02nd May 2025 - Open CV workshop

- https://www.youtube.com/watch?v=u-ym7BWHO-g&list=PLVlQHNRLflP9vV2_FO8h1yiVD90XhJy8M&index=14
- https://www.youtube.com/watch?v=cnA-5rY3DXQ&list=PLVlQHNRLflP9vV2_FO8h1yiVD90XhJy8M&index=13

OpenCV

- Numpy reading Image, Blur Image, CMAP Introduction
- Human Vision vs Computer Vision
- Image & how image can understand by computer
- Image - array - pixel
- pixel ranging between 0-255 0 -> Completely Black 255 -> Brighten Example: Dark red color -> 200-255 Light red color -> 0-10, 0-20
- 2D Channel - Black & White
- 3D Channel - RGB (Red, Green, Blue) gray_scale image => Not colored image

colored image => colorfull image not black & white image - understand the practicle as how image -- array -- shape of an array - numpy & plt (generate impage (work with values with array) - any color you can make modify with the image - Computer Vision libraries are opencv (cv2) yolov8, yolov9

In [ ]:

In [ ]:

Image Reading with Numpy & Matplotlib

In [13]:
```
import numpy as np   # library for dimensional (nd array)
```

In [4]:
```
ones_arr = np.ones((5,5))
ones_arr
```

Out[4]:
```
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 [5]:
```
ones_arr = np.ones((5,5), dtype = int)
ones_arr
```

Out[5]:
```
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 [6]:
```
zeros_arr = np.zeros((3,3), dtype = int)
zeros_arr
```

Out[6]:
```
array([[0, 0, 0],
       [0, 0, 0],
       [0, 0, 0]])
```

In [7]:
```
ones_arr
```

Out[7]:
```
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 [9]:
```
ones_arr * 255   # converting into 255
```

Out[9]:
```
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 [10]:
```
zeros_arr
```

Out[10]:
```
array([[0, 0, 0],
       [0, 0, 0],
       [0, 0, 0]])
```

In [11]:
```
ones_arr
```

Out[11]:
```
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 [12]:
```
import matplotlib.pyplot as plt   # library for Visualization
```

%matplotlib inline # all the pictures are keep inside in graphs)

In [17]:
```
from PIL import Image      # PIL represents Python Image library
```

In [19]:
```
horse_img = Image.open(r'C:\Users\Windows10 Pro\Downloads\horse.jpg')
horse_img
```

Out[19]:

In [20]:
```
type(horse_img)
```

Out[20]:
```
PIL.JpegImagePlugin.JpegImageFile
```

In [23]:
```
horse_arr = np.asarray(horse_img)
horse_arr
```

Out[23]:
```
array([[[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [179, 181, 176],
        [177, 182, 176],
        [177, 182, 176]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [178, 180, 175],
        [176, 181, 175],
        [176, 181, 175]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [177, 179, 174],
        [175, 180, 174],
        [175, 180, 174]],

       ...,

       [[179, 149, 115],
        [180, 150, 116],
        [181, 151, 117],
        ...,
        [124, 104,  80],
        [124, 104,  80],
        [124, 104,  80]],

       [[169, 139, 105],
        [169, 139, 105],
        [168, 138, 104],
        ...,
        [ 97,  77,  53],
        [ 96,  76,  52],
        [ 96,  76,  52]],

       [[177, 147, 113],
        [170, 140, 106],
        [159, 129,  95],
        ...,
        [106,  85,  64],
        [105,  84,  63],
        [105,  84,  63]]], dtype=uint8)
```

In [24]:
```
type(horse_arr)
```

Out[24]:
```
numpy.ndarray
```

In [25]:
```
horse_arr.shape
```

Out[25]: (183, 275, 3)

In [26]:
```
plt.imshow(horse_img)
```

Out[26]: <matplotlib.image.AxesImage at 0x1bab36088f0>

In [28]:
```
horse_red = horse_arr.copy()
horse_red
```

Out[28]:
```
array([[[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [179, 181, 176],
        [177, 182, 176],
        [177, 182, 176]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [178, 180, 175],
        [176, 181, 175],
        [176, 181, 175]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [177, 179, 174],
        [175, 180, 174],
        [175, 180, 174]],

