1. Introduction of Computer vision

Computer vision is a field of computer science that focuses on enabling computers to identify and understand objects and people in images and videos NOTE : for better understanding go through notes Difference between Human vision system and Computer vision system Human vision uses eyes and brain to see and understand, while computer vision uses a camera and computer to detect and recognize objects.

2. What is Image ?

A real image will represent as an array & that image will convert into pixel Pixel range between (0 - 255), where 0 = dark value, 255 = Highest / Brightest value Every pixel in image is stored in value between (0-255) Coloured image will be represented as RGB (Red, Green, Blue) Channels in image : 2D channel -> black and white || 3D channel -> Red, Green, Blue (RGB)

3. Numpy & Image connection

Image reading with Numpy & Matplotlib

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

In [2]:
```
ones_arr = np.ones((10,10),dtype=int)
```

In [3]:
```
ones_arr
```

Out[3]:
```
array([[1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1]])
```

In [4]:
```
ones_arr * 255
```

Out[4]:
```
array([[255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255, 255, 255, 255, 255, 255]])
```

In [5]:
```
import matplotlib.pyplot as plt
```

In [6]:
```
from PIL import Image
```

In [7]:
```
ele = Image.open(r"D:\Samson resume\elephant_img.jpg")
```

In [8]:
```
ele
```

Out[8]:

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

Out[9]:
```
PIL.JpegImagePlugin.JpegImageFile
```

In [10]:
```
ele_arr = np.asarray(ele)
ele_arr
```

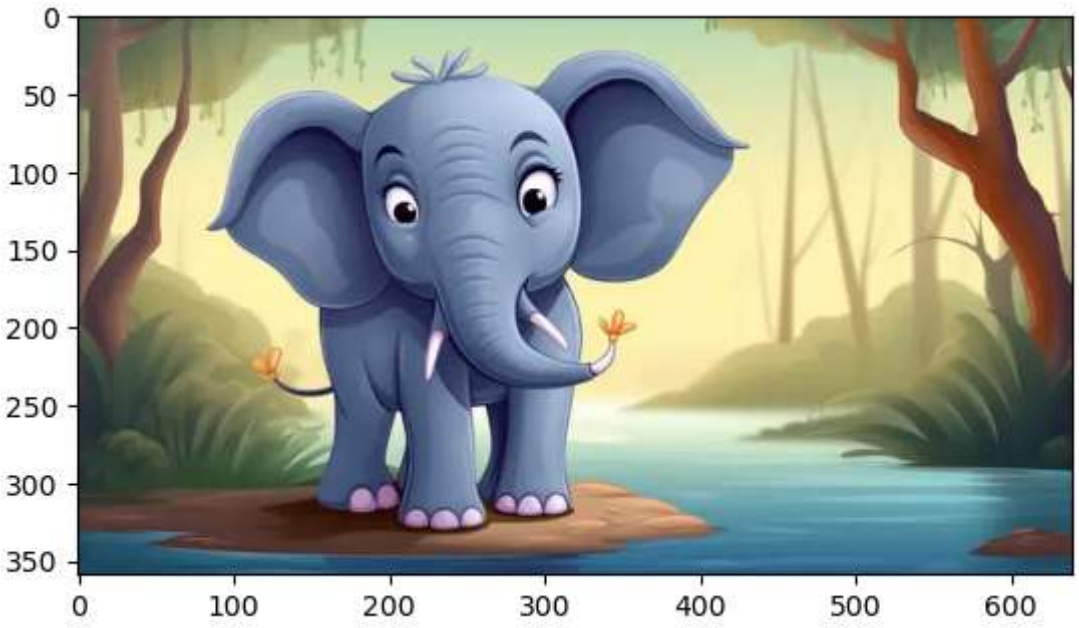
Out[10]:
```
array([[[ 78,  90,  70],
        [ 78,  90,  70],
        [ 78,  90,  70],
        ...,
        [ 82, 106,  72],
        [ 78, 102,  70],
        [ 76, 100,  68]],

       [[ 79,  91,  71],
        [ 79,  91,  71],
        [ 79,  91,  71],
        ...,
        [ 84, 105,  72],
        [ 80, 101,  70],
        [ 78,  99,  68]],

       [[ 80,  92,  72],
        [ 80,  92,  72],
        [ 79,  91,  71],
        ...,
        [ 85, 106,  73],
        [ 81, 102,  71],
        [ 79, 100,  69]],

       ...,

       [[ 31,  71,  96],
        [ 30,  72,  96],
        [ 30,  72,  96],
        ...,
        [ 36,  82, 115],
        [ 36,  82, 116],
        [ 36,  82, 116]],

       [[ 30,  72,  96],
        [ 30,  72,  96],
        [ 30,  72,  96],
        ...,
        [ 34,  82, 118],
        [ 34,  82, 118],
        [ 34,  82, 118]],

       [[ 30,  72,  96],
        [ 30,  72,  96],
        [ 28,  73,  96],
        ...,
        [ 33,  83, 118],
        [ 33,  83, 120],
        [ 33,  83, 120]]], dtype=uint8)
```

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

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

In [12]:
```
plt.imshow(ele_arr)
```

Out[12]: <matplotlib.image.AxesImage at 0x1f88b44b9b0>




In [13]:
```
ele_arr.shape
```

Out[13]: (359, 640, 3)

In [14]:
```
ele_red = ele_arr.copy()
```

In [15]:
```
ele_red
```

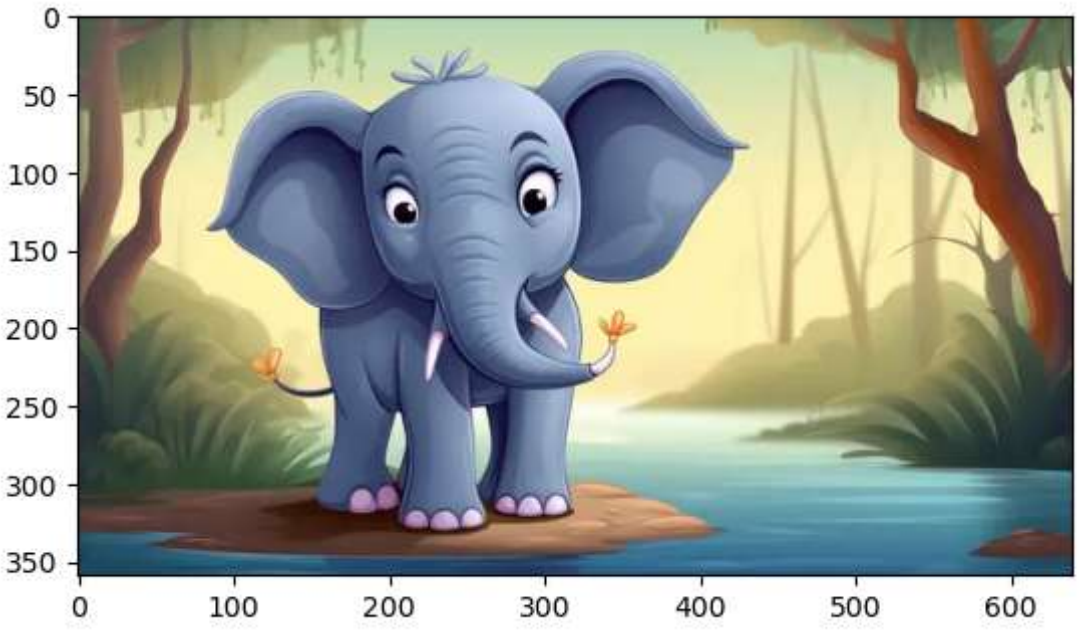
Out[15]:
```
array([[[ 78,  90,  70],
        [ 78,  90,  70],
        [ 78,  90,  70],
        ...,
        [ 82, 106,  72],
        [ 78, 102,  70],
        [ 76, 100,  68]],

       [[ 79,  91,  71],
        [ 79,  91,  71],
        [ 79,  91,  71],
        ...,
        [ 84, 105,  72],
        [ 80, 101,  70],
        [ 78,  99,  68]],

       [[ 80,  92,  72],
        [ 80,  92,  72],
        [ 79,  91,  71],
        ...,
        [ 85, 106,  73],
        [ 81, 102,  71],
        [ 79, 100,  69]],

       ...,

       [[ 31,  71,  96],
        [ 30,  72,  96],
        [ 30,  72,  96],
        ...,
        [ 36,  82, 115],
        [ 36,  82, 116],
        [ 36,  82, 116]],

       [[ 30,  72,  96],
        [ 30,  72,  96],
        [ 30,  72,  96],
        ...,
        [ 34,  82, 118],
        [ 34,  82, 118],
        [ 34,  82, 118]],

       [[ 30,  72,  96],
        [ 30,  72,  96],
        [ 28,  73,  96],
        ...,
        [ 33,  83, 118],
        [ 33,  83, 120],
        [ 33,  83, 120]]], dtype=uint8)
```

In [16]:
```
ele_arr == ele_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]],

       [[ 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(ele_red)
```

Out[17]:
```
<matplotlib.image.AxesImage at 0x1f88c54fef0>
```

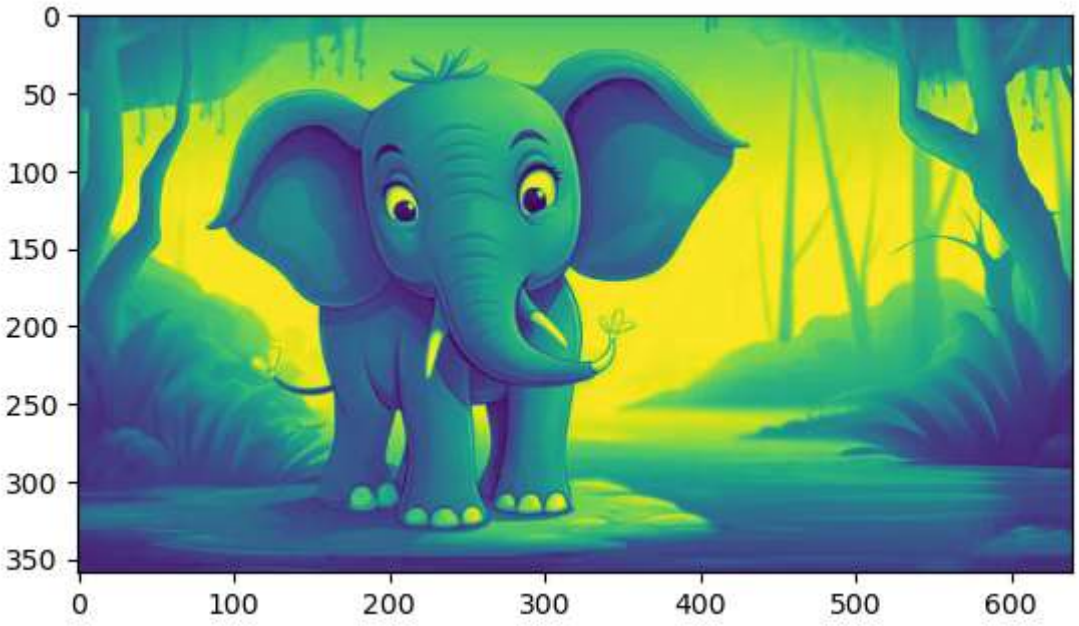



In [18]:
```
ele_red.shape
```

Out[18]: (359, 640, 3)

