Saving and loading arrays

INTRODUCTION TO NUMPY

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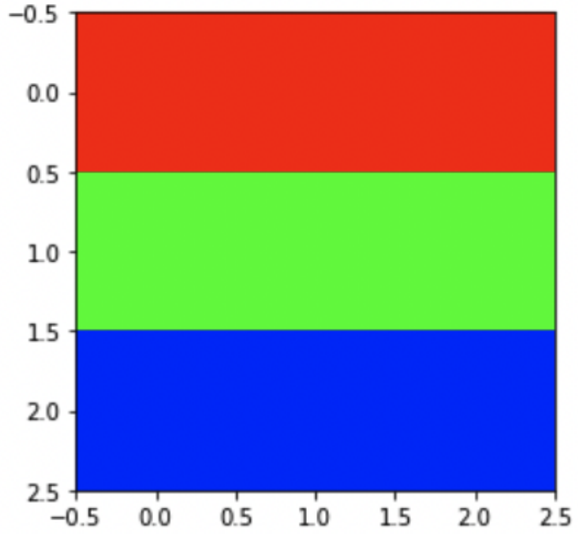
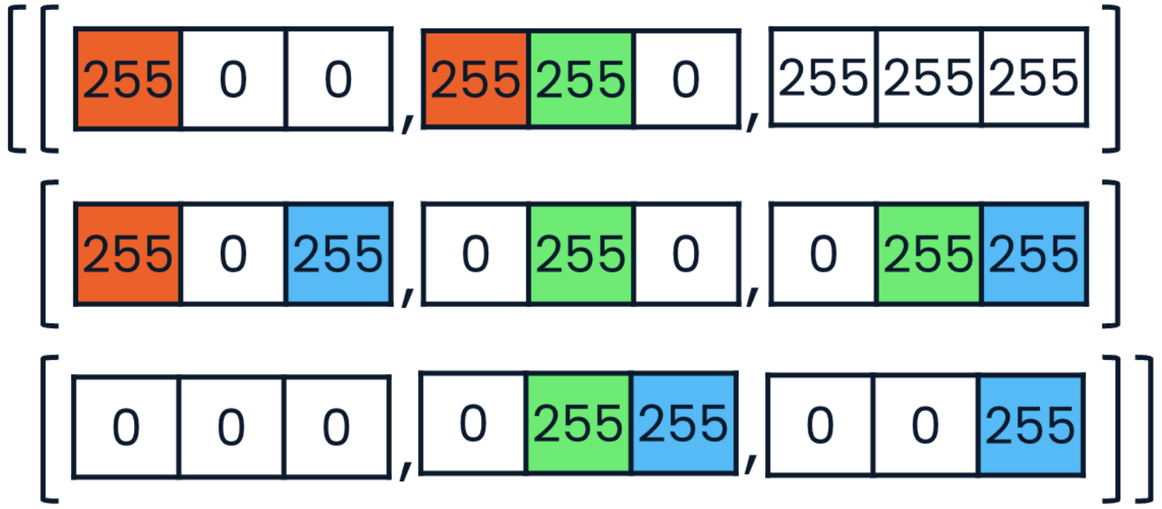
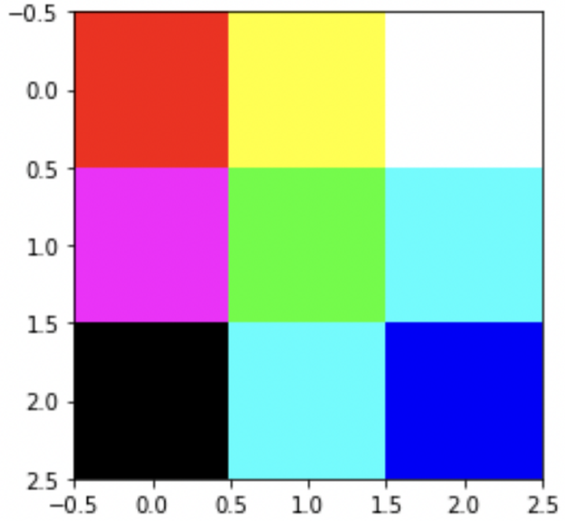
RGB arrays

```
rgb = np.array([[[255, 0, 0], [255, 0, 0], [255, 0, 0]],
                [[0, 255, 0], [0, 255, 0], [0, 255, 0]],
                [[0, 0, 255], [0, 0, 255], [0, 0, 255]]])
plt.imshow(rgb)
plt.show()
```



RGB arrays


255 0 0 , 255 255 0 , 255 255 255
255 0 255 , 0 255 0 , 0 255 255
0 0 0 , 0 255 255 , 0 0 255