       ...,

       [[179, 149, 115],
        [180, 150, 116],
        [181, 151, 117],
        ...,
        [124, 104,  80],
        [124, 104,  80],
        [124, 104,  80]],

       [[169, 139, 105],
        [169, 139, 105],
        [168, 138, 104],
        ...,
        [ 97,  77,  53],
        [ 96,  76,  52],
        [ 96,  76,  52]],

       [[177, 147, 113],
        [170, 140, 106],
        [159, 129,  95],
        ...,
        [106,  85,  64],
        [105,  84,  63],
        [105,  84,  63]]], dtype=uint8)
```

In [29]:
```
horse_arr == horse_red
```

Out[29]:
```
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]]])
```

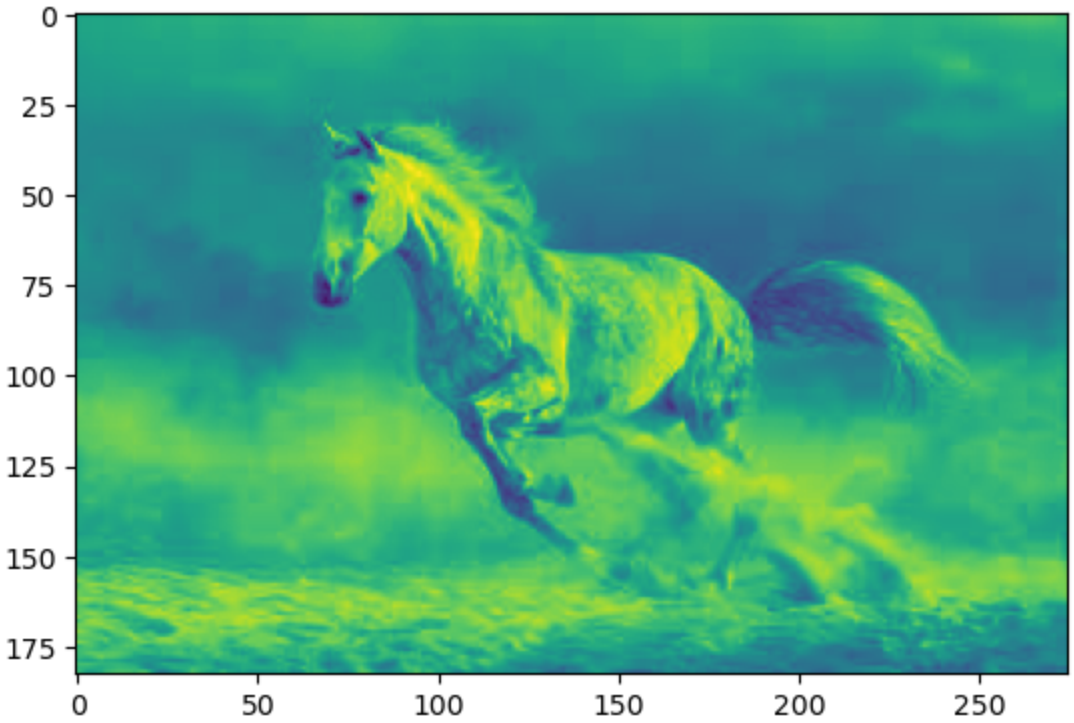
In [30]:
```
plt.imshow(horse_red)
plt.show()
```

In [31]:
```
horse_red.shape
```

Out[31]:
```
(183, 275, 3)
```

In [34]:
```
# R G B
plt.imshow(horse_red[:,:,0])
```

Out[34]:
```
<matplotlib.image.AxesImage at 0x1bab36426c0>
```



In [35]:
```
horse_red[:,:,0]
```

Out[35]:
```
array([[150, 150, 151, ..., 179, 177, 177],
       [150, 150, 151, ..., 178, 176, 176],
       [150, 150, 151, ..., 177, 175, 175],
       ...,
       [179, 180, 181, ..., 124, 124, 124],
       [169, 169, 168, ...,  97,  96,  96],
       [177, 170, 159, ..., 106, 105, 105]], dtype=uint8)
```

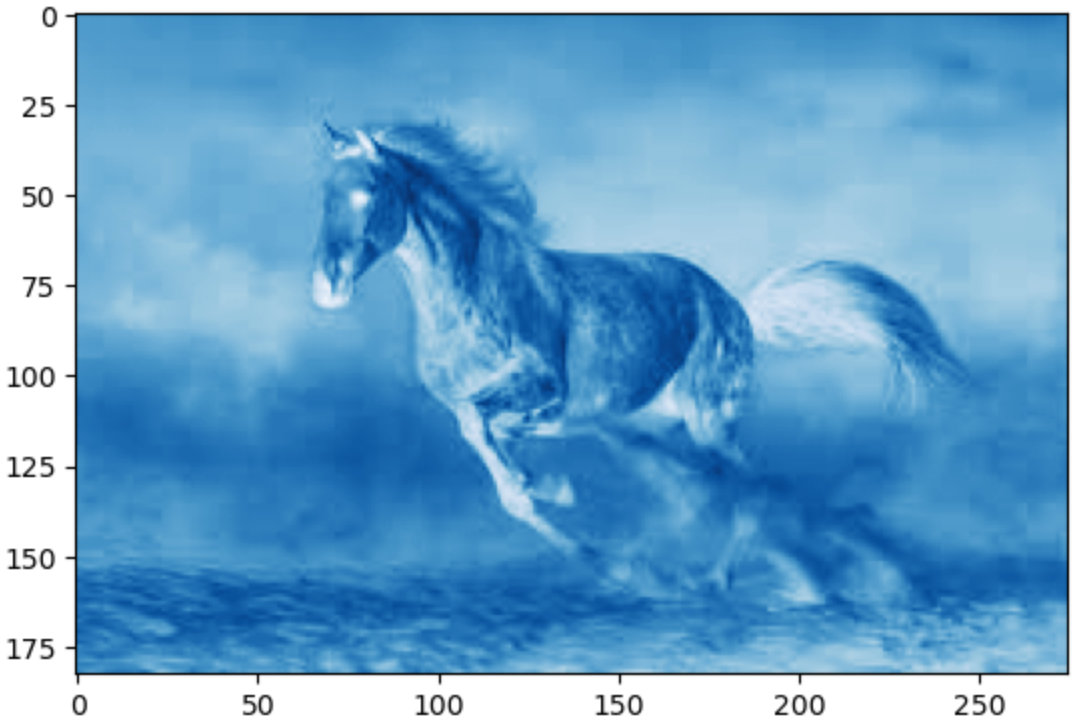
https://matplotlib.org/stable/gallery/color/cc

In [36]:
```
plt.imshow(horse_red[:,:,0], cmap = 'grey')
```

Out[36]:
```
<matplotlib.image.AxesImage at 0x1bab75c4230>
```

In [38]:
```
plt.imshow(horse_red[:,:,0], cmap = 'Blues')
```

Out[38]:
```
<matplotlib.image.AxesImage at 0x1bab8ffe270>
```



In [42]:
```
plt.imshow(horse_red[:,:,0], cmap = 'grey')
```

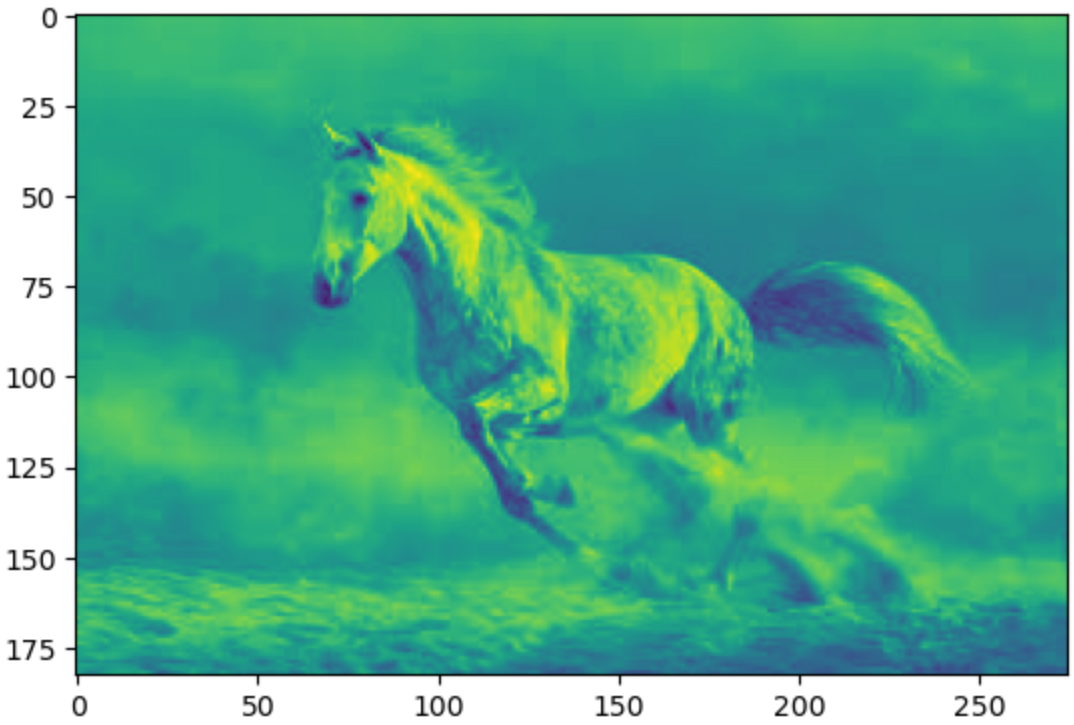
Out[42]: <matplotlib.image.AxesImage at 0x1bab90df650>

In [43]:
```
plt.imshow(horse_red[:,:,1], cmap = 'grey')
```

Out[43]: <matplotlib.image.AxesImage at 0x1bab90abe60>

In [44]:
```
plt.imshow(horse_red[:,:,1])
```

Out[44]: <matplotlib.image.AxesImage at 0x1baba3347a0>



In [45]:
```
horse_red[:,:,2]
```

Out[45]:
```
array([[176, 176, 177, ..., 176, 176, 176],
       [176, 176, 177, ..., 175, 175, 175],
       [176, 176, 177, ..., 174, 174, 174],
       ...,
       [115, 116, 117, ...,  80,  80,  80],
       [105, 105, 104, ...,  53,  52,  52],
       [113, 106,  95, ...,  64,  63,  63]], dtype=uint8)
```

In [47]:
```
horse_red[:,:,1]
```

Out[47]:
```
array([[169, 169, 170, ..., 181, 182, 182],
       [169, 169, 170, ..., 180, 181, 181],
       [169, 169, 170, ..., 179, 180, 180],
       ...,
       [149, 150, 151, ..., 104, 104, 104],
       [139, 139, 138, ...,  77,  76,  76],
       [147, 140, 129, ...,  85,  84,  84]], dtype=uint8)
```

In [49]:
```
horse_red[:,:,1] = 0
horse_red[:,:,1]
```

Out[49]:
```
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 [50]:
```
plt.imshow(horse_red)
```

Out[50]:
```
<matplotlib.image.AxesImage at 0x1baba337cb0>
```

In [51]:
```
horse_arr
```

Out[51]:
```
array([[[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [179, 181, 176],
        [177, 182, 176],
        [177, 182, 176]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [178, 180, 175],
        [176, 181, 175],
        [176, 181, 175]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [177, 179, 174],
        [175, 180, 174],
        [175, 180, 174]],

       ...,

       [[179, 149, 115],
        [180, 150, 116],
        [181, 151, 117],
        ...,
        [124, 104,  80],
        [124, 104,  80],
        [124, 104,  80]],

       [[169, 139, 105],
        [169, 139, 105],
        [168, 138, 104],
        ...,
        [ 97,  77,  53],
        [ 96,  76,  52],
        [ 96,  76,  52]],

       [[177, 147, 113],
        [170, 140, 106],
        [159, 129,  95],
        ...,
        [106,  85,  64],
        [105,  84,  63],
        [105,  84,  63]]], dtype=uint8)
```

In [52]:
```
horse_red
```

Out[52]:
```
array([[[150,   0, 176],
        [150,   0, 176],
        [151,   0, 177],
        ...,
        [179,   0, 176],
        [177,   0, 176],
        [177,   0, 176]],

       [[150,   0, 176],
        [150,   0, 176],
        [151,   0, 177],
        ...,
        [178,   0, 175],
        [176,   0, 175],
        [176,   0, 175]],

       [[150,   0, 176],
        [150,   0, 176],
        [151,   0, 177],
        ...,
        [177,   0, 174],
        [175,   0, 174],
        [175,   0, 174]],

       ...,

       [[179,   0, 115],
        [180,   0, 116],
        [181,   0, 117],
        ...,
        [124,   0,  80],
        [124,   0,  80],
        [124,   0,  80]],

       [[169,   0, 105],
        [169,   0, 105],
        [168,   0, 104],
        ...,
        [ 97,   0,  53],
        [ 96,   0,  52],
        [ 96,   0,  52]],

       [[177,   0, 113],
        [170,   0, 106],
        [159,   0,  95],
        ...,
        [106,   0,  64],
        [105,   0,  63],
        [105,   0,  63]]], dtype=uint8)
```

In [53]:
```
horse_img
```

Out[53]:

In [54]:
```
arr1 = np.asarray(horse_img)
arr1
```

Out[54]:
```
array([[[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [179, 181, 176],
        [177, 182, 176],
        [177, 182, 176]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [178, 180, 175],
        [176, 181, 175],
        [176, 181, 175]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [177, 179, 174],
        [175, 180, 174],
        [175, 180, 174]],

       ...,

       [[179, 149, 115],
        [180, 150, 116],
        [181, 151, 117],
        ...,
        [124, 104,  80],
        [124, 104,  80],
        [124, 104,  80]],

       [[169, 139, 105],
        [169, 139, 105],
        [168, 138, 104],
        ...,
        [ 97,  77,  53],
        [ 96,  76,  52],
        [ 96,  76,  52]],

       [[177, 147, 113],
        [170, 140, 106],
        [159, 129,  95],
        ...,
        [106,  85,  64],
        [105,  84,  63],
        [105,  84,  63]]], dtype=uint8)
```

In [55]:
```
type(arr1)
```

Out[55]:
```
numpy.ndarray
```

In [56]:
```
arr1.shape
```

Out[56]: (183, 275, 3)

In [57]:
```
plt.imshow(arr1)
```

Out[57]: <matplotlib.image.AxesImage at 0x1baba40d580>

In [58]:
```
horse_img1 = arr1.copy()
horse_img1
```

Out[58]:
```
array([[[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [179, 181, 176],
        [177, 182, 176],
        [177, 182, 176]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [178, 180, 175],
        [176, 181, 175],
        [176, 181, 175]],

       [[150, 169, 176],
        [150, 169, 176],
        [151, 170, 177],
        ...,
        [177, 179, 174],
        [175, 180, 174],
        [175, 180, 174]],

       ...,

       [[179, 149, 115],
        [180, 150, 116],
        [181, 151, 117],
        ...,
        [124, 104,  80],
        [124, 104,  80],
        [124, 104,  80]],

       [[169, 139, 105],
        [169, 139, 105],
        [168, 138, 104],
        ...,
        [ 97,  77,  53],
        [ 96,  76,  52],
        [ 96,  76,  52]],

       [[177, 147, 113],
        [170, 140, 106],
        [159, 129,  95],
        ...,
        [106,  85,  64],
        [105,  84,  63],
        [105,  84,  63]]], dtype=uint8)
```

In [59]:
```
horse_img1[:,:,0] = 0
horse_img1
```

Out[59]:
```
array([[[  0, 169, 176],
        [  0, 169, 176],
        [  0, 170, 177],
        ...,
        [  0, 181, 176],
        [  0, 182, 176],
        [  0, 182, 176]],

       [[  0, 169, 176],
        [  0, 169, 176],
        [  0, 170, 177],
        ...,
        [  0, 180, 175],
        [  0, 181, 175],
        [  0, 181, 175]],

       [[  0, 169, 176],
        [  0, 169, 176],
        [  0, 170, 177],
        ...,
        [  0, 179, 174],
        [  0, 180, 174],
        [  0, 180, 174]],

       ...,

       [[  0, 149, 115],
        [  0, 150, 116],
        [  0, 151, 117],
        ...,
        [  0, 104,  80],
        [  0, 104,  80],
        [  0, 104,  80]],

       [[  0, 139, 105],
        [  0, 139, 105],
        [  0, 138, 104],
        ...,
        [  0,  77,  53],
        [  0,  76,  52],
        [  0,  76,  52]],

       [[  0, 147, 113],
        [  0, 140, 106],
        [  0, 129,  95],
        ...,
        [  0,  85,  64],
        [  0,  84,  63],
        [  0,  84,  63]]], dtype=uint8)
```

In [60]:
```
plt.imshow(horse_img1)
```

Out[60]:
```
<matplotlib.image.AxesImage at 0x1baba426390>
```

In [61]:
```
horse_img1[:,:,1]
```

Out[61]:
```
array([[169, 169, 170, ..., 181, 182, 182],
       [169, 169, 170, ..., 180, 181, 181],
       [169, 169, 170, ..., 179, 180, 180],
       ...,
       [149, 150, 151, ..., 104, 104, 104],
       [139, 139, 138, ...,  77,  76,  76],
       [147, 140, 129, ...,  85,  84,  84]], dtype=uint8)
```

In [63]:
```
horse_img1[:,:,1] = 0
horse_img1
```

Out[63]:
```
array([[[  0,   0, 176],
        [  0,   0, 176],
        [  0,   0, 177],
        ...,
        [  0,   0, 176],
        [  0,   0, 176],
        [  0,   0, 176]],

       [[  0,   0, 176],
        [  0,   0, 176],
        [  0,   0, 177],
        ...,
        [  0,   0, 175],
        [  0,   0, 175],
        [  0,   0, 175]],

       [[  0,   0, 176],
        [  0,   0, 176],
        [  0,   0, 177],
        ...,
        [  0,   0, 174],
        [  0,   0, 174],
        [  0,   0, 174]],

       ...,

       [[  0,   0, 115],
        [  0,   0, 116],
        [  0,   0, 117],
        ...,
        [  0,   0,  80],
        [  0,   0,  80],
        [  0,   0,  80]],

       [[  0,   0, 105],
        [  0,   0, 105],
        [  0,   0, 104],
        ...,
        [  0,   0,  53],
        [  0,   0,  52],
        [  0,   0,  52]],

       [[  0,   0, 113],
        [  0,   0, 106],
        [  0,   0,  95],
        ...,
        [  0,   0,  64],
        [  0,   0,  63],
        [  0,   0,  63]]], dtype=uint8)
```

In [64]:
```
horse_img1[:,:,1]
```

Out[64]:
```
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 [65]:
```
plt.imshow(horse_img1)
```

Out[65]:
```
<matplotlib.image.AxesImage at 0x1baba492300>
```

In [ ]: