

CS351 Assignment 1

Drishika Nadella (181ME222)

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In [2]:

```
# Importing the relevant libraries

import numpy as np
from PIL import Image, ImageEnhance
```

In [15]:

```
# For the first nine questions, I have chosen an image that provides a glimpse of NITK

img = Image.open('nitk_view.jpeg')                      # Loading the image
img = img.resize((round(img.size[0]*0.5), round(img.size[1]*0.5)))    # Resizing the image for easier view
img                                         # Displaying the image
```

Out[15]:



1. Convert the image to monochrome

In [16]:

```
monochrome = img.convert('L')      # Converts the colour image to grayscale
monochrome.save('monochrome.png')  # Saves the image
monochrome
```

Out[16]:

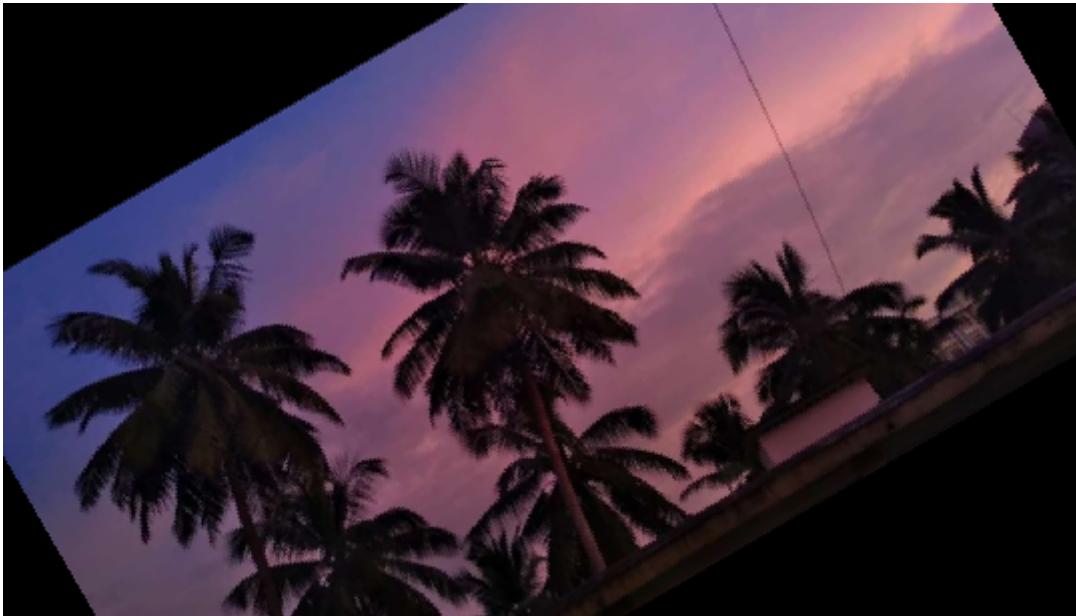


2. Rotate the image

In [10]:

```
# Rotating the image by 30 degrees anticlockwise  
  
rotated = img.rotate(30)  
rotated.save('rotated_by_30.png')  
rotated
```

Out[10]:



3. Flip the image

In [17]:

```
# img.transpose() transposes the 2D array that stores the image  
# FLIP_LEFT_RIGHT indicates that the image needs to be transposed laterally  
  
flipped = img.transpose(Image.FLIP_LEFT_RIGHT)  
flipped.save('flipped.png')  
flipped
```

Out[17]:



4. Inverse the image (upside down)

In [18]:

```
# img.transpose() transposes the 2D array that stores the image
# FLIP_TOP_BOTTOM indicates that the image needs to be transposed upside down

inverted = img.transpose(Image.FLIP_TOP_BOTTOM)
inverted.save('inverted.png')
inverted
```

Out[18]:



5. Change image contrast

In [23]:

```
# Defining the contrast function
contrast = ImageEnhance.Contrast(img)

# Increasing the contrast by 100% i.e. doubling the contrast
increase = 2
cont_increase = contrast.enhance(increase)
cont_increase.save("increasing_contrast.png")
cont_increase
```

Out[23]:



In [24]:

```
# Decreasing the contrast by 50%
decrease = 0.5
cont_decrease = contrast.enhance(decrease)
cont_decrease.save("decreasing_contrast.png")
cont_decrease
```

Out[24]:



6. Change image brightness

In [25]:

```
# Defining the brightness function
brightness = ImageEnhance.Brightness(img)

# Brightening the image by 100%
increase = 2
bright_increase = brightness.enhance(increase)
bright_increase.save("increasing_brightness.png")
bright_increase
```

Out[25]:



In [26]:

```
# Darkening the image by 50%  
  
decrease = 0.5  
bright_decrease = brightness.enhance(decrease)  
bright_decrease.save("decreasing_brightness.png")  
bright_decrease
```

Out[26]:



8. Negative image

In [29]:

```
# Read pixels and apply negative transformation

for i in range(0, img.size[0]-1):
    for j in range(0, img.size[1]-1):

        # Get the image's pixel value at (i,j) position
        original_pixels = img.getpixel((i,j));

        # Invert color
        redPixel      = 255 - original_pixels[0]; # Negate red pixel
        greenPixel   = 255 - original_pixels[1]; # Negate green pixel
        bluePixel    = 255 - original_pixels[2]; # Negate blue pixel

        # Modify the image with the inverted pixel values
        img.putpixel((i,j),(redPixel, greenPixel, bluePixel));

img.save('negative.png')
img
```

Out[29]:



10. Crop photo to US passport size photo

In [17]:

```
group = Image.open('group_photo.jpeg')  
# Loading my picture  
group  
# Displaying the image
```

Out[17]:



I am the second one from the left.

In [16]:

```
width, height = me.size  
print(f"Size of my photo in pixels {width, height}")
```

Size of my photo in pixels (778, 1037)

My computer's screen size is 13.6" x 7.65" and a resolution of 1366 x 768 pixels. This gives me a pixels per inch (PPI) value of 100.45. A US passport size photo is 2 x 2 inches. Converting this into pixels in my PC means I need to crop my photo to approximately 210 x 210 pixels.

In [26]:

```
# Getting the pixel values to be cropped. Left and top were determined through trial and error.
```

```
left = 450
top = 120
right = left + 210
bottom = top + 210
me = group.crop((left, top, right, bottom))

me.save('US_passport.png')
me
```

Out[26]:



In [27]:

```
# Negating the image

for i in range(0, me.size[0]-1):
    for j in range(0, me.size[1]-1):

        # Get the image's pixel value at (i,j) position
        original_pixels = me.getpixel((i,j));

        # Invert color
        redPixel      = 255 - original_pixels[0]; # Negate red pixel
        greenPixel   = 255 - original_pixels[1]; # Negate green pixel
        bluePixel    = 255 - original_pixels[2]; # Negate blue pixel

        # Modify the image with the inverted pixel values
        me.putpixel((i,j),(redPixel, greenPixel, bluePixel));

me.save('passport_negative.png')
me
```

Out[27]:



In []: