Image Pipeline

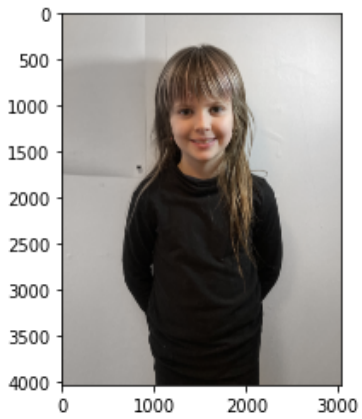
1. Take a picture of your face or have a friend do it.
2. Import the image into Jupyter Notebook.
3. Analyze the image
4. Create a histogram the whole image. RGB
5. Modify your image with brightness and contrast.
6. Mask out your face.
7. Use the mask to create a HSV histogram.
8. Analyze the histogram for skin tone ranges.
9. Use the HSV ranges to create a mask.
10. Apply the mask to the image and segment out your skin/face

In [ ]:
```
# Import Libraries
import cv2
import numpy as np
import matplotlib.pyplot as plt
```

In [ ]:
```
# Import image
img = cv2.imread('Graphics/coco.png', 1)
```

In [ ]:
```
img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
plt.imshow(img)
```

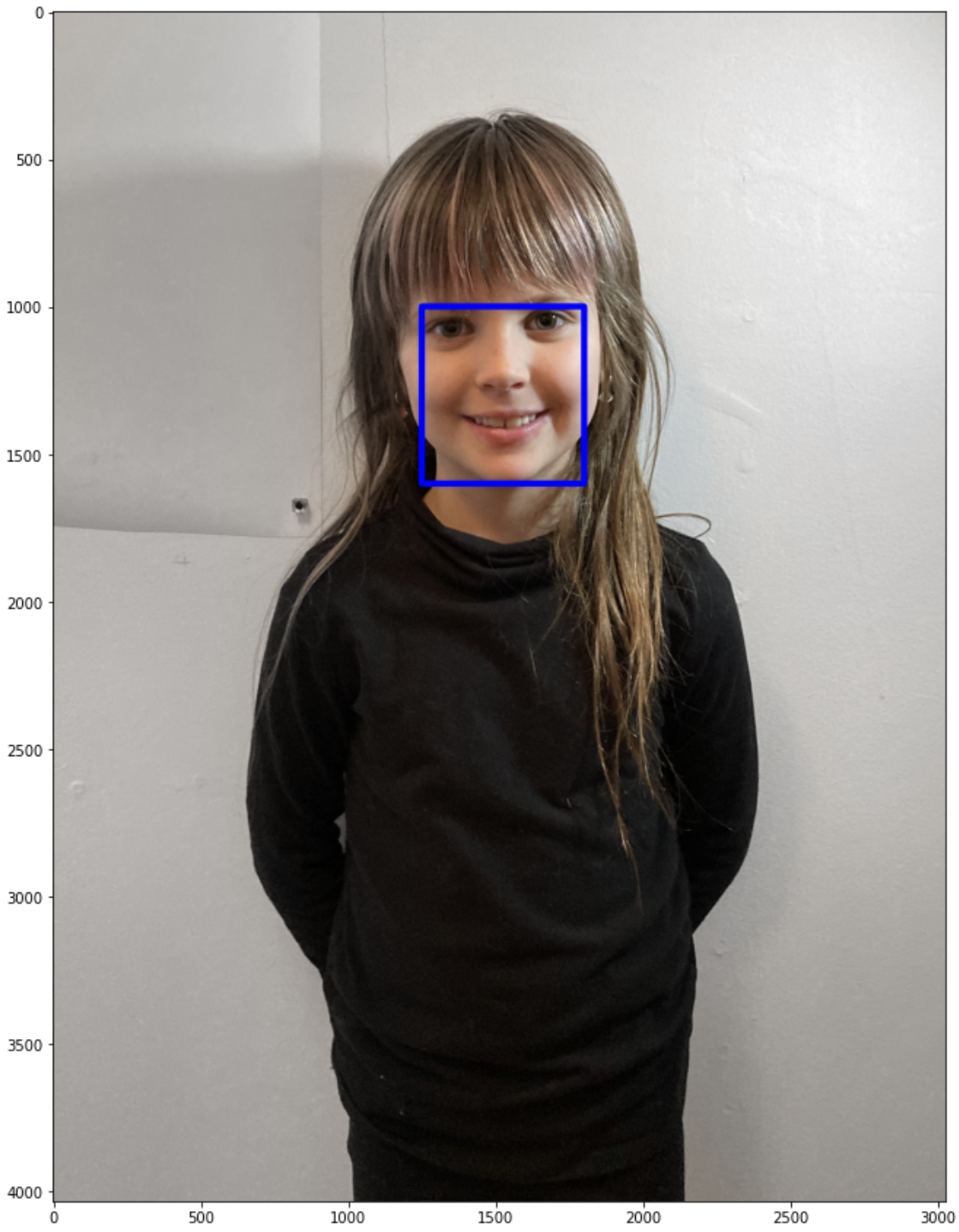
Out[ ]:
```
<matplotlib.image.AxesImage at 0x7fa33c349820>
```



