

```
In [ ]:
```

```
In [1]: import numpy as np
```

```
In [2]: # Create a 3x3 matrix filled with 1s and multiply by 255
# This is like simulating a white pixel grid because 255 is the max brightness in an 8-bit image
ones_arr = np.ones((3,3), dtype=int)
ones_arr
```

```
Out[2]: array([[1, 1, 1],
               [1, 1, 1],
               [1, 1, 1]])
```

```
In [3]: ones_arr * 255
```

```
Out[3]: array([[255, 255, 255],
               [255, 255, 255],
               [255, 255, 255]])
```

```
In [4]: import matplotlib.pyplot as plt
```

```
In [5]: %matplotlib inline
```

```
In [6]: from PIL import Image # python imaging library
```

```
In [7]: # Load two images using PIL
forest_image = Image.open(r'C:\Users\Arman\Downloads\image3.png')
```

```
In [8]: forest_image
```

```
Out[8]:
```



```
In [9]: type(forest_image)
```

```
Out[9]: PIL.PngImagePlugin.PngImageFile
```

```
In [10]: # Convert images to NumPy arrays
forest_arr = np.asarray(forest_image)
forest_arr
```

```
Out[10]: array([[[ 71,  85,  63],
   [ 69,  81,  60],
   [ 68,  81,  58],
   ...,
   [191, 199, 210],
   [188, 196, 209],
   [183, 190, 202]],

   [[ 73,  88,  64],
   [ 71,  86,  63],
   [ 69,  80,  58],
   ...,
   [195, 203, 216],
   [186, 194, 205],
   [185, 194, 207]],

   [[ 69,  83,  61],
   [ 68,  81,  58],
   [ 67,  78,  57],
   ...,
   [194, 204, 213],
   [186, 193, 203],
   [192, 202, 214]],

   ...,

   [[ 71, 101,  33],
   [ 71, 107,  36],
   [ 91, 126,  54],
   ...,
   [ 78, 105,  26],
   [ 80, 108,  30],
   [ 76, 101,  24]],

   [[ 70, 102,  32],
   [ 84, 117,  49],
   [ 98, 130,  60],
   ...,
   [ 75, 100,  21],
   [ 79, 105,  25],
   [ 76, 101,  27]],

   [[ 65,  97,  26],
   [ 73, 108,  38],
   [ 82, 118,  49],
   ...,
   [ 71,  92,  16],
   [ 72,  94,  18],
   [ 74,  95,  21]]], dtype=uint8)
```

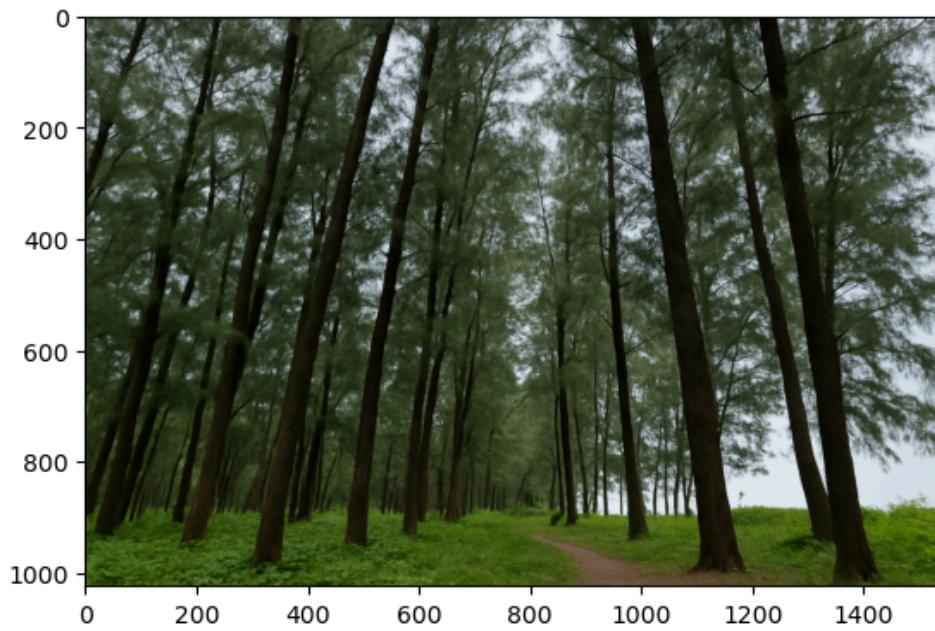
```
In [11]: type(forest_arr)
```

```
Out[11]: numpy.ndarray
```

```
In [12]: forest_arr.shape # Shape will be (height, width, 3 (for RGB))