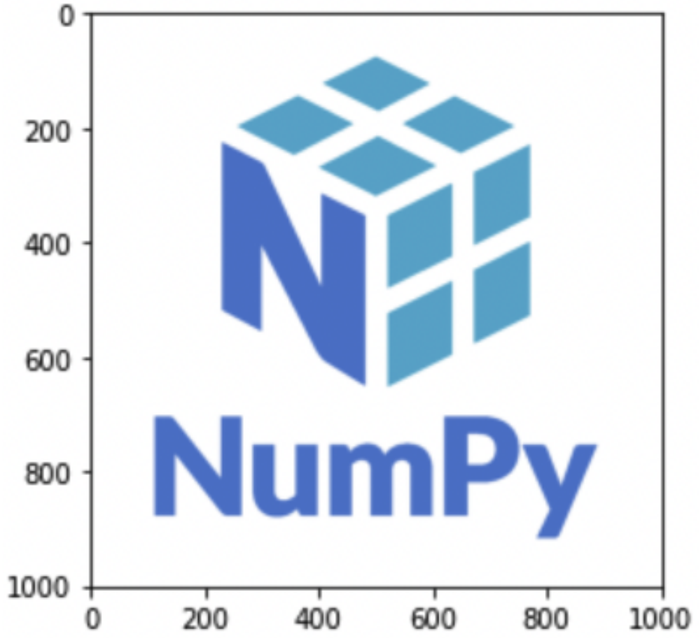

−0.5
0.0
0.5
1.0
1.5
2.0
2.5
−0.5 0.0 0.5 1.0 1.5 2.0 2.5

Loading .npy files

Save arrays in many formats:

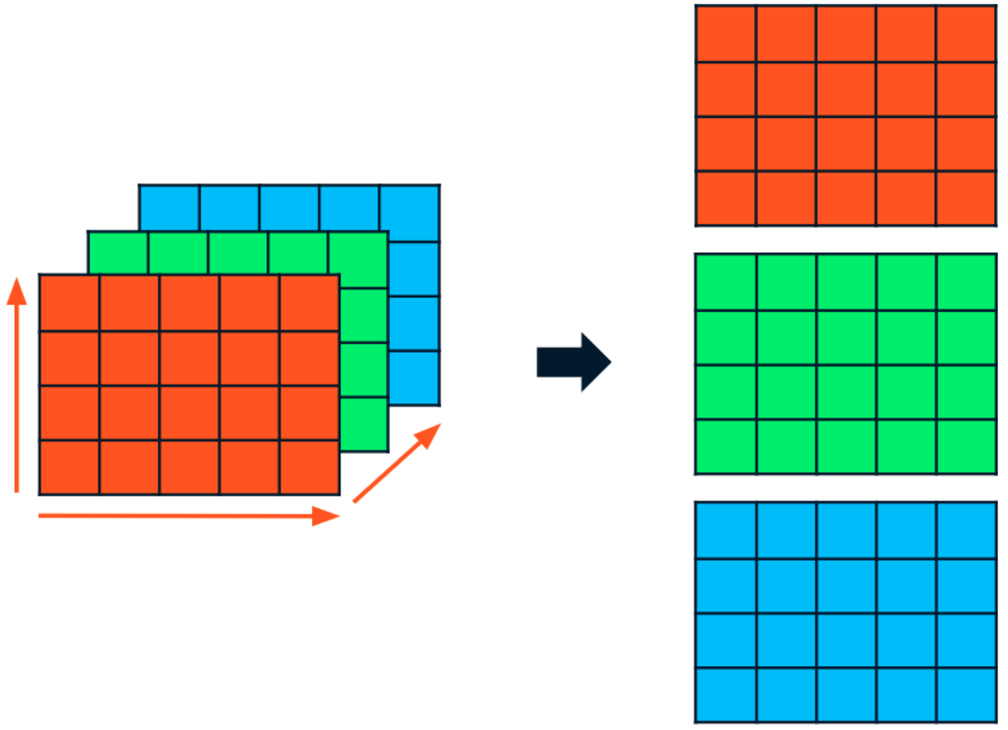
- `.csv`
- `.txt`
- `.pkl`
- `.npy`

```
with open("logo.npy", "rb") as f:
    logo_rgb_array = np.load(f)
plt.imshow(logo_rgb_array)
plt.show()
```



Examining RGB data

```
red_array = logo_rgb_array[:, :, 0]
blue_array = logo_rgb_array[:, :, 1]
green_array = logo_rgb_array[:, :, 2]
```



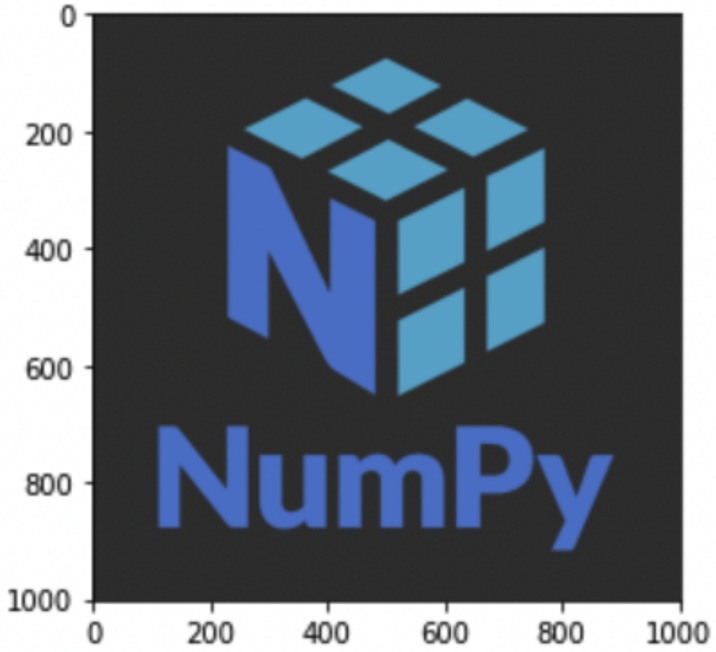
Examining RGB data

```
red_array[1], green_array[1], blue_array[1]
```

```
(array([255, 255, 255, ..., 255, 255, 255]),
 array([255, 255, 255, ..., 255, 255, 255]),
 array([255, 255, 255, ..., 255, 255, 255]))
```

Updating RGB data

```
dark_logo_array = np.where(logo_rgb_array == 255, 50, logo_rgb_array)
plt.imshow(dark_logo_array)
plt.show()
```



Saving arrays as .npy files

```
with open("dark_logo.npy", "wb") as f:
    np.save(f, dark_logo_array)
```

If we need help()...

```
help(np.unique)
```

```
Help on function unique in module numpy:
unique(ar, return_index=False, return_inverse=False, return_counts=False,
        axis=None)

Find the unique elements of an array.

Returns the sorted unique elements of an array. There are three optional
outputs in addition to the unique elements:

* the indices of the input array that give the unique values...
```

numpy.unique

numpy.unique(*ar, return_index=False, return_inverse=False, return_counts=False, axis=None*) [source]

Find the unique elements of an array.

Returns the sorted unique elements of an array. There are three optional outputs in addition to the unique elements:

- the indices of the input array that give the unique values
- the indices of the unique array that reconstruct the input array
- the number of times each unique value comes up in the input array

Parameters: **ar** : *array_like*

Input array. Unless *axis* is specified, this will be flattened if it is not already 1-D.

help() with methods

```
help(np.ndarray.flatten)
```

```
Help on method_descriptor: flatten(...)
a.flatten(order='C')

Return a copy of the array collapsed into one dimension.

Parameters
<hr />-------
order : {'C', 'F', 'A', 'K'}, optional
    'C' means to flatten in row-major (C-style) order.
    'F' means to flatten in column-major (Fortran- ...
```

Let's practice!

INTRODUCTION TO NUMPY

Array acrobatics

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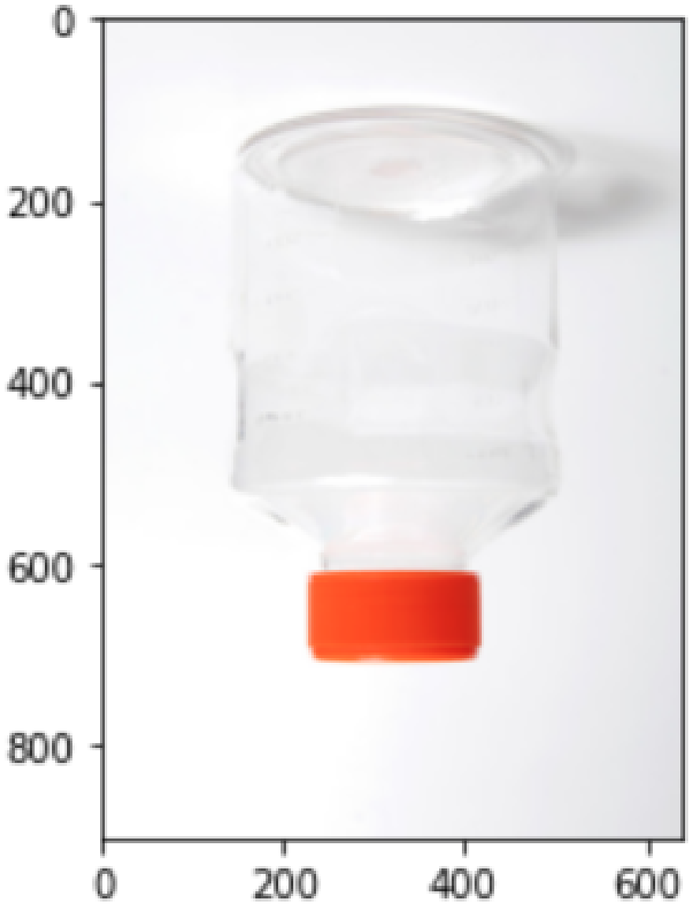
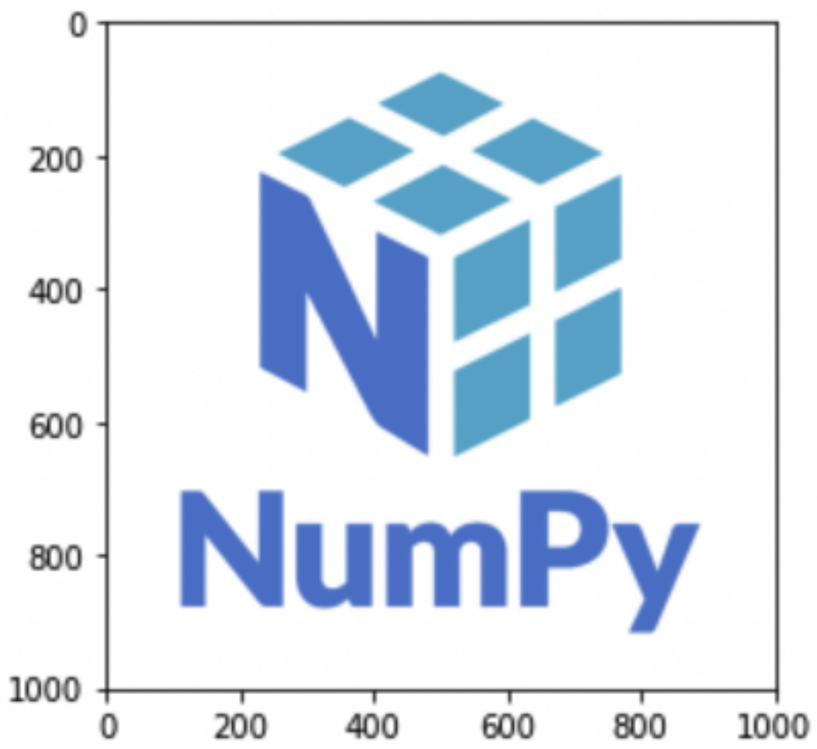
Data augmentation

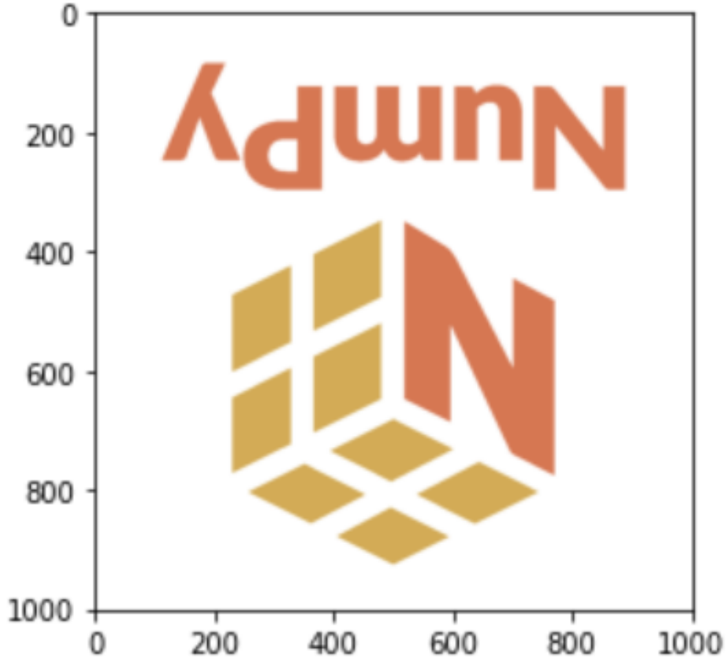


[1] Plastic bottle photo by Lilly_M via Wikimedia Commons

Flipping an array

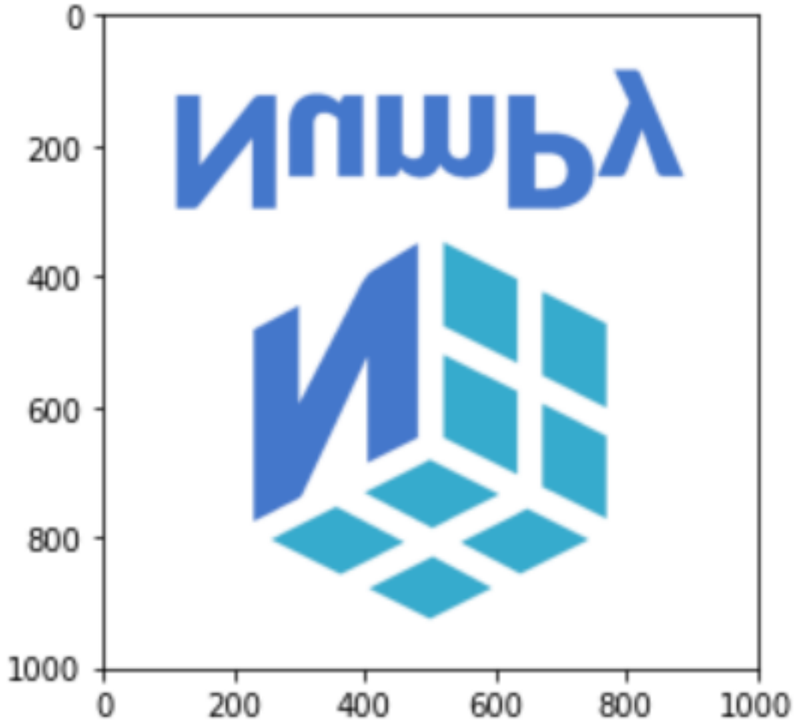



```
flipped_logo = np.flip(logo_rgb_array)
plt.imshow(flipped_logo)
plt.show()
```



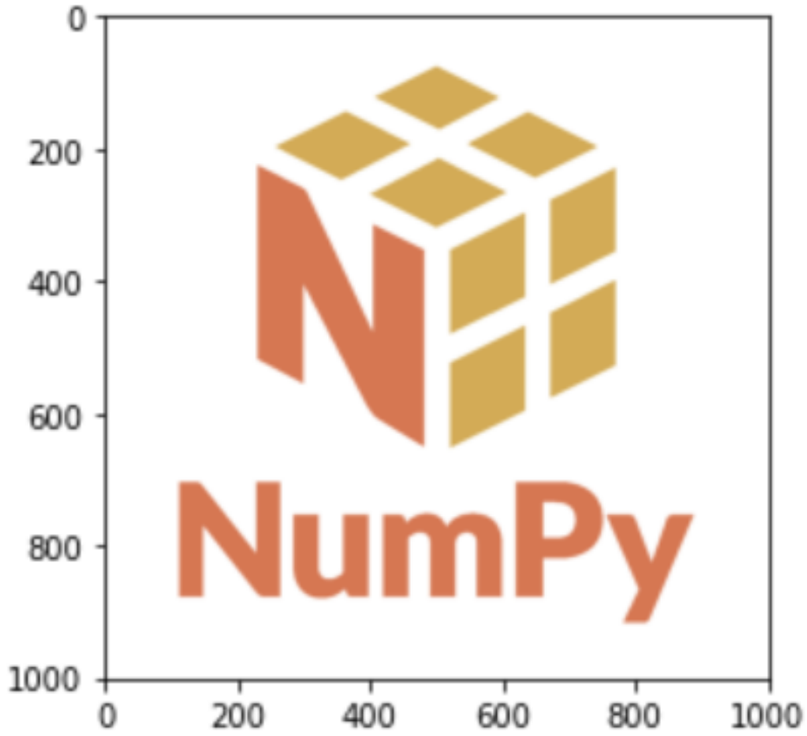
Flipping along an axis

```
flipped_rows_logo = np.flip(logo_rgb_array, axis=0)
plt.imshow(flipped_rows_logo)
plt.show()
```



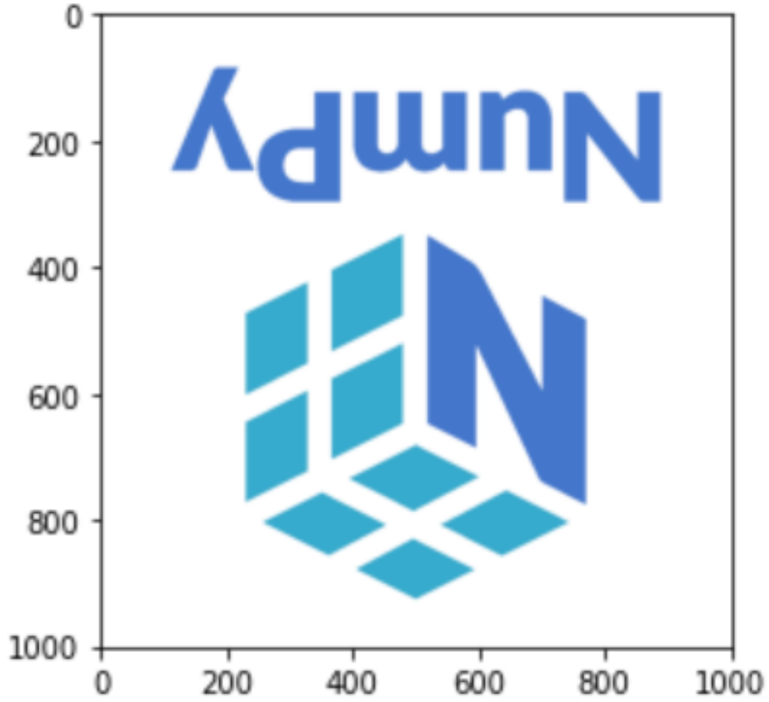
Flipping along an axis

```
flipped_colors_logo = np.flip(logo_rgb_array, axis=2)
plt.imshow(flipped_colors_logo)
plt.show()
```



Flipping multiple axes

```
flipped_except_colors_logo = np.flip(logo_rgb_array, axis=(0, 1))
plt.imshow(flipped_except_colors_logo)
plt.show()
```



Transposing an array

```
array = np.array([[1.1, 1.2, 1.3],
                  [2.1, 2.2, 2.3],
                  [3.1, 3.2, 3.3],
                  [4.1, 4.2, 4.3]])
np.flip(array)
```

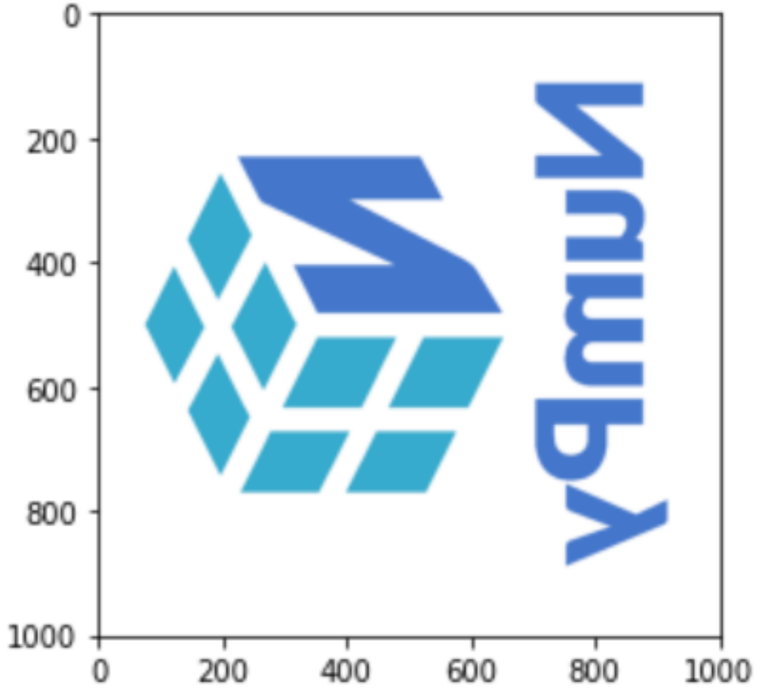
```
array([[4.3, 4.2, 4.1],
       [3.3, 3.2, 3.1],
       [2.3, 2.2, 2.1],
       [1.3, 1.2, 1.1]])
```

```
array = np.array([[1.1, 1.2, 1.3],
                  [2.1, 2.2, 2.3],
                  [3.1, 3.2, 3.3],
                  [4.1, 4.2, 4.3]])
np.transpose(array)
```

```
array([[1.1, 2.1, 3.1, 4.1],
       [1.2, 2.2, 3.2, 4.2],
       [1.3, 2.3, 3.3, 4.3]])
```

Setting transposed axis order

```
transposed_logo = np.transpose(logo_rgb_array, axes=(1, 0, 2))
plt.imshow(transposed_logo)
plt.show()
```



Let's practice!

INTRODUCTION TO NUMPY

Stacking and splitting

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Slicing dimensions

```
rgb = np.array([[[255, 0, 0], [255, 255, 0], [255, 255, 255]],
                [[255, 0, 255], [0, 255, 0], [0, 255, 255]],
                [[0, 0, 0], [0, 255, 255], [0, 0, 255]]])
red_array = rgb[:, :, 0]
green_array = rgb[:, :, 1]
blue_array = rgb[:, :, 2]
red_array
```

```
array([[255, 255, 255],
       [255,   0,   0],
       [0,   0,   0]])
```

Splitting arrays

```
red_array, green_array, blue_array = np.split(rgb, 3, axis=2)
red_array
```

```
array([[[255], [255], [255]],
       [[255], [  0], [  0]],
       [[  0], [  0], [  0]]])
```

```
red_array.shape
```

```
(3, 3, 1)
```

Trailing dimensions

```
red_array_2D = red_array.reshape((3, 3))
red_array_2D
```

```
array([[255, 255, 255],
       [255,   0,   0],
       [  0,   0,   0]])
```

```
red_array_2D.shape
```

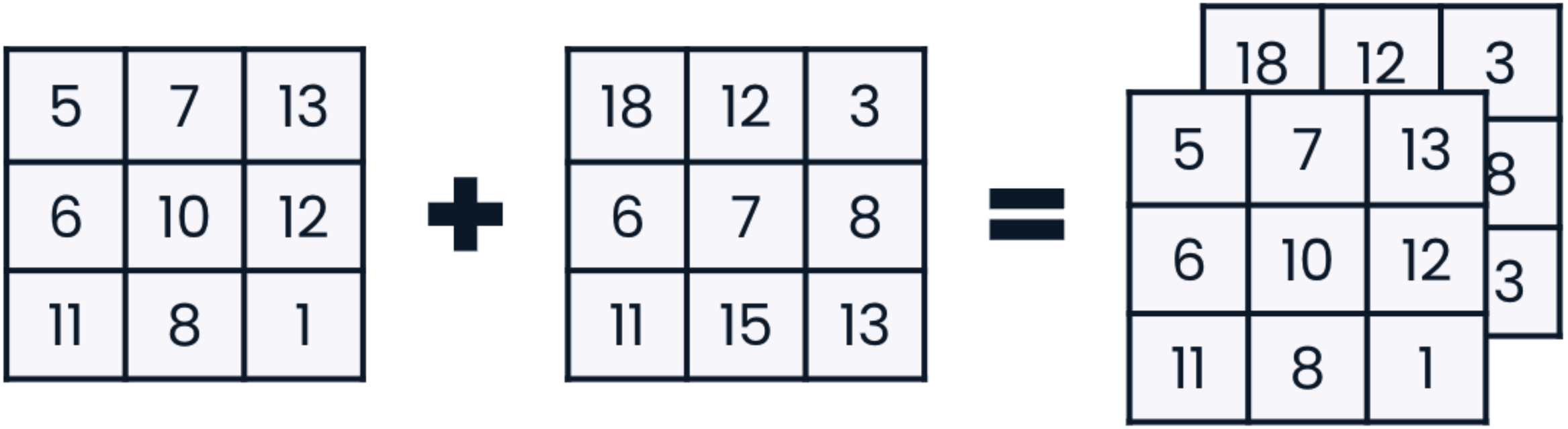
```
(3, 3)
```

Array division rules

```
red_array, green_array, blue_array = np.split(rgb, 5, axis=2)
```

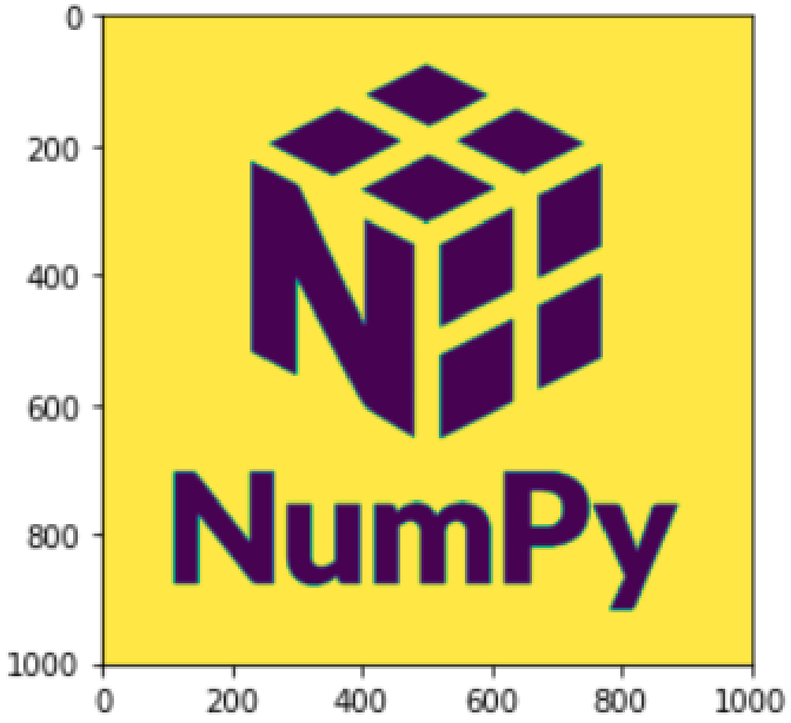
```
ValueError: array split does not result in an equal division
```

Stacking arrays



Plotting 2D image data

```
red_array, green_array, blue_array = np.split(logo_rgb_array, 3, axis=2)
plt.imshow(red_array)
plt.show()
```

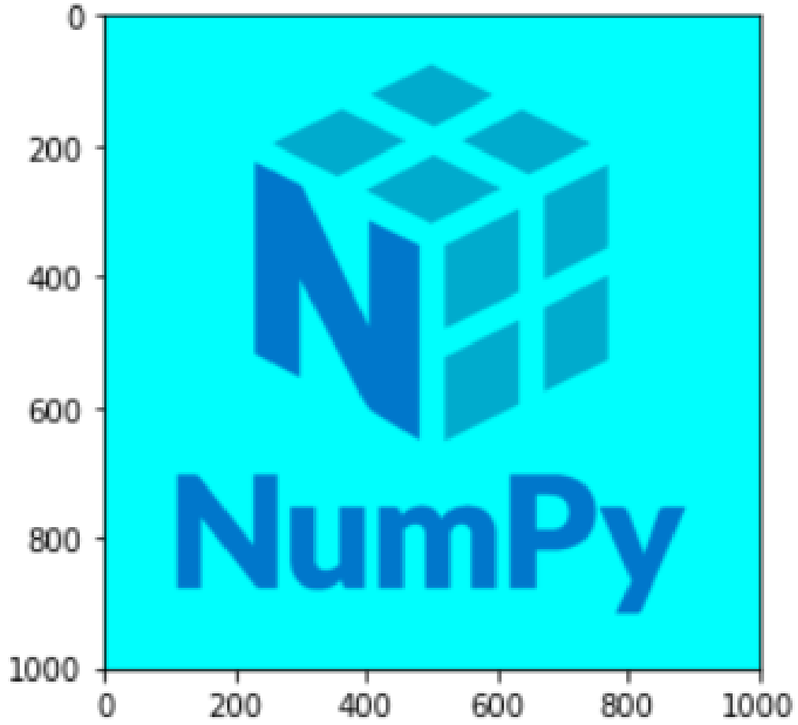


Stacking 2D arrays

```
red_array = np.zeros((1001, 1001)).astype(np.int32)
green_array = green_array.reshape((1001, 1001))
blue_array = blue_array.reshape((1001, 1001))
```

Stacking 2D arrays

```
stacked_rgb = np.stack([red_array, green_array, blue_array], axis=2)
plt.imshow(stacked_rgb)
plt.show()
```



Let's practice!

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Congratulations!

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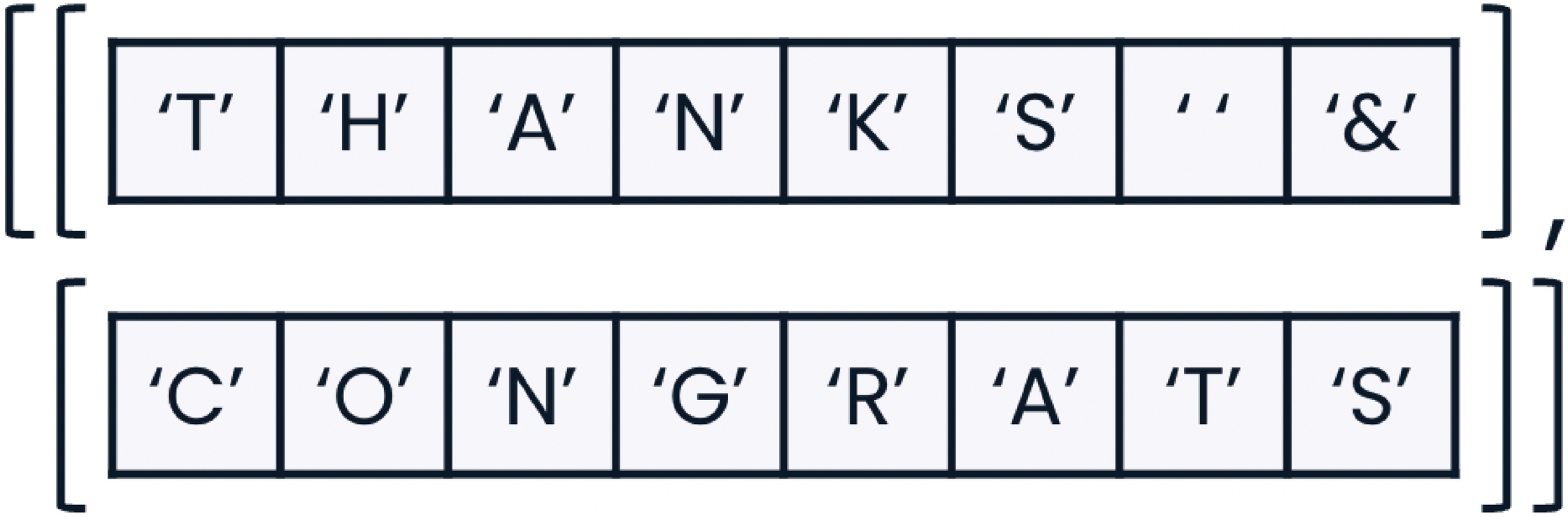
Welcome to team NumPy

NumPy is amazing!

What's next?

DataCamp courses:

- Data Manipulation with pandas
- Introduction to Data Visualization with Seaborn
- Parallel Programming with Dask in Python
- Introduction to TensorFlow in Python


'T' 'H' 'A' 'N' 'K' 'S' ' ' '&'
'C' 'O' 'N' 'G' 'R' 'A' 'T' 'S'

Thank you!

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