In [ ]:
```
# Convert back to BGR
img = cv2.cvtColor(img, cv2.COLOR_RGB2BGR)

# Top left of rectangle.
top_left = (1250, 1000)

# Bottom right of rectangle.
bottom_right = (1800, 1600)

# Color
rect_color = (255,0,0)

# Thickness of line
```

```
thickness = 20

# Apply rectangle.
img_rect = cv2.rectangle(img, top_left, bottom_right, rect_color, thickness)

# Convert back to RGB
img_rect = cv2.cvtColor(img_rect, cv2.COLOR_BGR2RGB)

# Make image larger on plot.
fig = plt.figure(figsize=(15,15))

# Plot image.
plt.imshow(img_rect)
```

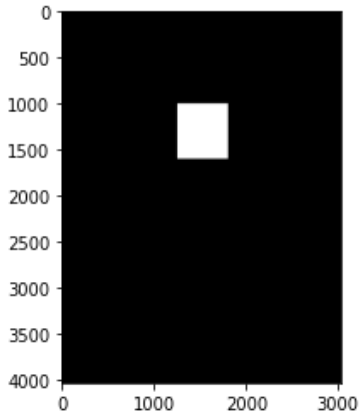
Out[ ]:
```
<matplotlib.image.AxesImage at 0x7fa32a3cdc40>
```



In [ ]:
```
# Top left of rectangle.
# top_left = (1250, 1000)

# Bottom right of rectangle.
```

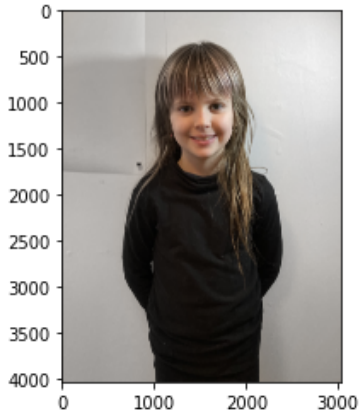
```
# bottom_right = (1800, 1600)


# Create an black mask.
mask = np.zeros(img.shape[:2], np.uint8)

# Add the white portion of the mask.
mask[1000:1600, 1250:1800] = 255

# Plot mask.
plt.imshow(mask, cmap="gray")
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x7fa3117100d0>
```



In [ ]:
```
# Reimport image
img = cv2.imread("Graphics/coco.png", 1)
img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
plt.imshow(img)
```

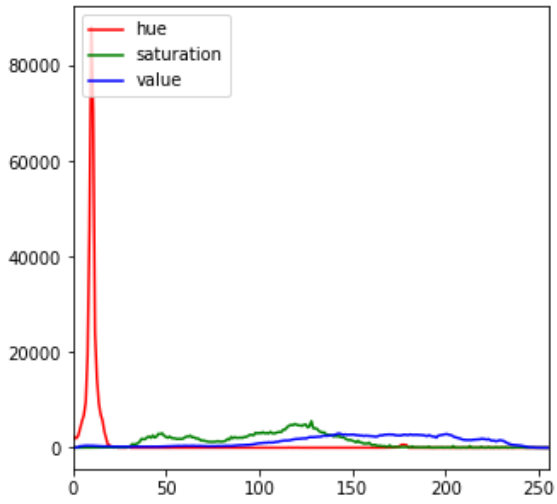
Out[ ]:
```
<matplotlib.image.AxesImage at 0x7fa313ad55b0>
```



In [ ]:
```
img = cv2.cvtColor(img, cv2.COLOR_RGB2HSV)
```

In [ ]:
```
# Size of the histogram
fig = plt.figure(figsize=(5,5))

# Plot the hue.
hist = cv2.calcHist([img],[0],mask,[256],[0,255])
plt.plot(hist, color="red")
plt.xlim([0,255])

# Plot the saturation
hist = cv2.calcHist([img],[1],mask,[256],[0,255])
plt.plot(hist, color="green")
plt.xlim([0,255])

# Plot the value
hist = cv2.calcHist([img],[2],mask,[256],[0,255])
```

```
plt.plot(hist, color="blue")
plt.xlim([0,255])

plt.legend(('hue', 'saturation', 'value'), loc = 'upper left')
plt.show()
```



In [ ]:

```
# Minimum and maximum HSV values.
min_HSV = np.array([0,30,100], np.uint8)
max_HSV = np.array([25,170,240], np.uint8)

# cv2.inRange(image, minimum, maximum)
skinArea = cv2.inRange(img, min_HSV, max_HSV)

# Bitwise And mask
skinHSV = cv2.bitwise_and(img, img, mask=skinArea)

# Convert to RGB
skinHSV = cv2.cvtColor(skinHSV, cv2.COLOR_HSV2RGB)

# Plot masked image.
plt.imshow(skinHSV)
```

Out[ ]: <matplotlib.image.AxesImage at 0x7fa31318cd30>