```

```
Out[12]: (1024, 1536, 3)
```

```
In [13]: plt.imshow(forest_arr)
plt.show()
```



```
In [14]: forest_red = forest_arr.copy()
```

```
In [15]: forest_red
```

```
Out[15]: array([[[ 71,  85,  63],
   [ 69,  81,  60],
   [ 68,  81,  58],
   ...,
   [191, 199, 210],
   [188, 196, 209],
   [183, 190, 202]],

   [[ 73,  88,  64],
   [ 71,  86,  63],
   [ 69,  80,  58],
   ...,
   [195, 203, 216],
   [186, 194, 205],
   [185, 194, 207]],

   [[ 69,  83,  61],
   [ 68,  81,  58],
   [ 67,  78,  57],
   ...,
   [194, 204, 213],
   [186, 193, 203],
   [192, 202, 214]],

   ...,

   [[ 71, 101,  33],
   [ 71, 107,  36],
   [ 91, 126,  54],
   ...,
   [ 78, 105,  26],
   [ 80, 108,  30],
   [ 76, 101,  24]],

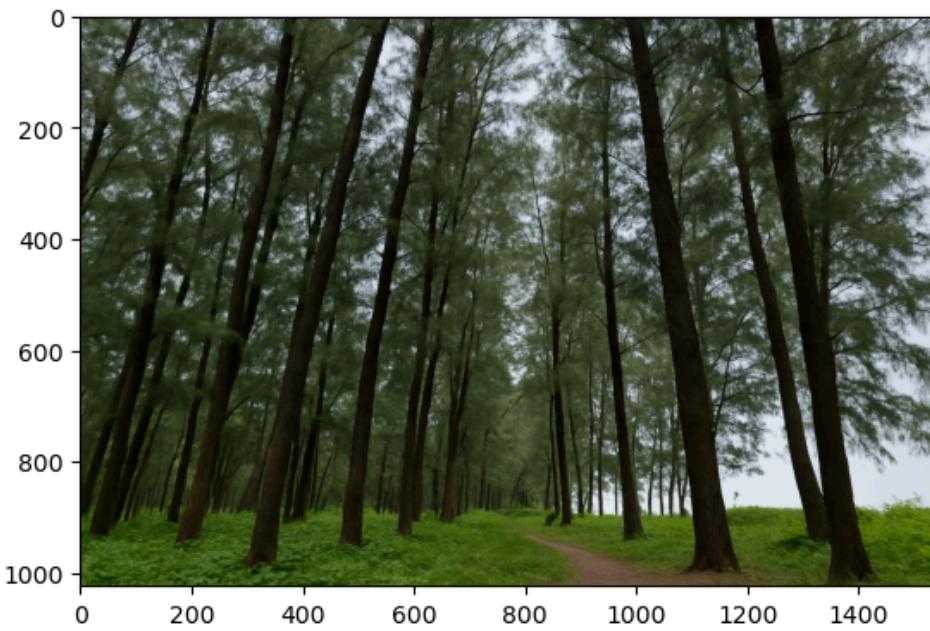
   [[ 70, 102,  32],
   [ 84, 117,  49],
   [ 98, 130,  60],
   ...,
   [ 75, 100,  21],
   [ 79, 105,  25],
   [ 76, 101,  27]],

   [[ 65,  97,  26],
   [ 73, 108,  38],
   [ 82, 118,  49],
   ...,
   [ 71,  92,  16],
   [ 72,  94,  18],