In [19]:
```
plt.imshow(ele_red[:,:,0])
```

Out[19]: <matplotlib.image.AxesImage at 0x1f88cd8cce0>

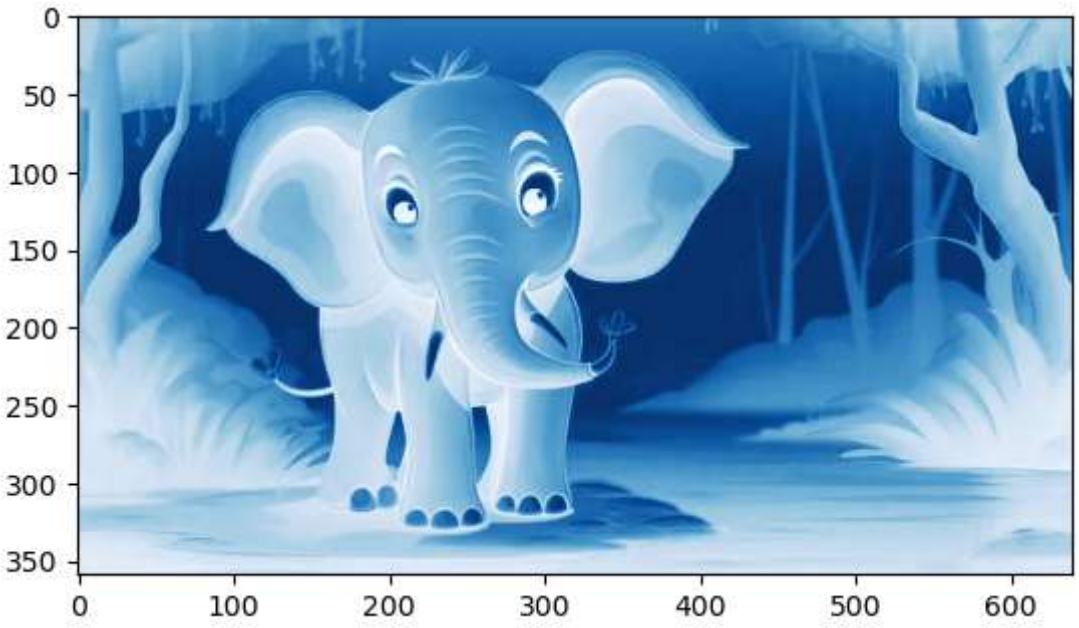



In [20]:
```
ele_red[:,:,0]
```

Out[20]:
```
array([[78, 78, 78, ..., 82, 78, 76],
       [79, 79, 79, ..., 84, 80, 78],
       [80, 80, 79, ..., 85, 81, 79],
       ...,
       [31, 30, 30, ..., 36, 36, 36],
       [30, 30, 30, ..., 34, 34, 34],
       [30, 30, 28, ..., 33, 33, 33]], dtype=uint8)
```

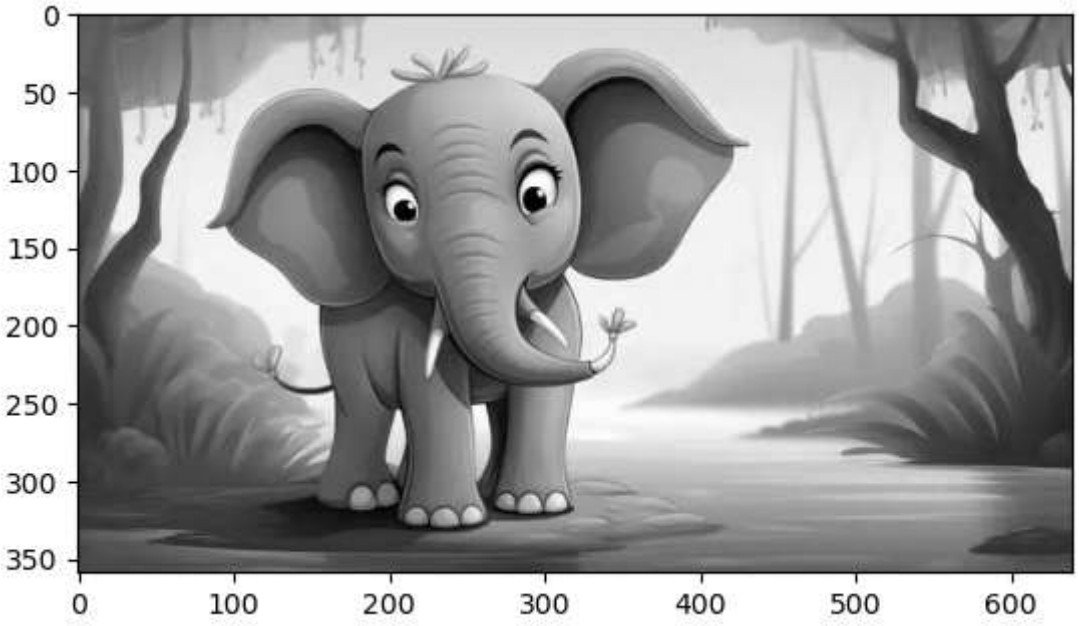
In [21]:
```
plt.imshow(ele_red[:,:,0], cmap='Blues')
```

Out[21]:
```
<matplotlib.image.AxesImage at 0x1f88c527fe0>
```



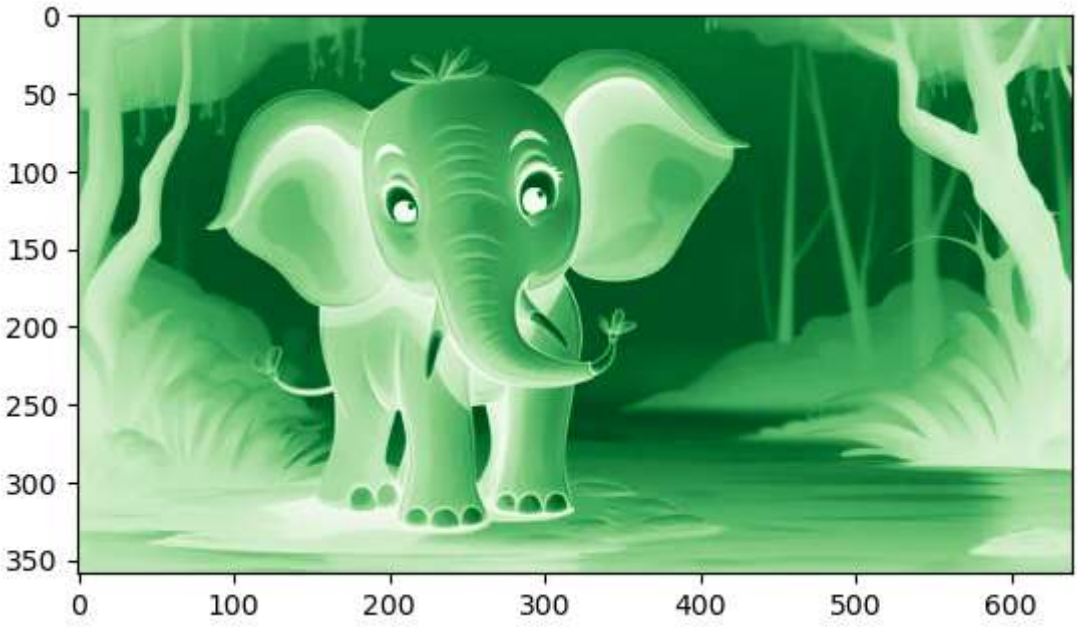

In [22]:
```
plt.imshow(ele_red[:,:,1], cmap='grey')
```

Out[22]:
```
<matplotlib.image.AxesImage at 0x1f88ceabc80>
```



In [23]:
```
plt.imshow(ele_red[:,:,1], cmap='Greens')
```

Out[23]:
```
<matplotlib.image.AxesImage at 0x1f88cdca060>
```




In [ ]: