

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

```
In [5]: ones_arr = np.ones((5,5))
```

```
In [6]: ones_arr
```

```
Out[6]: 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.]])
```

```
In [7]: ones_arr = np.ones((5,5), dtype = int)
```

```
In [8]: ones_arr
```

```
Out[8]: 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]])
```

```
In [11]: zeros_arr = np.zeros((3,3), dtype = int)
```

```
In [12]: zeros_arr
```

```
Out[12]: array([[0, 0, 0],
   [0, 0, 0],
   [0, 0, 0]])
```

```
In [13]: ones_arr
```

```
Out[13]: 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]])
```

```
In [14]: ones_arr * 255
```

```
Out[14]: 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]])
```

```
In [15]: zeros_arr
```

```
Out[15]: array([[0, 0, 0],
   [0, 0, 0],
   [0, 0, 0]])
```

```
In [16]: ones_arr
```

```
Out[16]: 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]])
```

```
In [2]: import matplotlib.pyplot as plt
```

```
In [3]: %matplotlib inline
```

## image

```
In [4]: from PIL import Image #Python Image Library
```

```
In [5]: dog_img = Image.open(r"C:\Users\91939\Desktop\PICS\doggy.jpg")
```

```
In [6]: dog_img
```

```
Out[6]:
```



```
In [7]: gold_img = Image.open(r"C:\Users\91939\Desktop\PICS\goldie.jpg")
```

```
In [8]: gold_img
```

```
Out[8]:
```



## array format of image

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

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

```
In [10]: gold_arr = np.asarray(gold_img)  
gold_arr
```

```
Out[10]: array([[[ 18,  36,  20],
   [ 18,  36,  20],
   [ 18,  36,  20],
   ...,
   [ 37,  34,  25],
   [ 38,  38,  30],
   [ 43,  43,  35]],

   [[ 18,  36,  20],
   [ 18,  36,  20],
   [ 18,  36,  20],
   ...,
   [ 38,  35,  26],
   [ 40,  37,  30],
   [ 43,  43,  35]],

   [[ 19,  36,  20],
   [ 19,  36,  20],
   [ 19,  36,  20],
   ...,
   [ 39,  35,  26],
   [ 40,  37,  30],
   [ 45,  42,  35]],

   ...,

   [[121, 164,  48],
   [117, 160,  42],
   [104, 148,  27],
   ...,
   [147, 187,  65],
   [122, 162,  40],
   [110, 150,  28]],

   [[114, 155,  37],
   [119, 160,  42],
   [110, 154,  33],
   ...,
   [121, 161,  39],
   [109, 149,  27],
   [114, 154,  32]],

   [[105, 144,  27],
   [121, 162,  42],
   [118, 159,  39],
   ...,
   [106, 148,  24],
   [103, 145,  21],
   [119, 161,  37]]], dtype=uint8)
```

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

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

```
In [12]: gold_arr.shape
```

```
Out[12]: (171, 295, 3)
```

```
In [13]: plt.imshow(gold_arr)
```

```
Out[13]: <matplotlib.image.AxesImage at 0x1bd824e2390>
```



## copy of image

```
In [83]: gold_arr2 = gold_arr.copy()
```

```
In [84]: gold_arr
```

```
Out[84]: array([[[ 18,  36,  20],
   [ 18,  36,  20],
   [ 18,  36,  20],
   ...,
   [ 37,  34,  25],
   [ 38,  38,  30],
   [ 43,  43,  35]],

   [[ 18,  36,  20],
   [ 18,  36,  20],
   [ 18,  36,  20],
   ...,
   [ 38,  35,  26],
   [ 40,  37,  30],
   [ 43,  43,  35]],

   [[ 19,  36,  20],
   [ 19,  36,  20],
   [ 19,  36,  20],
   ...,
   [ 39,  35,  26],
   [ 40,  37,  30],
   [ 45,  42,  35]],

   ...,

   [[121, 164,  48],
   [117, 160,  42],
   [104, 148,  27],
   ...,
   [147, 187,  65],
   [122, 162,  40],
   [110, 150,  28]],

   [[114, 155,  37],
   [119, 160,  42],
   [110, 154,  33],
   ...,
   [121, 161,  39],
   [109, 149,  27],
   [114, 154,  32]],

   [[105, 144,  27],
   [121, 162,  42],
   [118, 159,  39],
   ...,
   [106, 148,  24],
   [103, 145,  21],
   [119, 161,  37]]], dtype=uint8)
```

```
In [85]: gold_arr2 == gold_arr
```

```
Out[85]: 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]],

[[ 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 [86]: plt.imshow(gold_arr2)
```

```
Out[86]: <matplotlib.image.AxesImage at 0x1bd85d87a10>
```



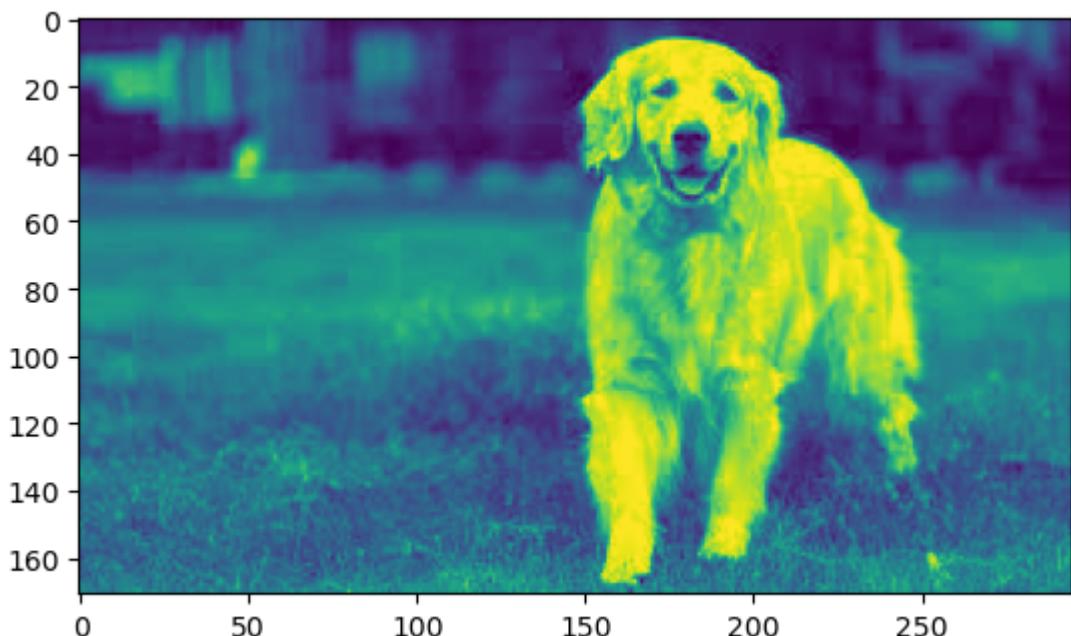
```
In [87]: gold_arr2.shape
```

```
Out[87]: (171, 295, 3)
```

## reduce array values

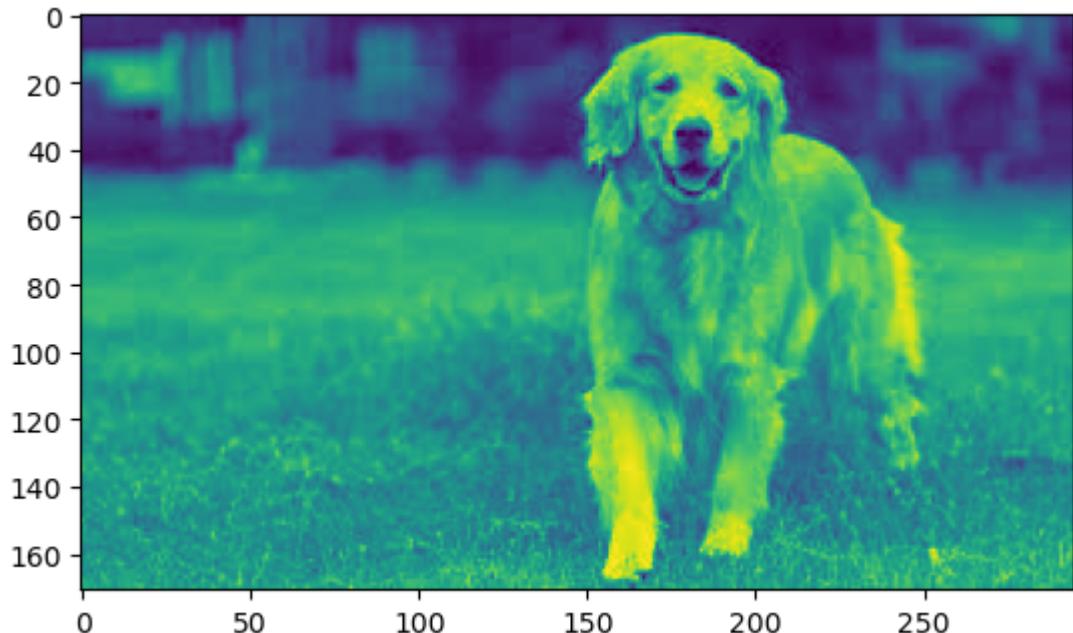
```
In [25]: plt.imshow(gold_arr2[:, :, 0])
```

```
Out[25]: <matplotlib.image.AxesImage at 0x1bd83fe1f40>
```



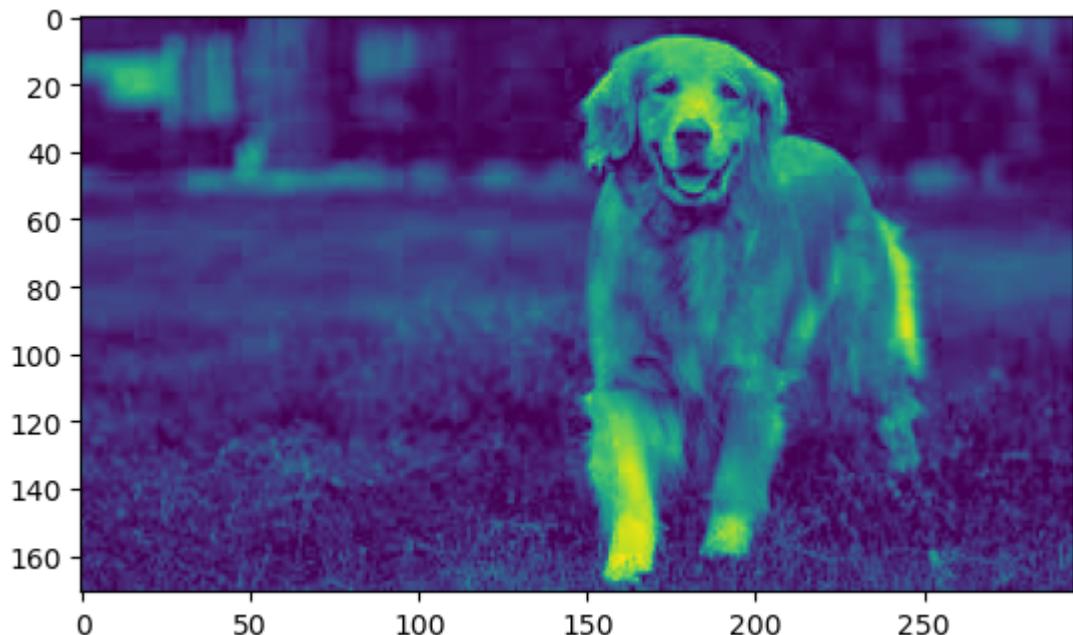
```
In [26]: plt.imshow(gold_arr2[:, :, 1])
```

```
Out[26]: <matplotlib.image.AxesImage at 0x1bd826e2600>
```



```
In [27]: plt.imshow(gold_arr2[:, :, 2])
```

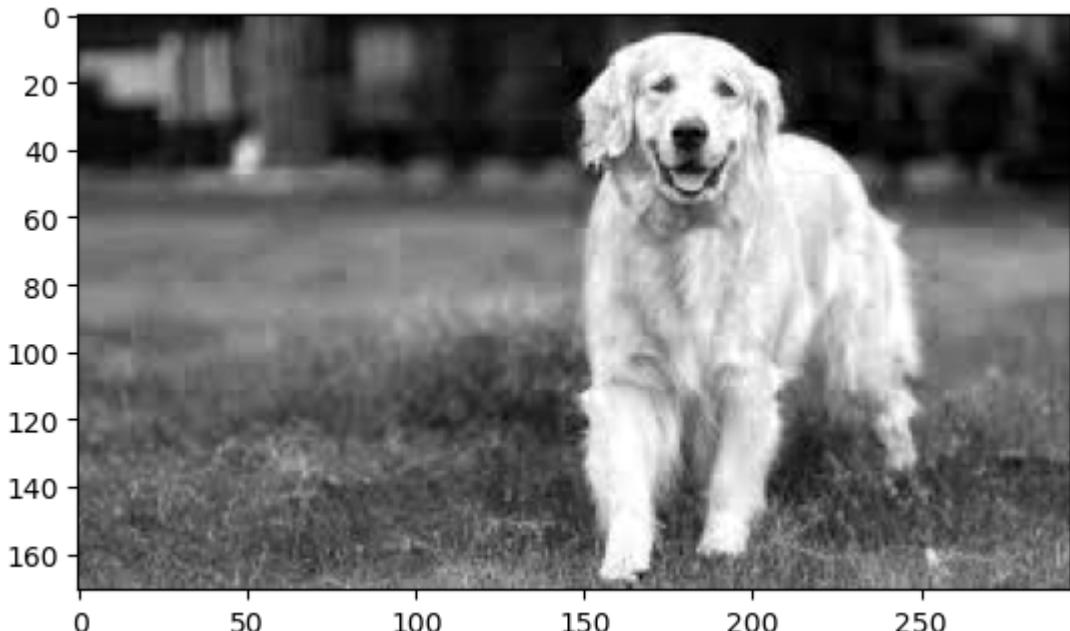
```
Out[27]: <matplotlib.image.AxesImage at 0x1bd8408f230>
```



## cmap conversion of colours

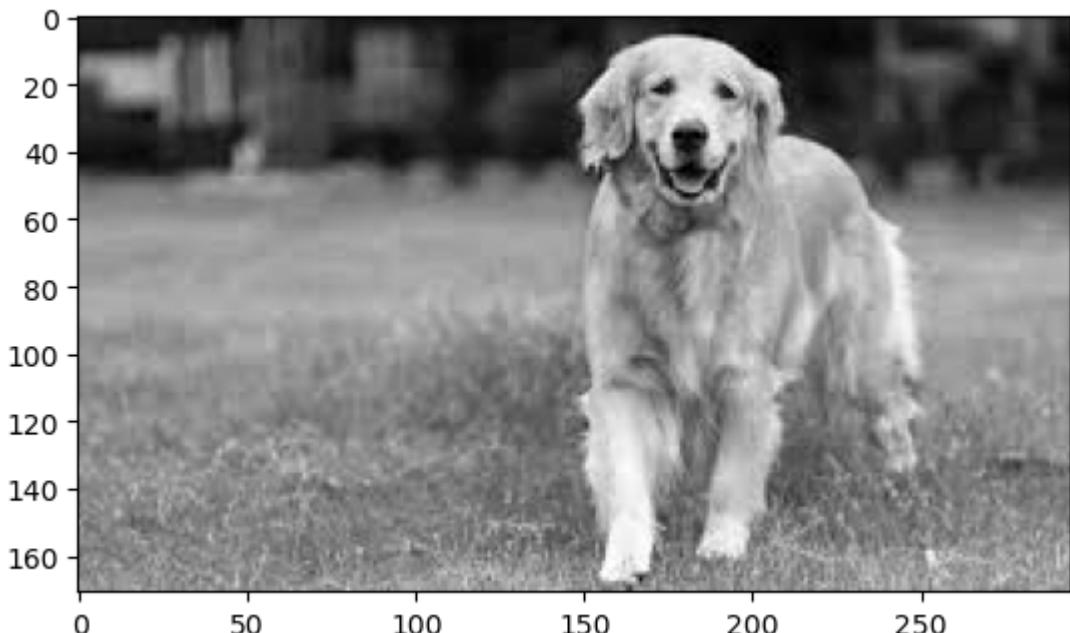
```
In [28]: plt.imshow(gold_arr2[:, :, 0], cmap='gray')
```

```
Out[28]: <matplotlib.image.AxesImage at 0x1bd84099760>
```



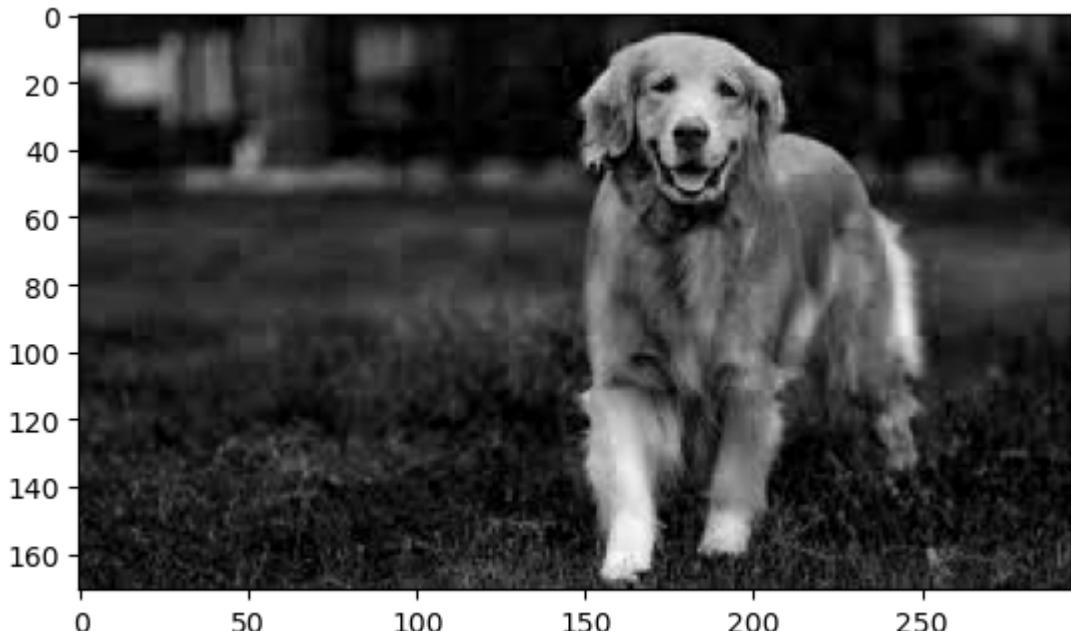
```
In [29]: plt.imshow(gold_arr2[:, :, 1], cmap='gray')
```

```
Out[29]: <matplotlib.image.AxesImage at 0x1bd8454e4b0>
```



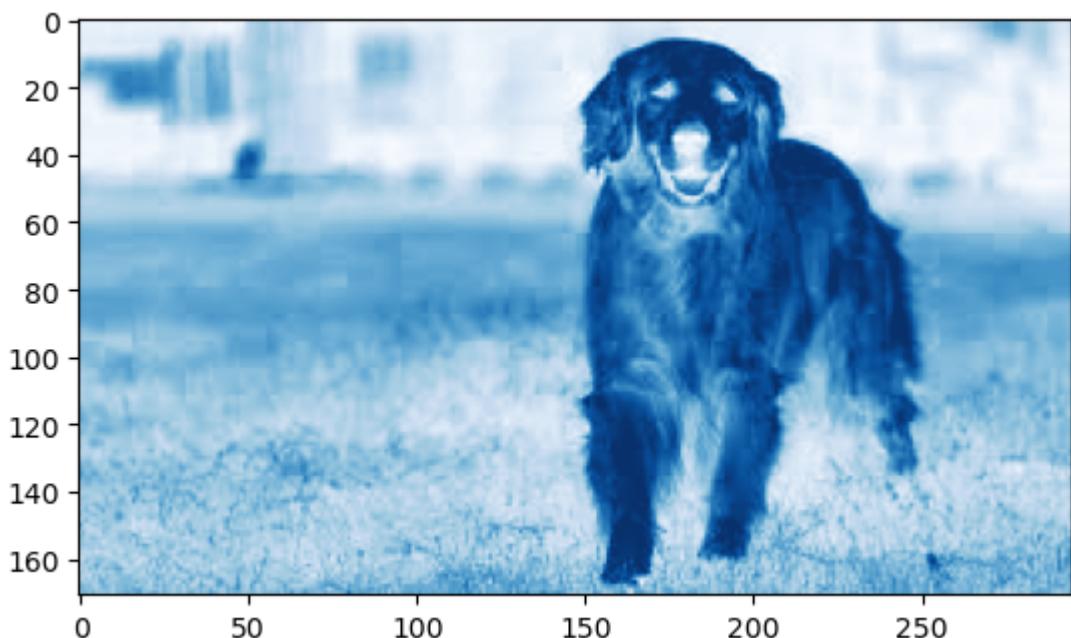
```
In [30]: plt.imshow(gold_arr2[:, :, 2], cmap='gray')
```

```
Out[30]: <matplotlib.image.AxesImage at 0x1bd84074830>
```



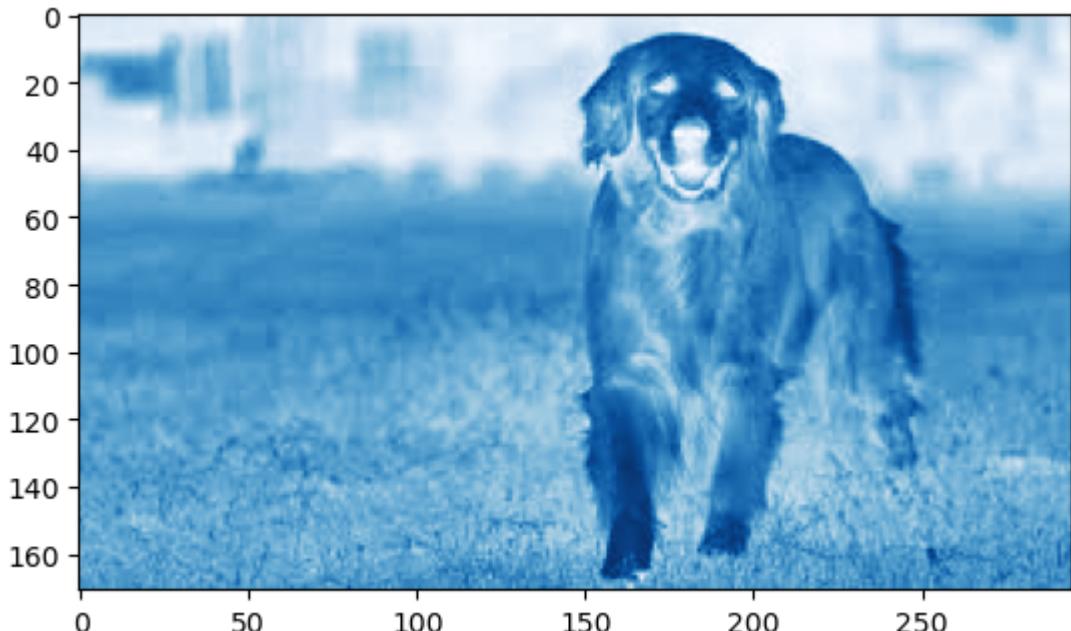
```
In [57]: plt.imshow(gold_arr2[:, :, 0], cmap='Blues')
```

```
Out[57]: <matplotlib.image.AxesImage at 0x2323a2f1d00>
```



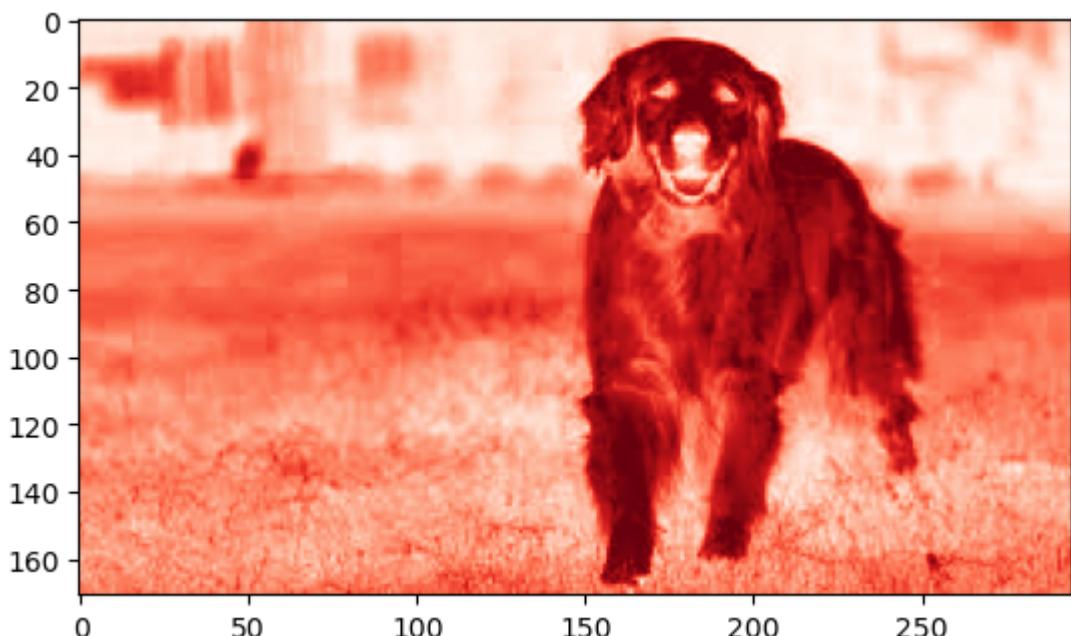
```
In [35]: plt.imshow(gold_arr2[:, :, 1], cmap='Blues')
```

```
Out[35]: <matplotlib.image.AxesImage at 0x1bd83fe01a0>
```



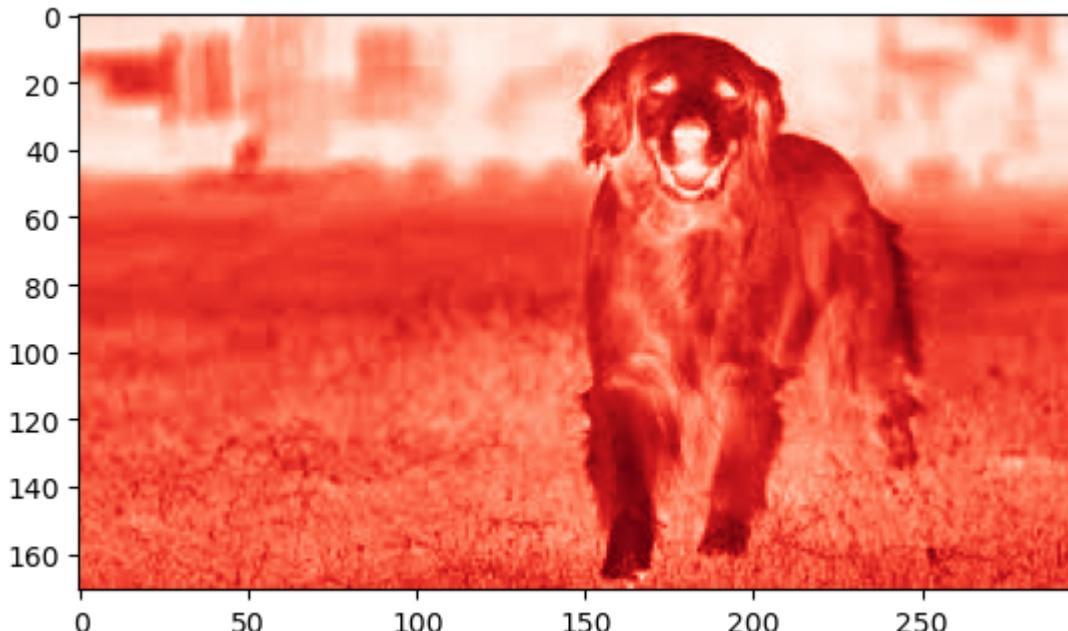
```
In [58]: plt.imshow(gold_arr2[:, :, 0], cmap='Reds')
```

```
Out[58]: <matplotlib.image.AxesImage at 0x23239e2b3b0>
```



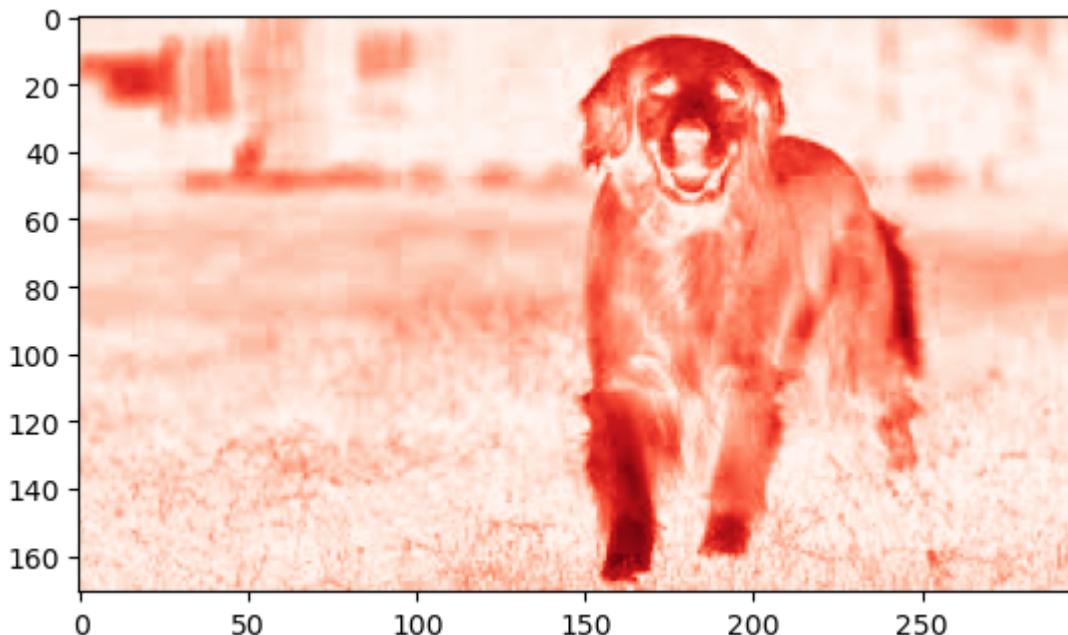
```
In [32]: plt.imshow(gold_arr2[:, :, 1], cmap='Reds')
```

```
Out[32]: <matplotlib.image.AxesImage at 0x1bd826aa540>
```



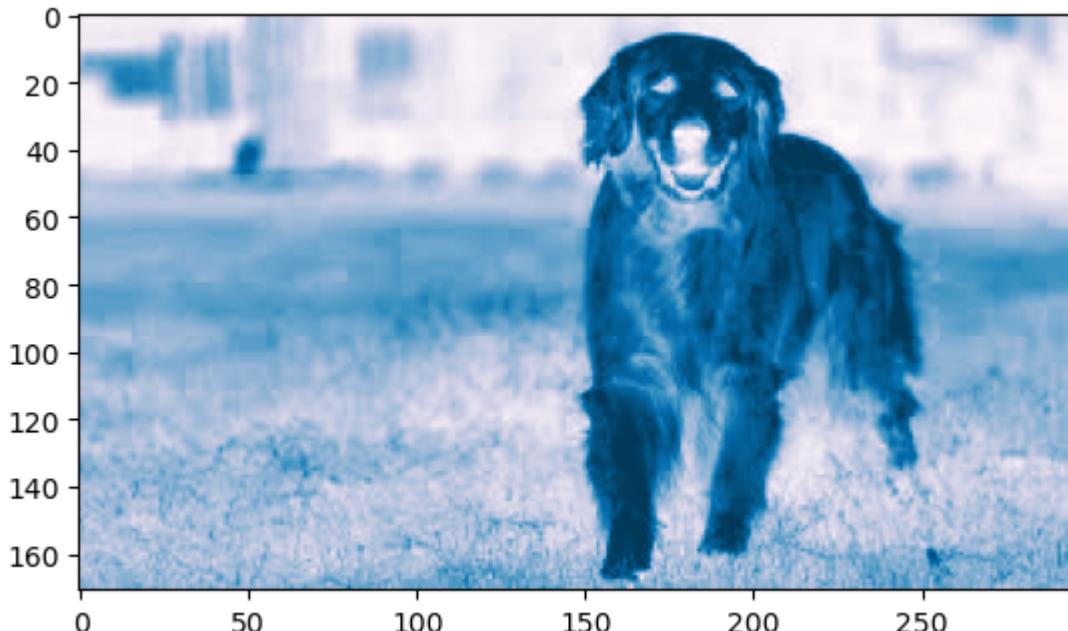
```
In [31]: plt.imshow(gold_arr2[:, :, 2], cmap='Reds')
```

```
Out[31]: <matplotlib.image.AxesImage at 0x1bd84099e80>
```



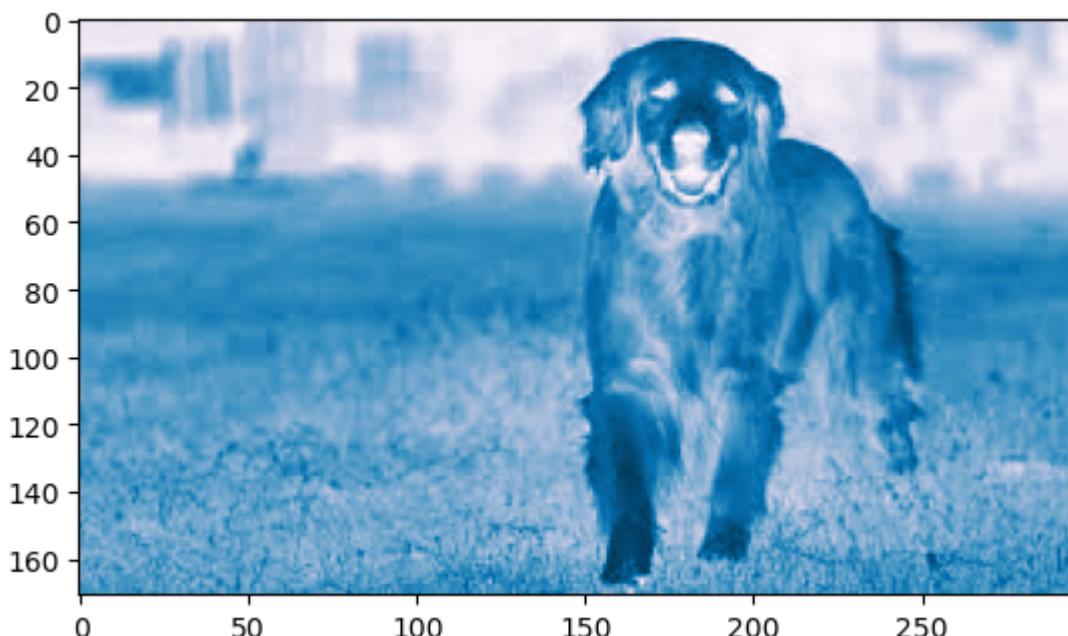
```
In [59]: plt.imshow(gold_arr2[:, :, 0], cmap='PuBu')
```

```
Out[59]: <matplotlib.image.AxesImage at 0x23238606690>
```



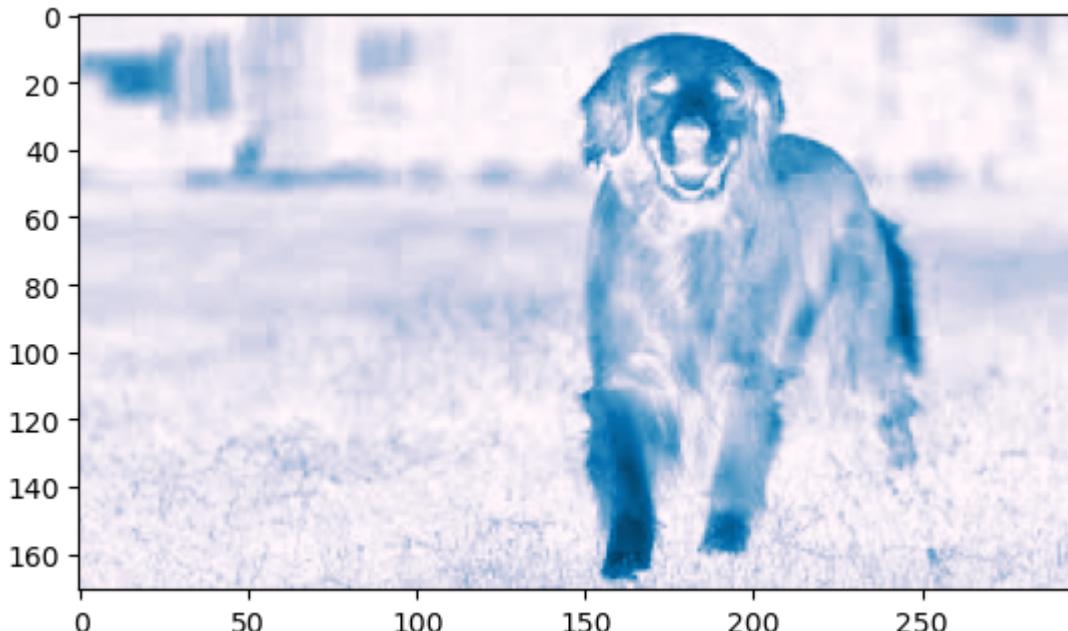
```
In [33]: plt.imshow(gold_arr2[:, :, 1], cmap='PuBu')
```

```
Out[33]: <matplotlib.image.AxesImage at 0x1bd8452ec90>
```



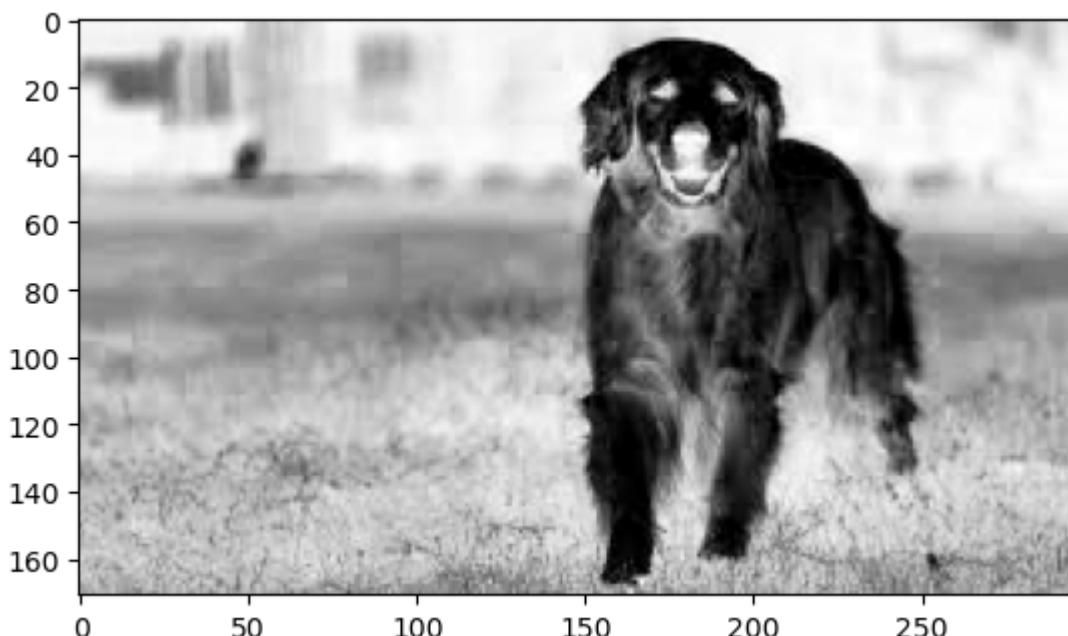
```
In [34]: plt.imshow(gold_arr2[:, :, 2], cmap='PuBu')
```

```
Out[34]: <matplotlib.image.AxesImage at 0x1bd859221e0>
```



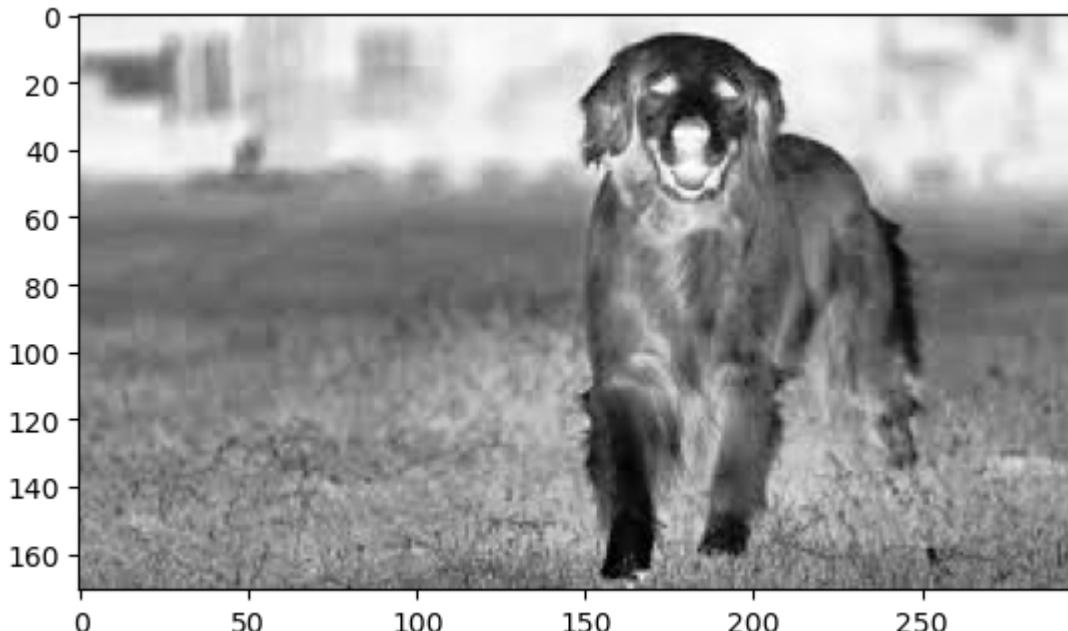
```
In [84]: plt.imshow(gold_arr2[:, :, 0], cmap='Greys')
```

```
Out[84]: <matplotlib.image.AxesImage at 0x2323ba2e3f0>
```



```
In [36]: plt.imshow(gold_arr2[:, :, 1], cmap='Greys')
```

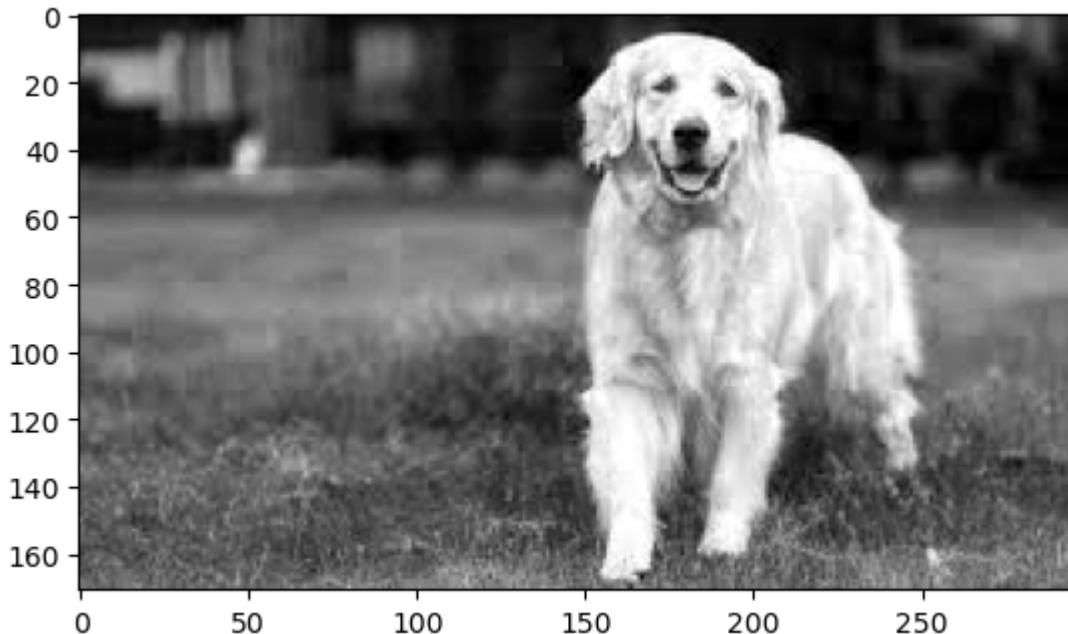
```
Out[36]: <matplotlib.image.AxesImage at 0x1bd848cf5c0>
```



```
In [92]: plt.imshow(gold_arr2[:, :, 1], cmap='Greys')
```

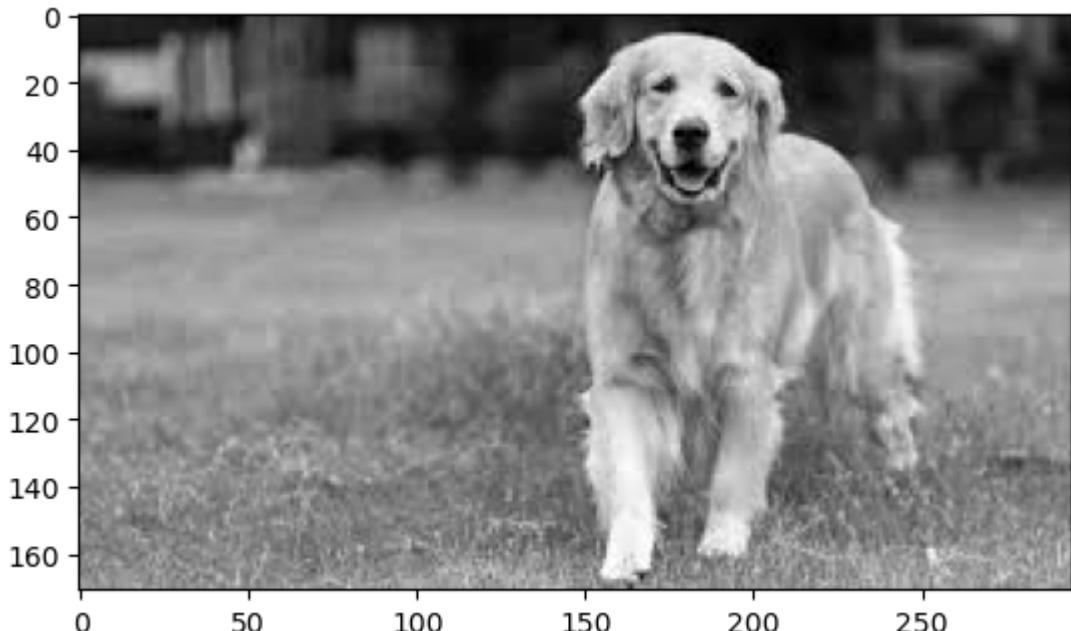
```
In [93]: plt.imshow(gold_arr2[:, :, 0], cmap='grey')
```

```
Out[93]: <matplotlib.image.AxesImage at 0x2323b7fe840>
```



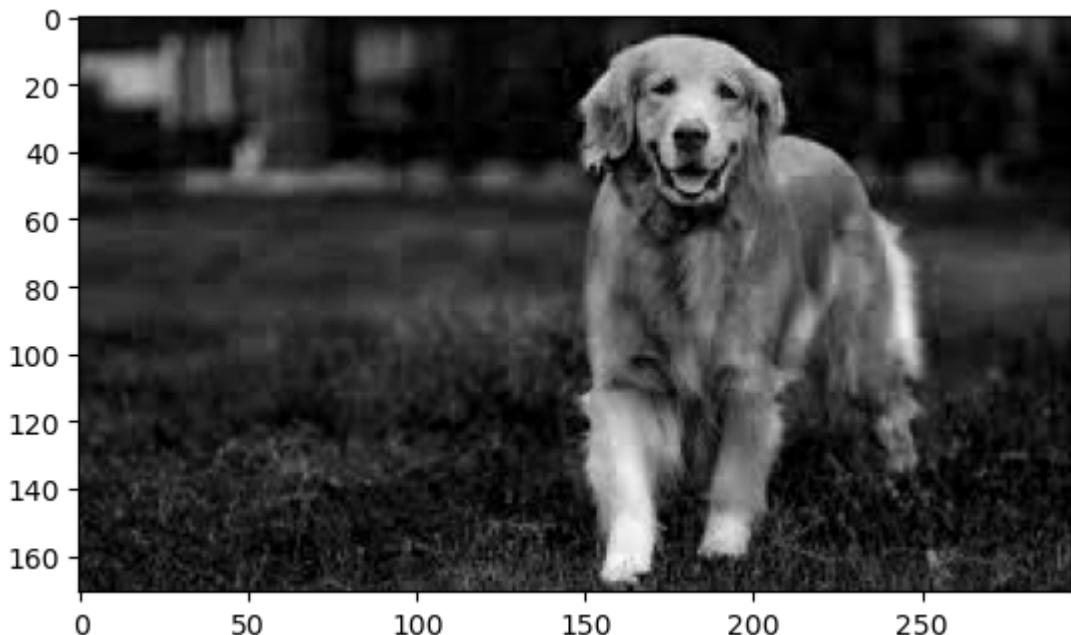
```
In [71]: plt.imshow(gold_arr2[:, :, 1], cmap='grey')
```

```
Out[71]: <matplotlib.image.AxesImage at 0x2323a6c1d00>
```



```
In [70]: plt.imshow(gold_arr2[:, :, 2], cmap='grey')
```

```
Out[70]: <matplotlib.image.AxesImage at 0x2323a7a6330>
```



```
In [38]: gold_arr2[:, :, 0]
```

```
Out[38]: array([[ 18,  18,  18, ...,  37,  38,  43],
   [ 18,  18,  18, ...,  38,  40,  43],
   [ 19,  19,  19, ...,  39,  40,  45],
   ...,
   [121, 117, 104, ..., 147, 122, 110],
   [114, 119, 110, ..., 121, 109, 114],
   [105, 121, 118, ..., 106, 103, 119]], dtype=uint8)
```

```
In [39]: gold_arr2[:, :, 1]
```

```
Out[39]: array([[ 36,  36,  36, ...,  34,  38,  43],
   [ 36,  36,  36, ...,  35,  37,  43],
   [ 36,  36,  36, ...,  35,  37,  42],
   ...,
   [164, 160, 148, ..., 187, 162, 150],
   [155, 160, 154, ..., 161, 149, 154],
   [144, 162, 159, ..., 148, 145, 161]], dtype=uint8)
```

```
In [42]: gold_arr2[:, :, 2]
```

```
Out[42]: array([[20, 20, 20, ..., 25, 30, 35],
   [20, 20, 20, ..., 26, 30, 35],
   [20, 20, 20, ..., 26, 30, 35],
   ...,
   [48, 42, 27, ..., 65, 40, 28],
   [37, 42, 33, ..., 39, 27, 32],
   [27, 42, 39, ..., 24, 21, 37]], dtype=uint8)
```

```
In [88]: gold_arr2
```

```
Out[88]: array([[[ 18,  36,  20],
   [ 18,  36,  20],
   [ 18,  36,  20],
   ...,
   [ 37,  34,  25],
   [ 38,  38,  30],
   [ 43,  43,  35]],

   [[ 18,  36,  20],
   [ 18,  36,  20],
   [ 18,  36,  20],
   ...,
   [ 38,  35,  26],
   [ 40,  37,  30],
   [ 43,  43,  35]],

   [[ 19,  36,  20],
   [ 19,  36,  20],
   [ 19,  36,  20],
   ...,
   [ 39,  35,  26],
   [ 40,  37,  30],
   [ 45,  42,  35]],

   ...,

   [[121, 164,  48],
   [117, 160,  42],
   [104, 148,  27],
   ...,
   [147, 187,  65],
   [122, 162,  40],
   [110, 150,  28]],

   [[114, 155,  37],
   [119, 160,  42],
   [110, 154,  33],
   ...,
   [121, 161,  39],
   [109, 149,  27],
   [114, 154,  32]],

   [[105, 144,  27],
   [121, 162,  42],
   [118, 159,  39],
   ...,
   [106, 148,  24],
   [103, 145,  21],
   [119, 161,  37]]], dtype=uint8)
```

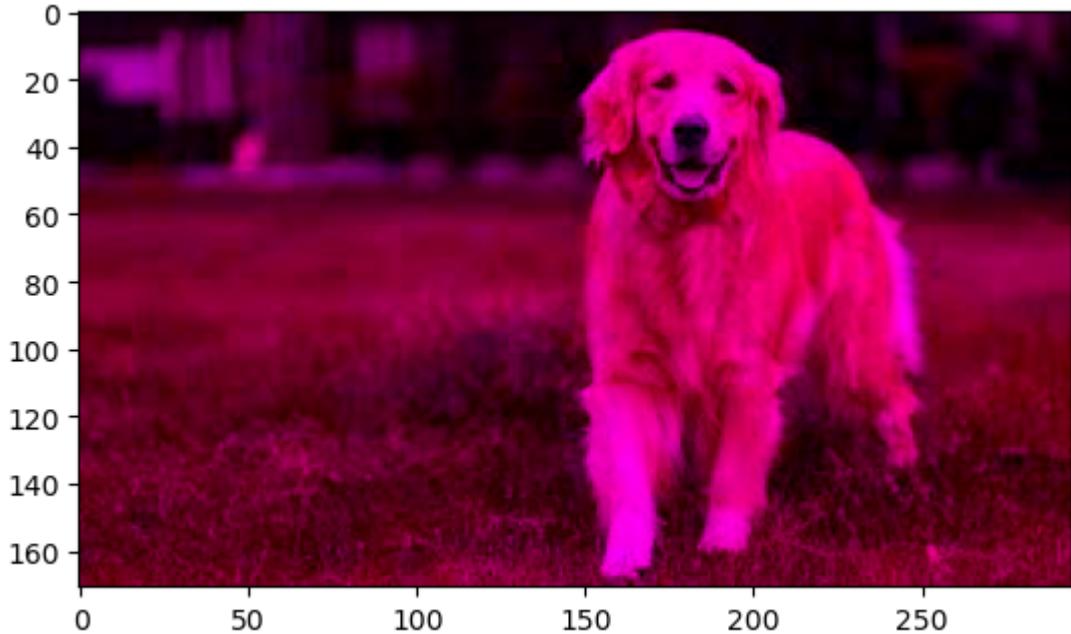
```
In [89]: gold_arr2[:, :, 1] = 0
```

```
In [90]: gold_arr2[:, :, 1]
```

```
Out[90]: 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 [91]: plt.imshow(gold_arr2)
```

```
Out[91]: <matplotlib.image.AxesImage at 0x1bd85d9be30>
```



```
In [54]: gold_arr2
```

```
Out[54]: array([[[ 18,    0,   20],
   [ 18,    0,   20],
   [ 18,    0,   20],
   ...,
   [ 37,    0,   25],
   [ 38,    0,   30],
   [ 43,    0,   35]],

   [[ 18,    0,   20],
   [ 18,    0,   20],
   [ 18,    0,   20],
   ...,
   [ 38,    0,   26],
   [ 40,    0,   30],
   [ 43,    0,   35]],

   [[ 19,    0,   20],
   [ 19,    0,   20],
   [ 19,    0,   20],
   ...,
   [ 39,    0,   26],
   [ 40,    0,   30],
   [ 45,    0,   35]],

   ...,

   [[[121,    0,   48],
   [117,    0,   42],
   [104,    0,   27],
   ...,
   [147,    0,   65],
   [122,    0,   40],
   [110,    0,   28]],

   [[114,    0,   37],
   [119,    0,   42],
   [110,    0,   33],
   ...,
   [121,    0,   39],
   [109,    0,   27],
   [114,    0,   32]],

   [[[105,    0,   27],
   [121,    0,   42],
   [118,    0,   39],
   ...,
   [106,    0,   24],
   [103,    0,   21],
   [119,    0,   37]]], dtype=uint8)
```

```
In [95]: gold_arr2[:, :, 2]
```

```
Out[95]: array([[20, 20, 20, ..., 25, 30, 35],
 [20, 20, 20, ..., 26, 30, 35],
 [20, 20, 20, ..., 26, 30, 35],
 ...,
 [48, 42, 27, ..., 65, 40, 28],
 [37, 42, 33, ..., 39, 27, 32],
 [27, 42, 39, ..., 24, 21, 37]], dtype=uint8)
```

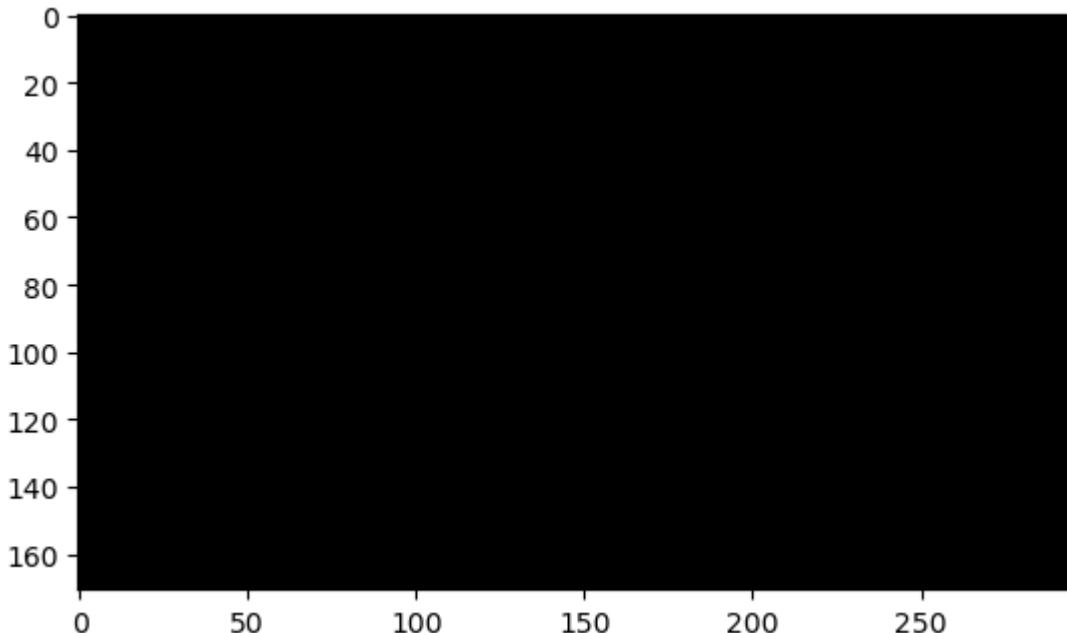
```
In [96]: gold_arr2[:, :, 2] = 0
```

```
In [97]: gold_arr2[:, :, 2]
```

```
Out[97]: 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 [98]: plt.imshow(gold_arr2)
```

```
Out[98]: <matplotlib.image.AxesImage at 0x1bd85d9a690>
```



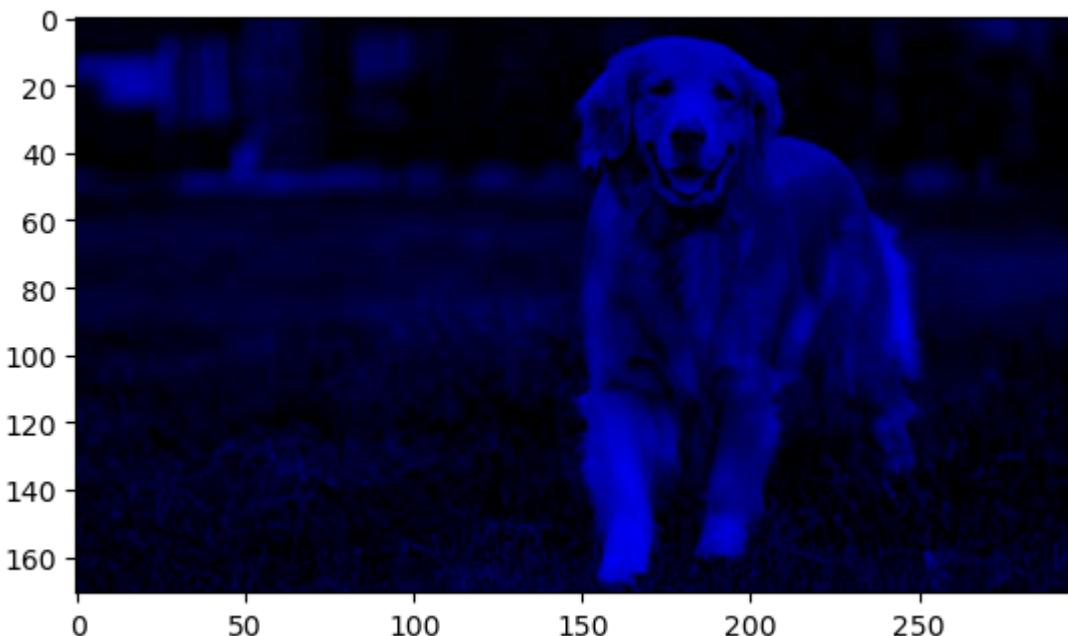
```
In [92]: gold_arr2[:, :, 0] = 0
```

```
In [93]: gold_arr2[:, :, 0]
```

```
Out[93]: 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 [94]: plt.imshow(gold_arr2)
```

```
Out[94]: <matplotlib.image.AxesImage at 0x1bd85cef0aa0>
```



```
In [ ]: gold_arr
```

```
In [ ]:
```

```
In [60]: gold_arr2
```

```
Out[60]: array([[[ 18,    0,    0],
   [ 18,    0,    0],
   [ 18,    0,    0],
   ...,
   [ 37,    0,    0],
   [ 38,    0,    0],
   [ 43,    0,    0]],

   [[ 18,    0,    0],
   [ 18,    0,    0],
   [ 18,    0,    0],
   ...,
   [ 38,    0,    0],
   [ 40,    0,    0],
   [ 43,    0,    0]],

   [[ 19,    0,    0],
   [ 19,    0,    0],
   [ 19,    0,    0],
   ...,
   [ 39,    0,    0],
   [ 40,    0,    0],
   [ 45,    0,    0]],

   ...,

   [[[121,    0,    0],
   [117,    0,    0],
   [104,    0,    0],
   ...,
   [147,    0,    0],
   [122,    0,    0],
   [110,    0,    0]],

   [[114,    0,    0],
   [119,    0,    0],
   [110,    0,    0],
   ...,
   [121,    0,    0],
   [109,    0,    0],
   [114,    0,    0]],

   [[105,    0,    0],
   [121,    0,    0],
   [118,    0,    0],
   ...,
   [106,    0,    0],
   [103,    0,    0],
   [119,    0,    0]]], dtype=uint8)
```

```
In [61]: gold_img
```

Out[61]:



In [62]: arr1 = np.asarray(gold\_img)

In [63]: arr1

```
Out[63]: array([[[ 18,  36,  20],
   [ 18,  36,  20],
   [ 18,  36,  20],
   ...,
   [ 37,  34,  25],
   [ 38,  38,  30],
   [ 43,  43,  35]],

   [[ 18,  36,  20],
   [ 18,  36,  20],
   [ 18,  36,  20],
   ...,
   [ 38,  35,  26],
   [ 40,  37,  30],
   [ 43,  43,  35]],

   [[ 19,  36,  20],
   [ 19,  36,  20],
   [ 19,  36,  20],
   ...,
   [ 39,  35,  26],
   [ 40,  37,  30],
   [ 45,  42,  35]],

   ...,

   [[121, 164,  48],
   [117, 160,  42],
   [104, 148,  27],
   ...,
   [147, 187,  65],
   [122, 162,  40],
   [110, 150,  28]],

   [[114, 155,  37],
   [119, 160,  42],
   [110, 154,  33],
   ...,
   [121, 161,  39],
   [109, 149,  27],
   [114, 154,  32]],

   [[105, 144,  27],
   [121, 162,  42],
   [118, 159,  39],
   ...,
   [106, 148,  24],
   [103, 145,  21],
   [119, 161,  37]]], dtype=uint8)
```

```
In [99]: type(arr1)
```

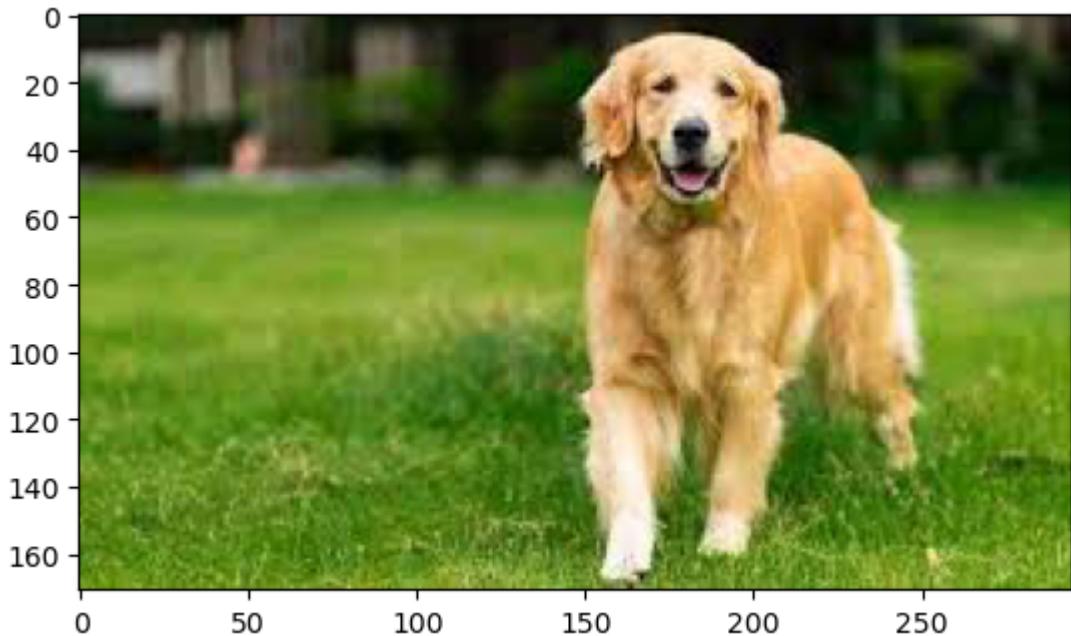
```
Out[99]: numpy.ndarray
```

```
In [100...]: arr1.shape
```

```
Out[100...]: (171, 295, 3)
```

```
In [101...]: plt.imshow(gold_img)
```

```
Out[101... <matplotlib.image.AxesImage at 0x1bd840911c0>
```

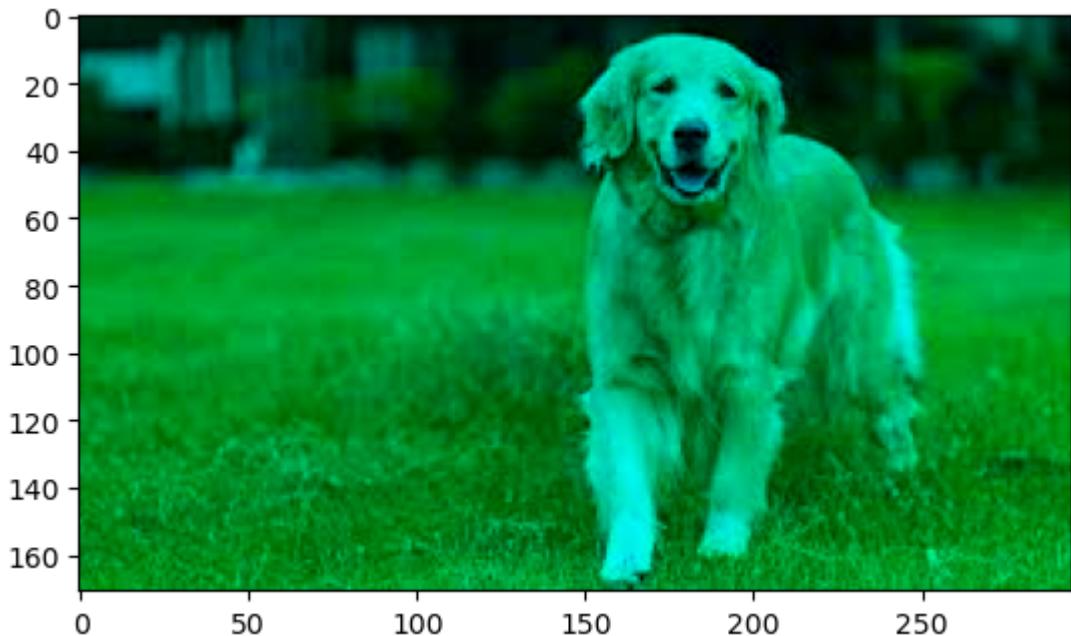


```
In [102... gold_img1 = arr1.copy()
```

```
In [103... gold_img1[:, :, 0] = 0
```

```
In [104... plt.imshow(gold_img1)
```

```
Out[104... <matplotlib.image.AxesImage at 0x1bd87612960>
```



```
In [105... gold_img1[:, :, 1] = 0
```

```
In [106... plt.imshow(gold_img1)
```

```
Out[106... <matplotlib.image.AxesImage at 0x1bd873bbfe0>
```