   [ 74,  95,  21]]], dtype=uint8)
```

```
In [16]: forest_arr == forest_red
```

```
Out[16]: array([[[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]],
  [[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]],
  [[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]],
  ...,
  [[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]])
```

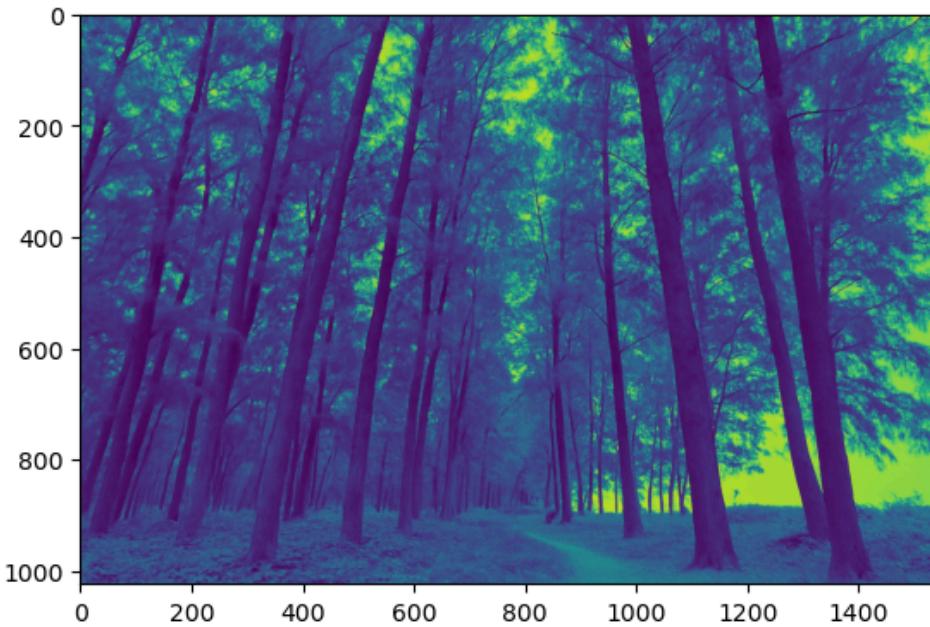
```
In [17]: plt.imshow(forest_red)
plt.show()
```



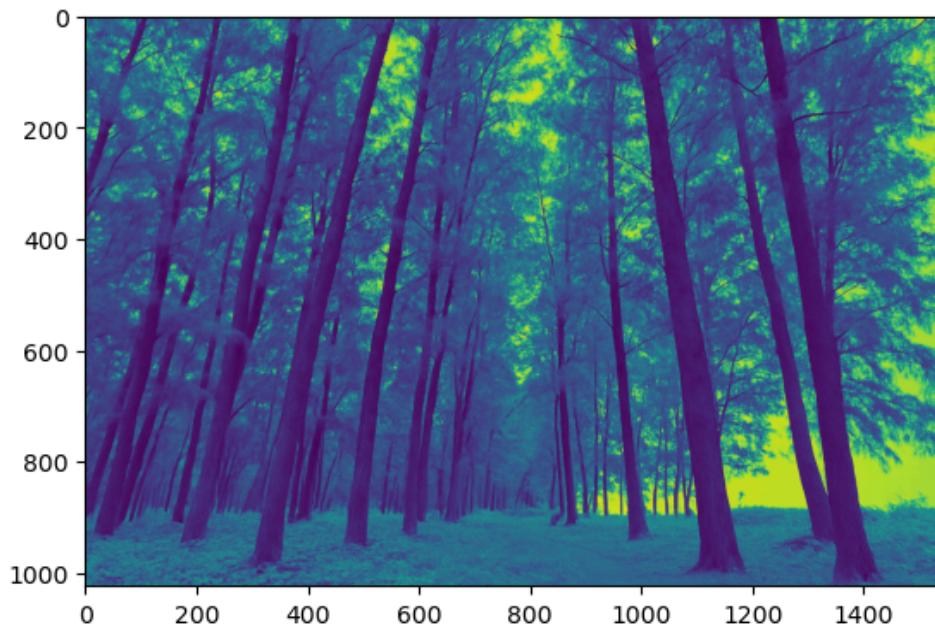
```
In [18]: forest_red.shape
```

```
Out[18]: (1024, 1536, 3)
```

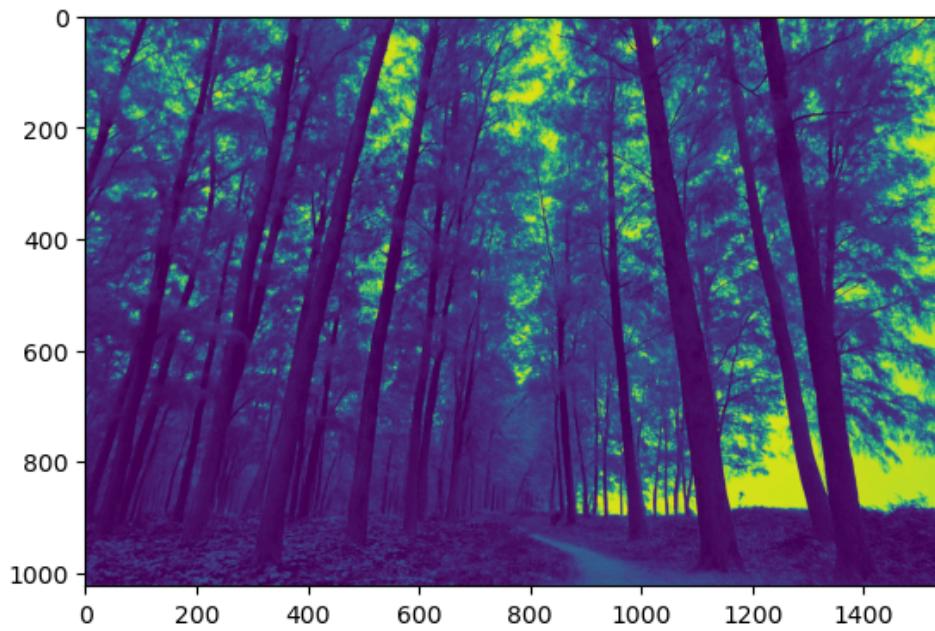
```
In [19]: # Show only the Red channel (index 0)
# change color (R-0 G-1 B-2)
plt.imshow(forest_red[:, :, 0])
plt.show()
```



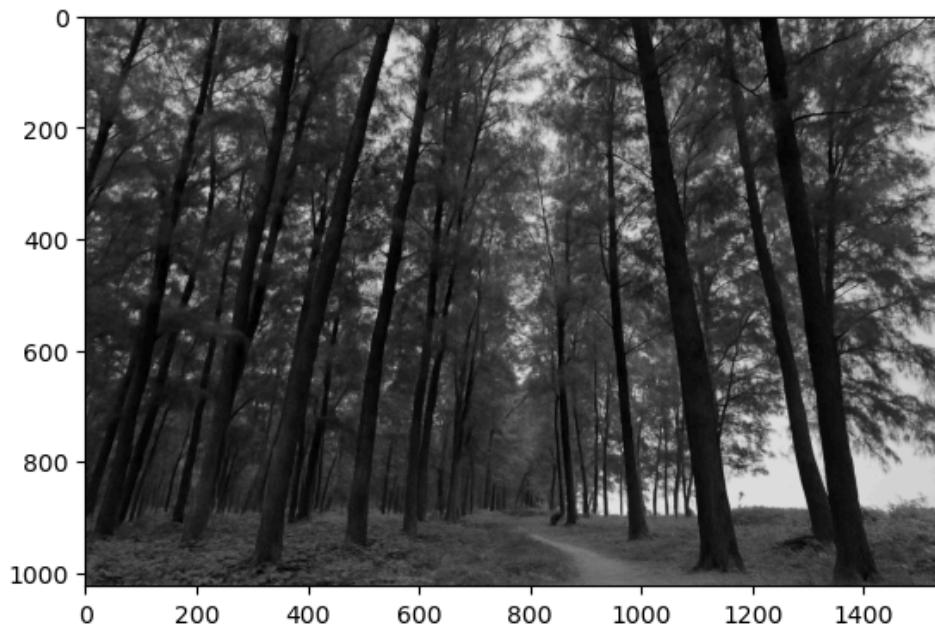
```
In [20]: # Show only the Green channel (index 1)
plt.imshow(forest_red[:, :, 1])
plt.show()
```



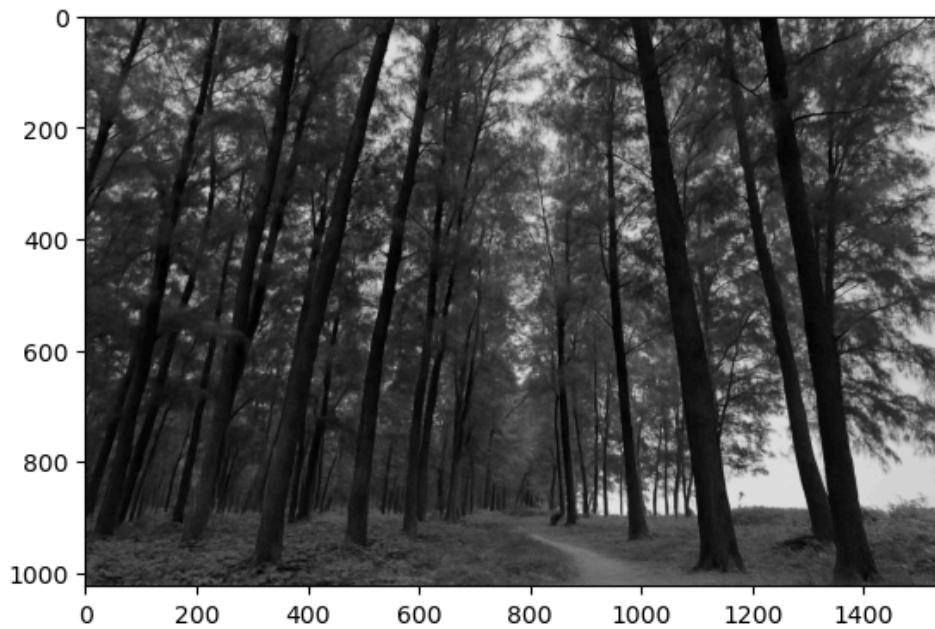
```
In [21]: # Show only the Blue channel ( index 2)
plt.imshow(forest_red[:, :, 2])
plt.show()
```



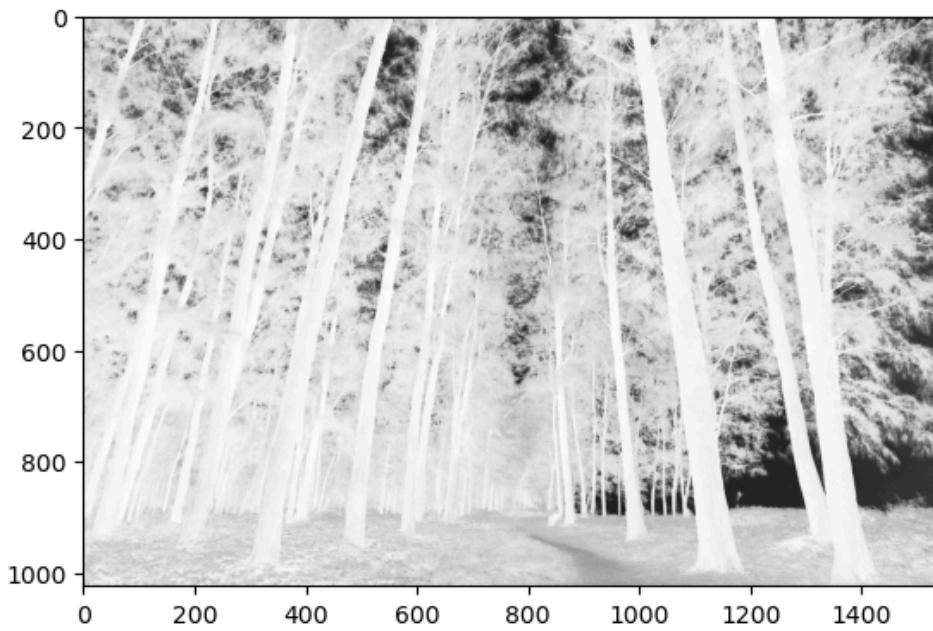
```
In [22]: plt.imshow(forest_red[:, :, 0], cmap='gray')
plt.show()
```



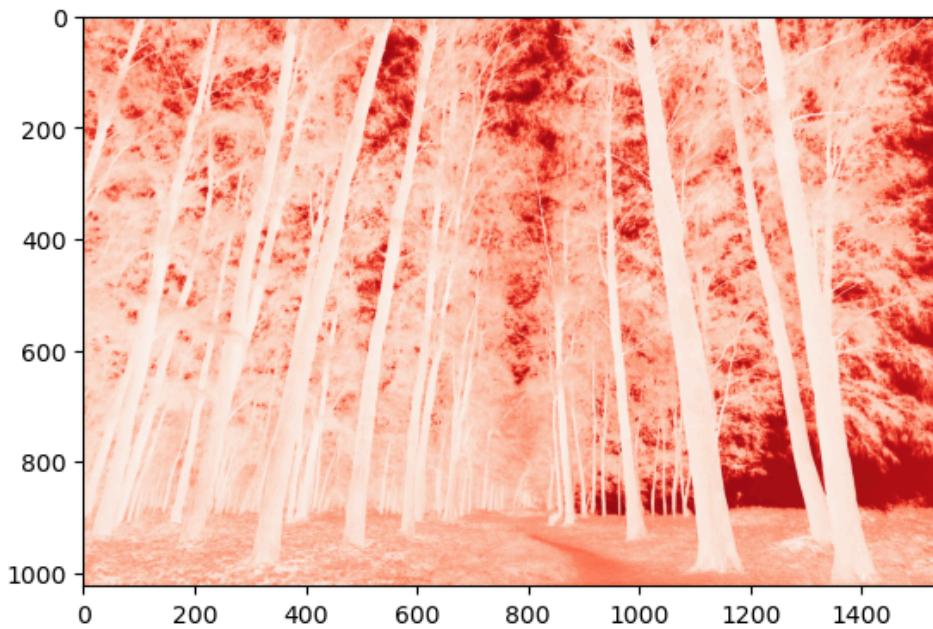
```
In [23]: plt.imshow(forest_red[:, :, 0], cmap = 'gray')
plt.show()
```



```
In [24]: plt.imshow(forest_red[:, :, 0], cmap = 'Greys')
plt.show()
```



```
In [25]: plt.imshow(forest_red[:, :, 0], cmap = 'Reds')
plt.show()
```



```
In [26]: forest_red[:, :, 0]
```

```
Out[26]: array([[ 71,  69,  68, ..., 191, 188, 183],
   [ 73,  71,  69, ..., 195, 186, 185],
   [ 69,  68,  67, ..., 194, 186, 192],
   ...,
   [ 71,  71,  91, ...,  78,  80,  76],
   [ 70,  84,  98, ...,  75,  79,  76],
   [ 65,  73,  82, ...,  71,  72,  74]], dtype=uint8)
```

```
In [27]: forest_red[:, :, 1]
```

```
Out[27]: array([[ 85,  81,  81, ..., 199, 196, 190],
   [ 88,  86,  80, ..., 203, 194, 194],
   [ 83,  81,  78, ..., 204, 193, 202],
   ...,
   [101, 107, 126, ..., 105, 108, 101],
   [102, 117, 130, ..., 100, 105, 101],
   [ 97, 108, 118, ...,  92,  94,  95]], dtype=uint8)
```

```
In [28]: forest_red[:, :, 2]
```

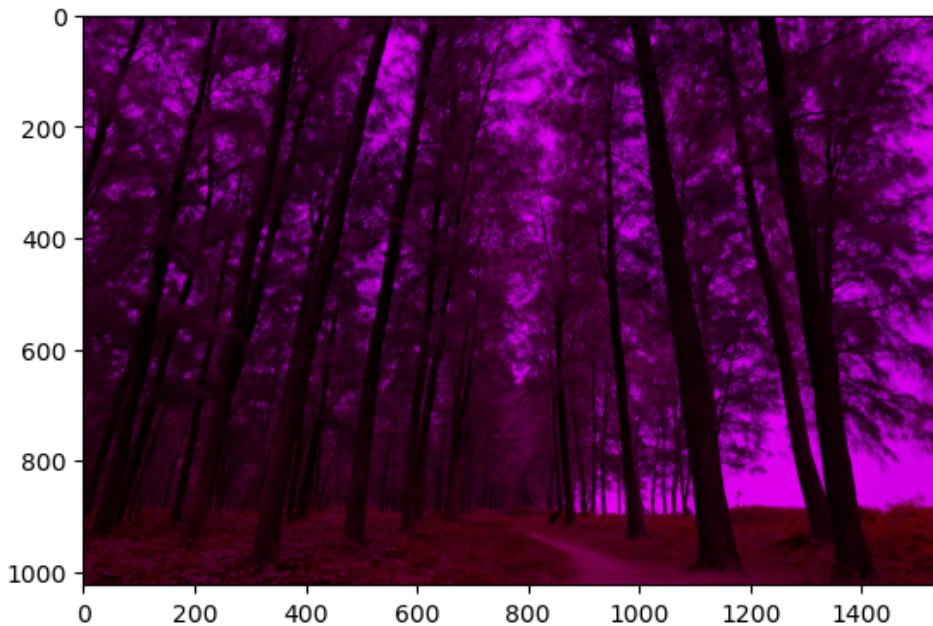
```
Out[28]: array([[ 63,  60,  58, ..., 210, 209, 202],  
   [ 64,  63,  58, ..., 216, 205, 207],  
   [ 61,  58,  57, ..., 213, 203, 214],  
   ...,  
   [ 33,  36,  54, ..., 26,  30,  24],  
   [ 32,  49,  60, ..., 21,  25,  27],  
   [ 26,  38,  49, ..., 16,  18,  21]], dtype=uint8)
```

```
In [29]: forest_red[:, :, 1] = 0
```

```
In [30]: forest_red[:, :, 1]
```

```
Out[30]: array([[0, 0, 0, ..., 0, 0, 0],  
   [0, 0, 0, ..., 0, 0, 0],  
   [0, 0, 0, ..., 0, 0, 0],  
   ...,  
   [0, 0, 0, ..., 0, 0, 0],  
   [0, 0, 0, ..., 0, 0, 0],  
   [0, 0, 0, ..., 0, 0, 0]], dtype=uint8)
```

```
In [31]: plt.imshow(forest_red)  
plt.show()
```

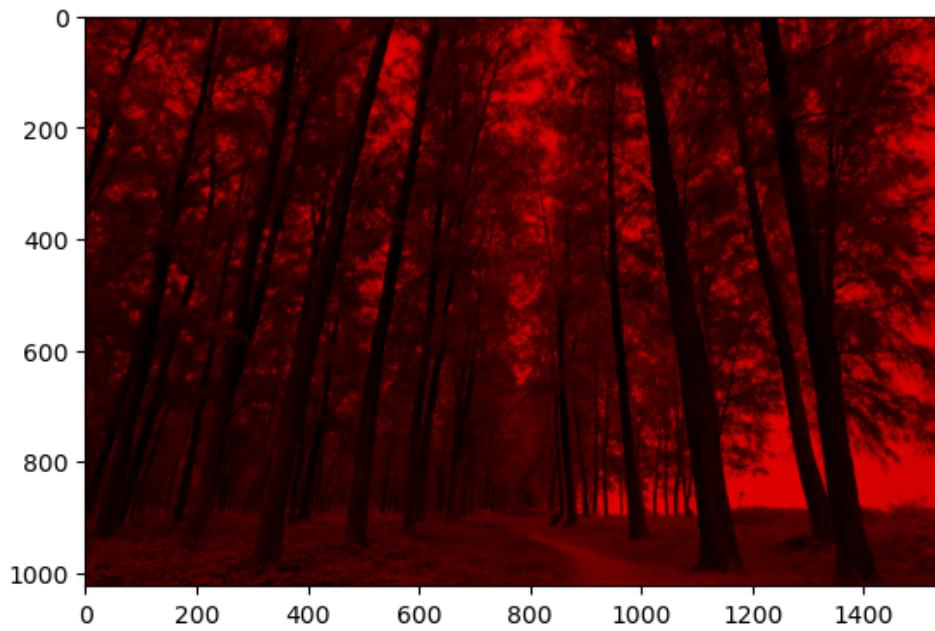


```
In [32]: forest_red[:, :, 2] = 0
```

```
In [33]: forest_red[:, :, 2]
```

```
Out[33]: array([[0, 0, 0, ..., 0, 0, 0],  
   [0, 0, 0, ..., 0, 0, 0],  
   [0, 0, 0, ..., 0, 0, 0],  
   ...,  
   [0, 0, 0, ..., 0, 0, 0],  
   [0, 0, 0, ..., 0, 0, 0],  
   [0, 0, 0, ..., 0, 0, 0]], dtype=uint8)
```

```
In [34]: plt.imshow(forest_red)  
plt.show()
```



In [35]: `forest_arr`

```
Out[35]: array([[[ 71,  85,  63],
   [ 69,  81,  60],
   [ 68,  81,  58],
   ...,
   [191, 199, 210],
   [188, 196, 209],
   [183, 190, 202]],

   [[ 73,  88,  64],
   [ 71,  86,  63],
   [ 69,  80,  58],
   ...,
   [195, 203, 216],
   [186, 194, 205],
   [185, 194, 207]],

   [[ 69,  83,  61],
   [ 68,  81,  58],
   [ 67,  78,  57],
   ...,
   [194, 204, 213],
   [186, 193, 203],
   [192, 202, 214]],

   ...,

   [[ 71, 101,  33],
   [ 71, 107,  36],
   [ 91, 126,  54],
   ...,
   [ 78, 105,  26],
   [ 80, 108,  30],
   [ 76, 101,  24]],

   [[ 70, 102,  32],
   [ 84, 117,  49],
   [ 98, 130,  60],
   ...,
   [ 75, 100,  21],
   [ 79, 105,  25],
   [ 76, 101,  27]],

   [[ 65,  97,  26],
   [ 73, 108,  38],
   [ 82, 118,  49],
   ...,
   [ 71,  92,  16],
   [ 72,  94,  18],
   [ 74,  95,  21]]], dtype=uint8)
```

```
In [36]: forest_red
```

```
Out[36]: array([[[ 71,    0,    0],
   [ 69,    0,    0],
   [ 68,    0,    0],
   ...,
   [191,    0,    0],
   [188,    0,    0],
   [183,    0,    0]],

   [[ 73,    0,    0],
   [ 71,    0,    0],
   [ 69,    0,    0],
   ...,
   [195,    0,    0],
   [186,    0,    0],
   [185,    0,    0]],

   [[ 69,    0,    0],
   [ 68,    0,    0],
   [ 67,    0,    0],
   ...,
   [194,    0,    0],
   [186,    0,    0],
   [192,    0,    0]],

   ...,

   [[ 71,    0,    0],
   [ 71,    0,    0],
   [ 91,    0,    0],
   ...,
   [ 78,    0,    0],
   [ 80,    0,    0],
   [ 76,    0,    0]],

   [[ 70,    0,    0],
   [ 84,    0,    0],
   [ 98,    0,    0],
   ...,
   [ 75,    0,    0],
   [ 79,    0,    0],
   [ 76,    0,    0]],

   [[ 65,    0,    0],
   [ 73,    0,    0],
   [ 82,    0,    0],
   ...,
   [ 71,    0,    0],
   [ 72,    0,    0],
   [ 74,    0,    0]]], dtype=uint8)
```

```
In [37]: forest_image
```

Out[37]:

