, 4)
plt.title('Red-Green')
plt.imshow(pic_arr[:, :,0:1])
plt.subplot(2, 3, 5)
plt.title('Green-Blue')
plt.imshow(pic_arr[:, :,1:2])
plt.subplot(2, 3, 6)
plt.title('Real-Image')
plt.xticks(rotation=45)
plt.imshow(pic_arr[:, :,3])
plt.tight_layout(pad=2)
```

In [14]:

```
plt.subplot(2, 3, 1)
plt.title('Red')
plt.xticks(rotation=45)
plt.imshow(pic_arr[:, :,0], cmap='gray')
plt.subplot(2, 3, 2)
plt.title('Green')
plt.imshow(pic_arr[:, :,1], cmap='gray')
plt.subplot(2, 3, 3)
plt.title('Blue')
plt.imshow(pic_arr[:, :,2], cmap='gray')
plt.subplot(2, 3, 4)
plt.title('Red-Green')
plt.imshow(pic_arr[:, :,0:1], cmap='gray')
plt.subplot(2, 3, 5)
plt.title('Green-Blue')
plt.imshow(pic_arr[:, :,1:2], cmap='gray')
plt.subplot(2, 3, 6)
plt.title('Real-Image')
plt.xticks(rotation=45)
plt.imshow(pic_arr[:, :,3], cmap='gray')
plt.tight_layout(pad=2)
```

In [15]:

```
pic_red_removed=pic_arr.copy()
pic_red_removed[:, :,0]=0
```

Out [15]:

In [16]:

```
plt.imshow(pic_red_removed)
```

Out [16]: `<matplotlib.image.AxesImage at 0x212810cefa0>`

In [17]:

```
pic_green_removed=pic_arr.copy()
pic_green_removed[:, :,1]=0
```

Out [17]:

In [18]:

```
plt.imshow(pic_green_removed)
```

Out [18]: `<matplotlib.image.AxesImage at 0x2128552b160>`

In [19]:

```
pic_blue_removed=pic_arr.copy()
pic_blue_removed[:, :,2]=0
```

Out [19]:

In [20]:

```
plt.imshow(pic_blue_removed)
```

Out [20]: `<matplotlib.image.AxesImage at 0x2128473b708>`

In [21]:

```
plt.subplot(1, 3, 1)
plt.title('Red-Removed')
plt.xticks(rotation=45)
plt.imshow(pic_red_removed)
plt.subplot(1, 3, 2)
plt.title('Green-Removed')
plt.imshow(pic_green_removed)
plt.subplot(1, 3, 3)
plt.title('Blue-Removed')
plt.xticks(rotation=45)
plt.imshow(pic_blue_removed)
plt.tight_layout(pad=2)
```

In [22]:

```
pic_red=pic_arr.copy()
pic_red[:, :,1]=0
pic_red[:, :,2]=0
plt.title('Only-Red')
plt.imshow(pic_red)
```

Out [22]: `<matplotlib.image.AxesImage at 0x2128473b858>`

In [23]:

```
pic_green=pic_arr.copy()
pic_green[:, :,0]=0
pic_green[:, :,2]=0
plt.title('Only-Green')
plt.imshow(pic_green)
```

Out [23]: `<matplotlib.image.AxesImage at 0x2127e53b138>`

In [24]:

```
pic_blue=pic_arr.copy()
pic_blue[:, :,0]=0
pic_blue[:, :,1]=0
plt.title('Only-Blue')
plt.imshow(pic_blue)
```

Out [24]: `<matplotlib.image.AxesImage at 0x21283a27168>`

In [25]:

```
plt.subplot(2, 2, 1)
plt.title('Only-Red')
plt.xticks(rotation=45)
plt.imshow(pic_red)
plt.subplot(2, 2, 2)
plt.title('Only-Green')
plt.xticks(rotation=45)
plt.imshow(pic_green)
plt.subplot(2, 2, 3)
plt.title('Only-Blue')
plt.xticks(rotation=45)
plt.imshow(pic_blue)
plt.subplot(2, 2, 4)
plt.title('Real-Image')
plt.xticks(rotation=45)
plt.imshow(pic)
plt.tight_layout(pad=5)
```