



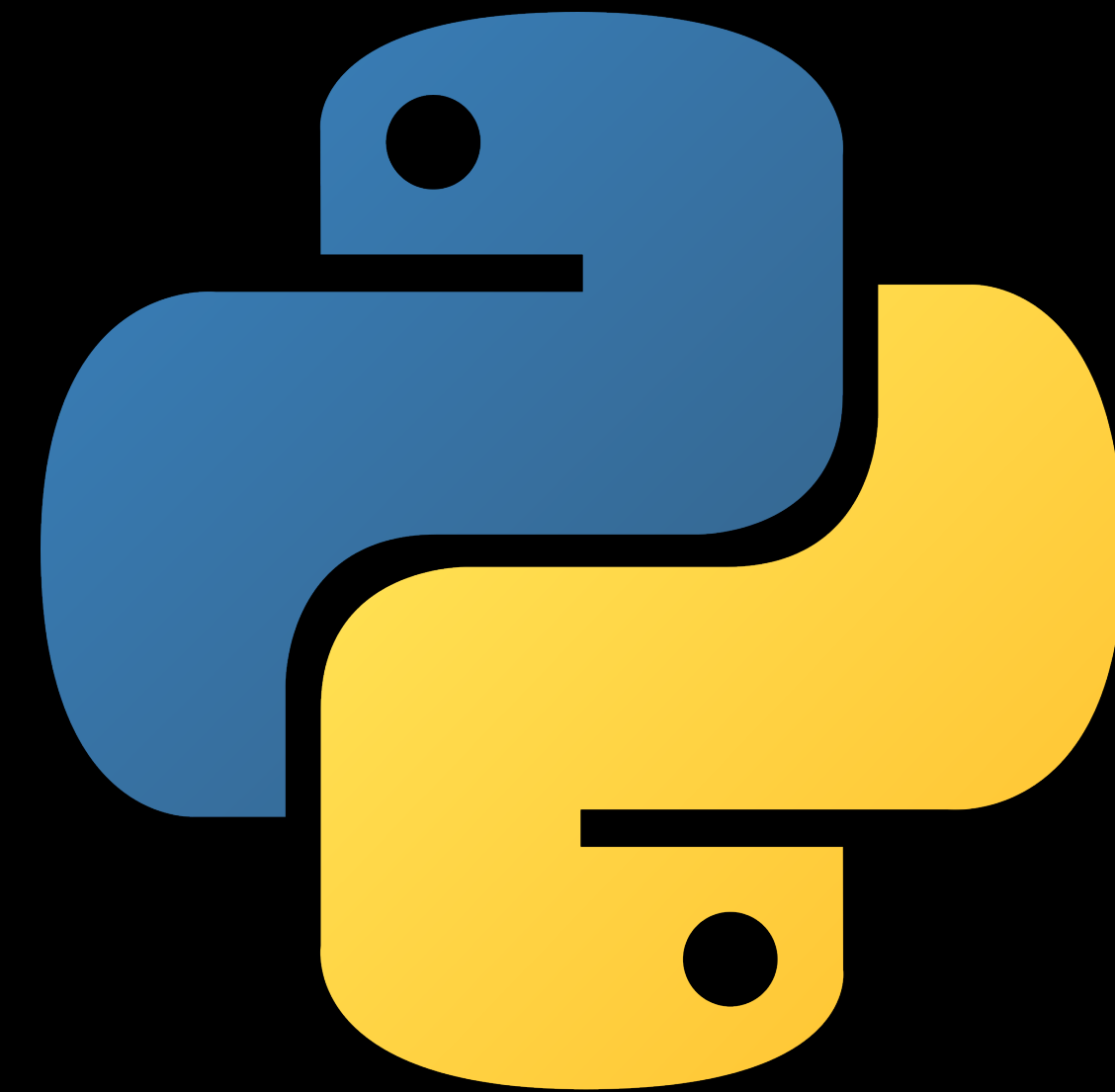
# Day 1

A Roadmap of the Python ecosystem, and an introduction to NumPy

Dylan Cromer, Ishan Mishra, Eamonn O'Shea

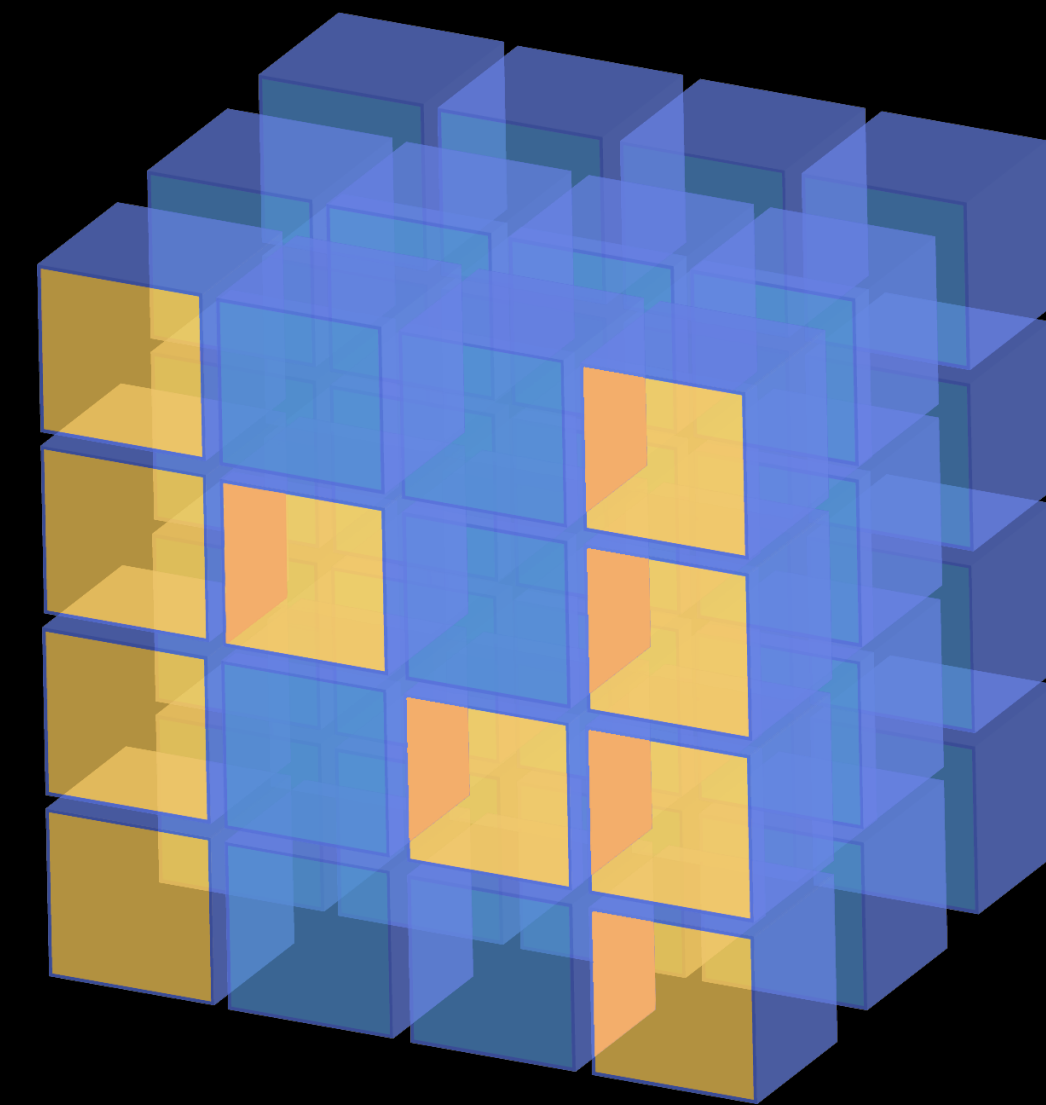
# Python

- Programming language
- Python code is made of “modules” (.py files)
- Modules can be structured into “packages”
- “Libraries” are larger containers of one or more packages



# NumPy

- Core numerical library used extensively



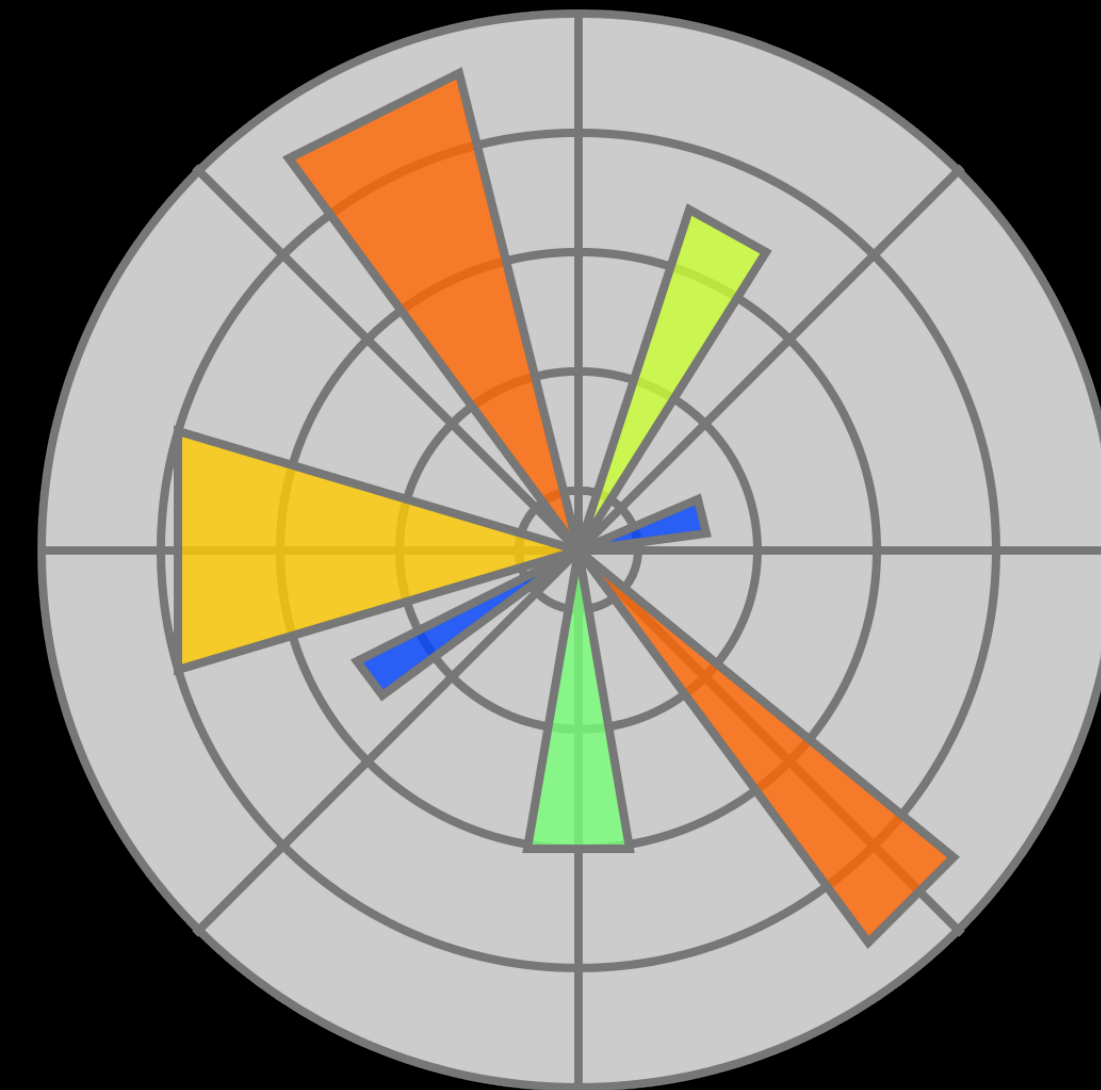
# SciPy

- Library of higher-level scientific tools built on NumPy
- Also the name of a community/organization that runs NumPy, Scipy, and other packages



# Matplotlib

- Library of plotting and visualization tools



# Jupyter

- Name of project that develops the Jupyter Notebook
- Jupyter Notebook is a webapp that runs on your computer
- Lets you write and run Python interactively



# Anaconda

- Packaged distribution of Python + many useful packages
- Manages the installation of many common packages
- Even non-Python software

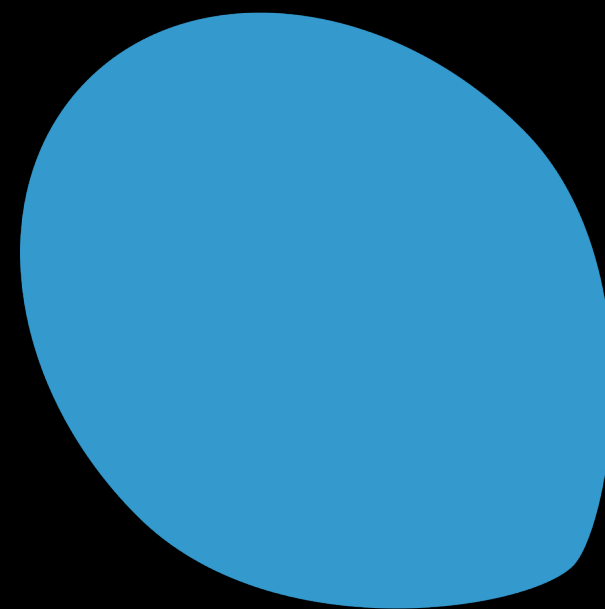


... and way more

IP[y]: IPython  
Interactive Computing



SymPy

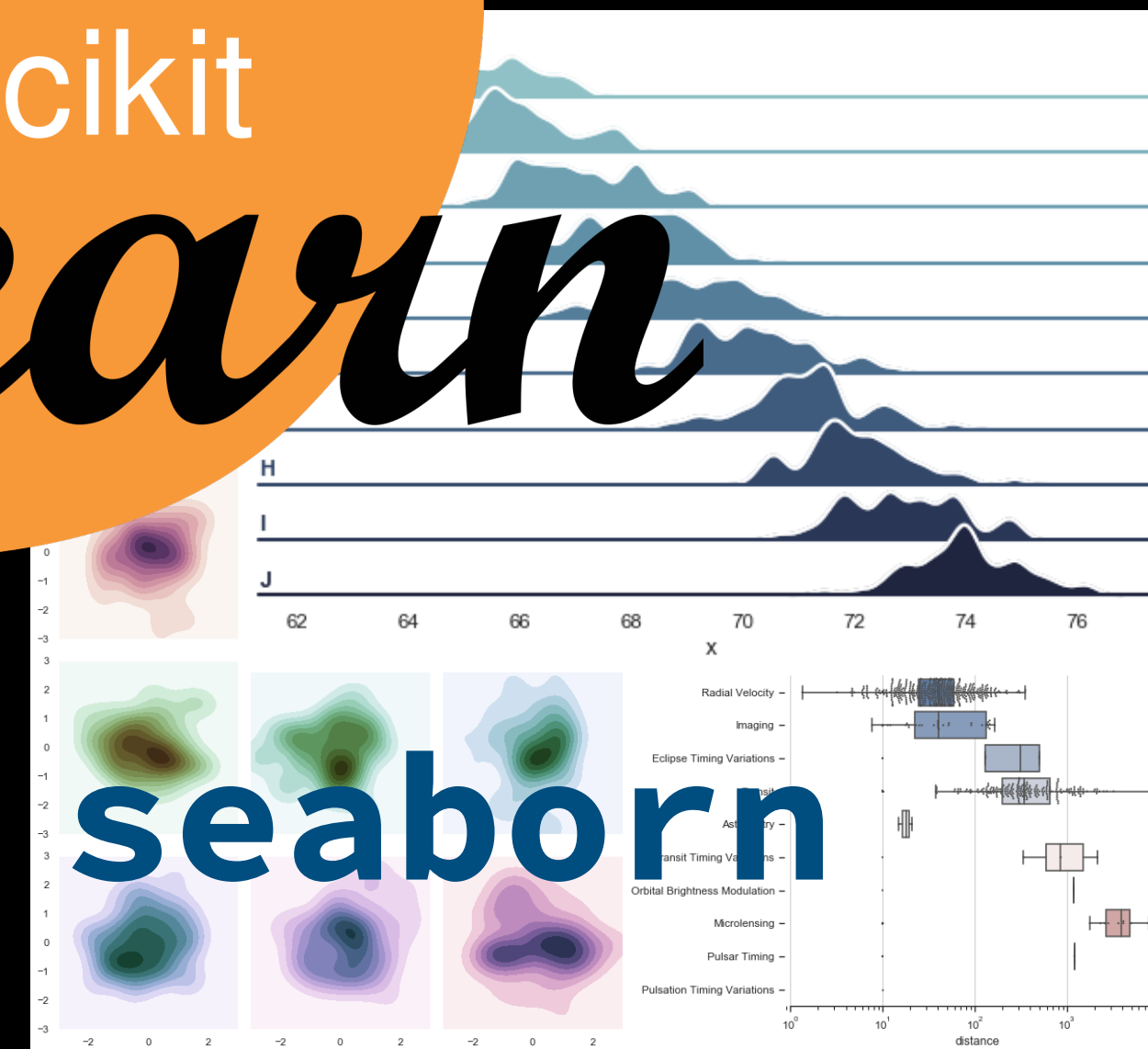


scikit

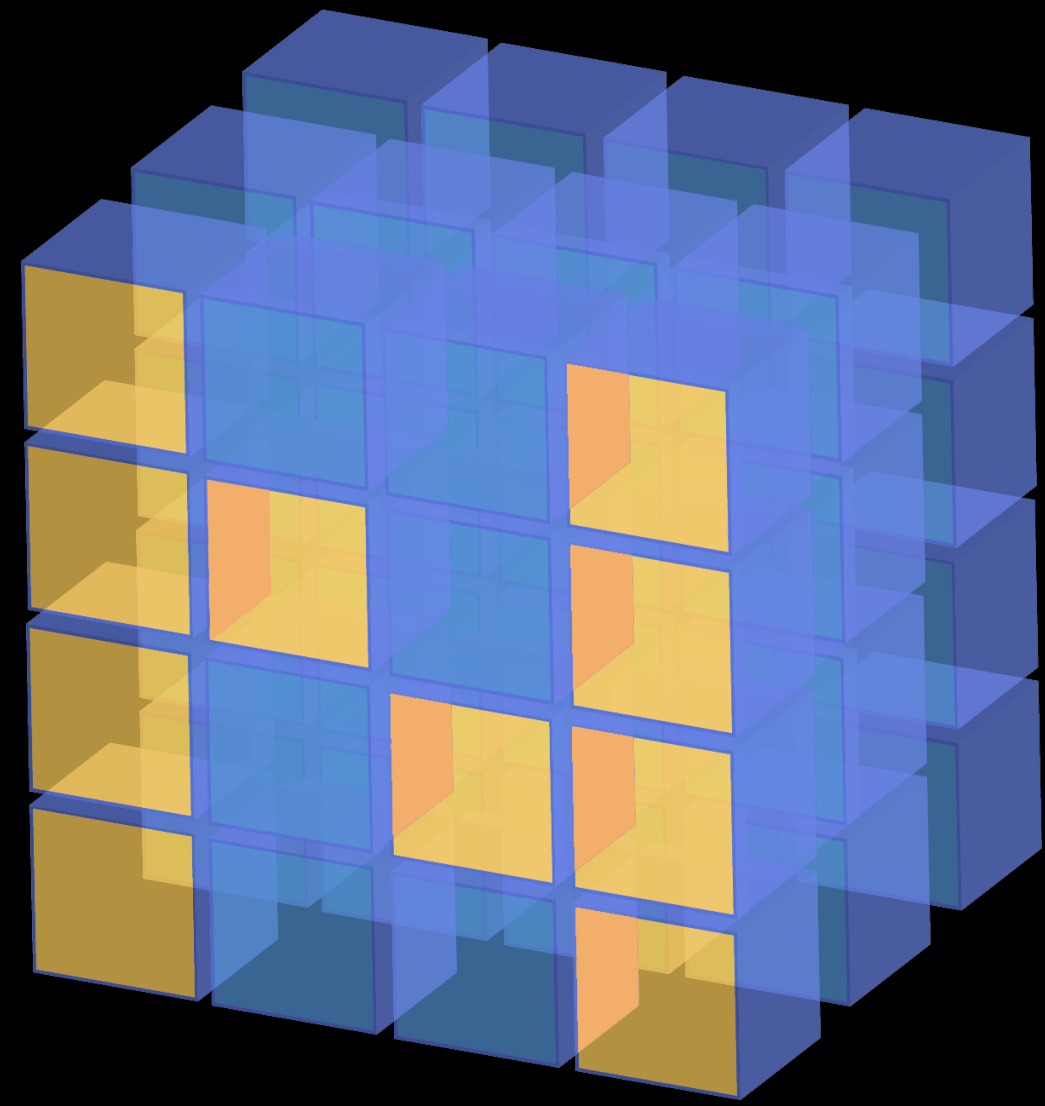
learn



The  
AstroPy  
Project



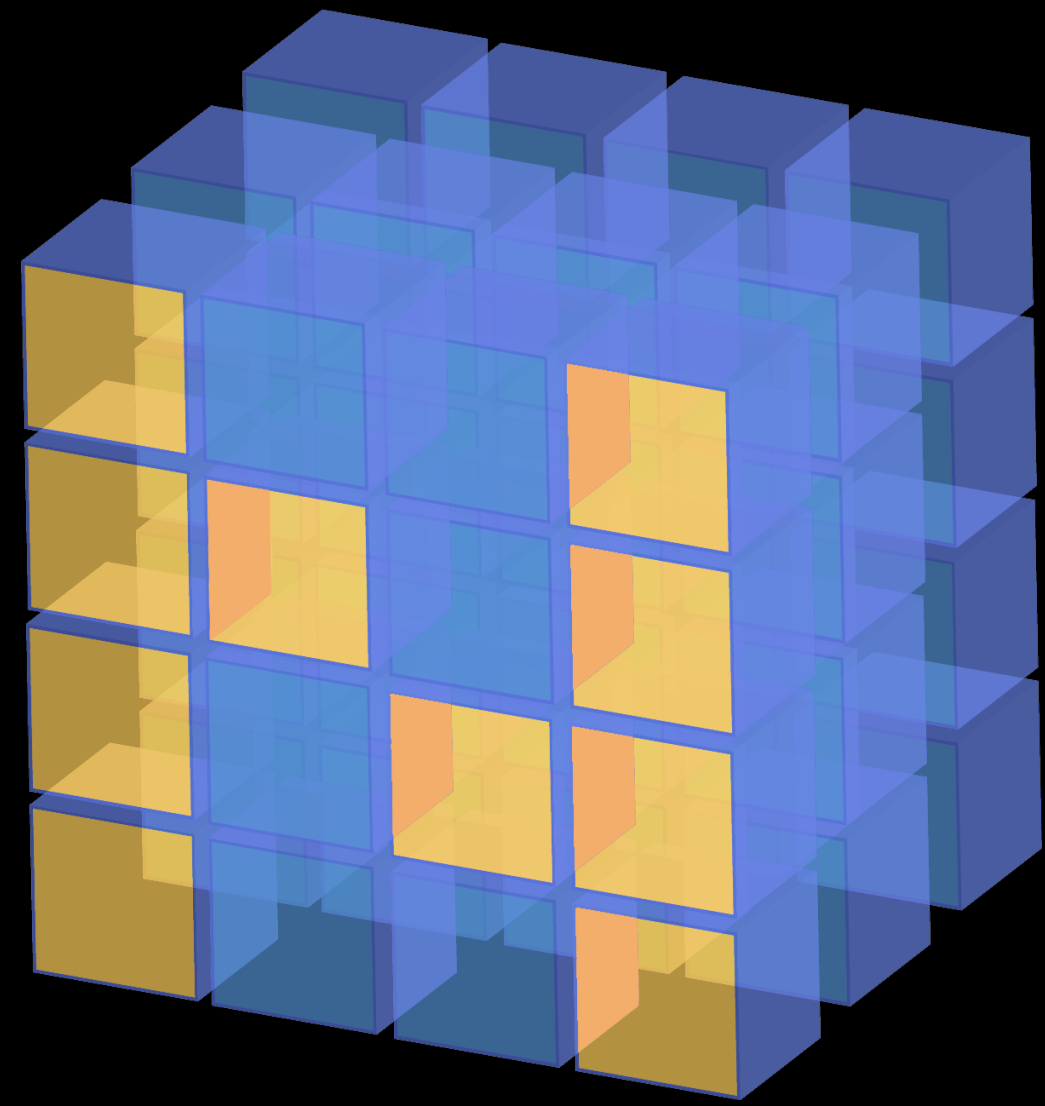




# NumPy: what does it do?

- most importantly: adds the numpy array:
  - faster than python std library objects
  - more convenient
  - near-universal adoption

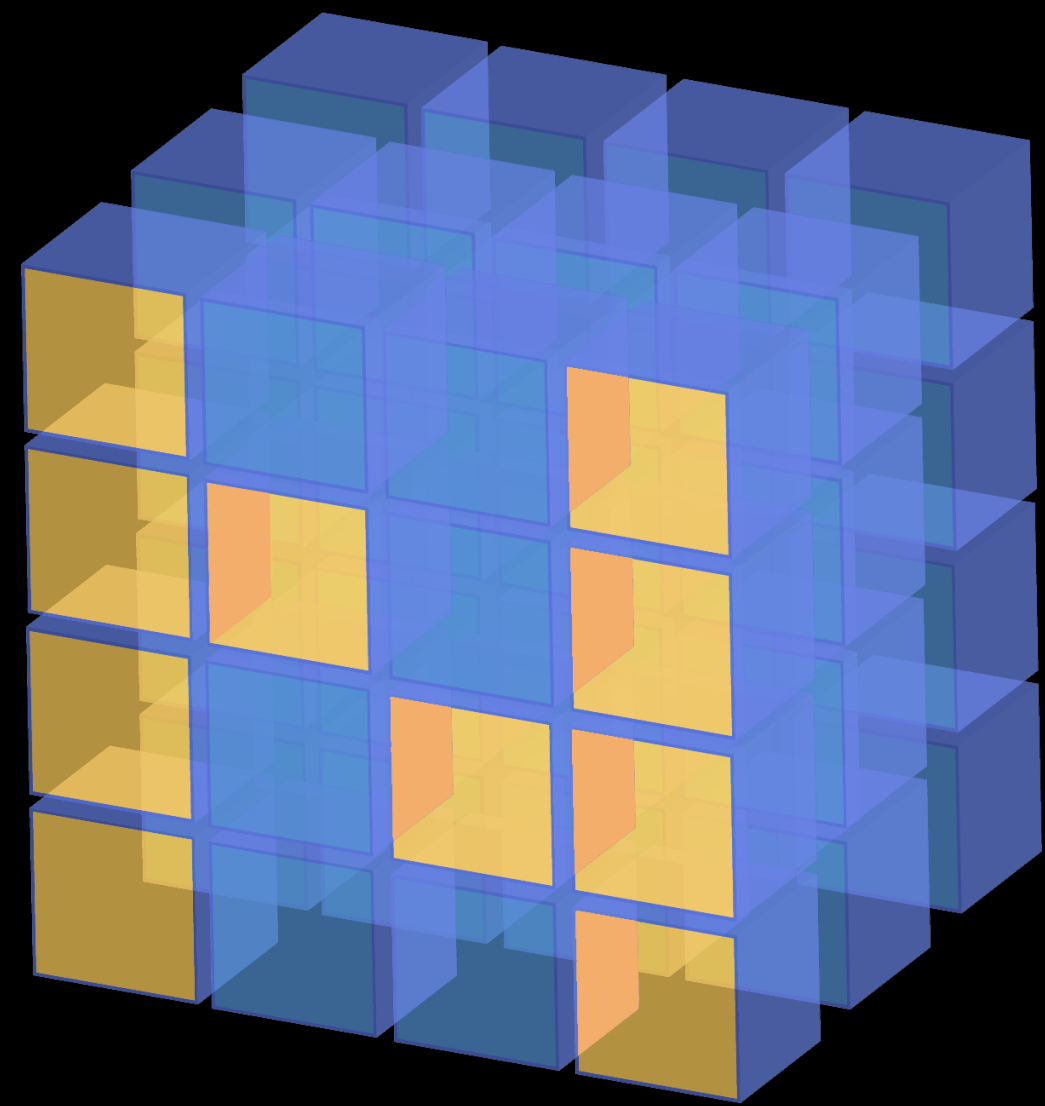
Exercises: open day1.ipynb



# More about NumPy arrays

- 2D numpy arrays don't act like matrices (with the standard operators)

`array([[1, 2],  
 [3, 4]])`  $\star$  `array([[1, 2],  
 [3, 4]])`  $\neq$  `array([[7, 10],  
 [15, 22]])`



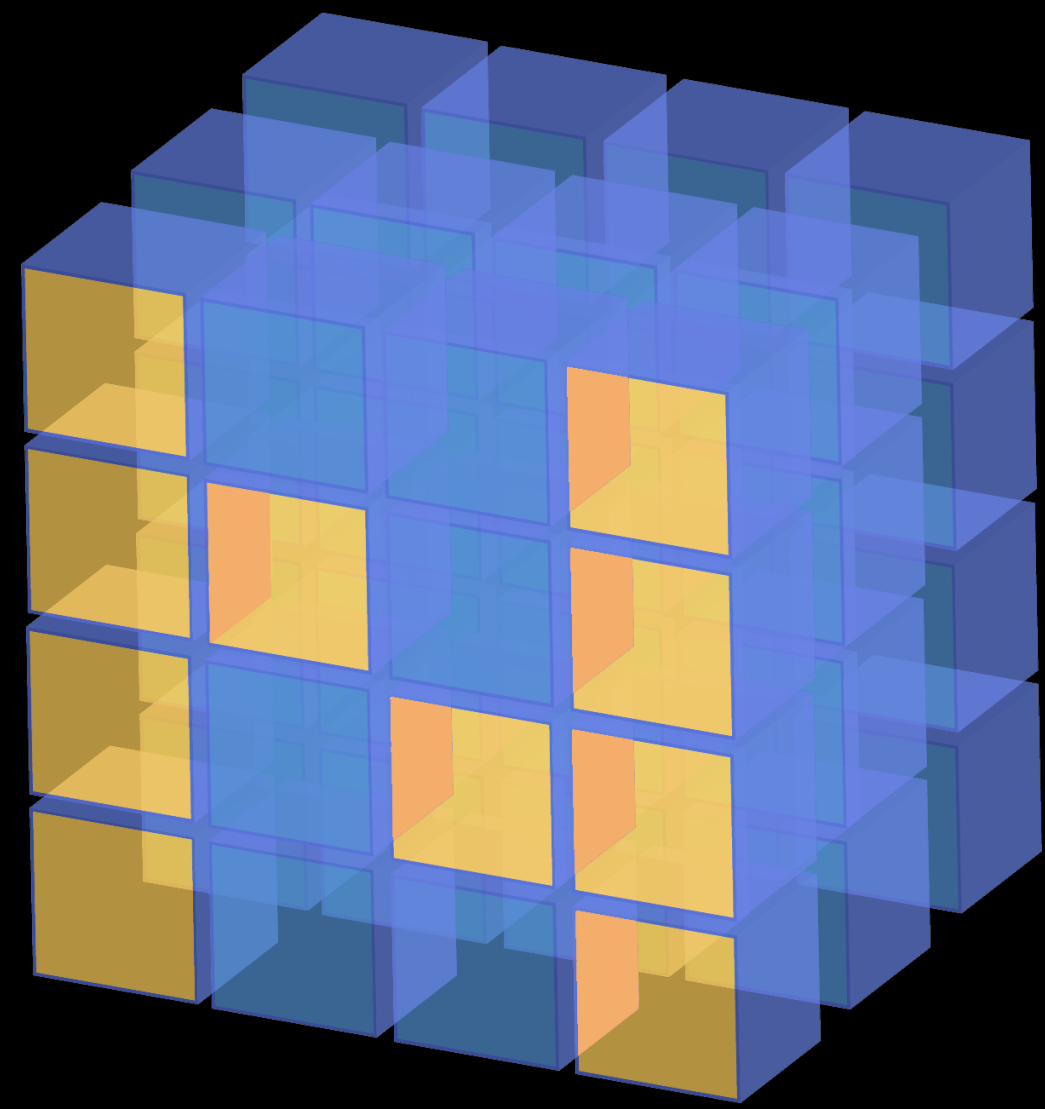
# More about NumPy arrays

- 2D numpy arrays don't act like matrices (with the standard operators)

```
array([[1, 2],  
       [3, 4]]) * array([[1, 2],  
                          [3, 4]]) = array([[1, 4],  
                                             [9, 16]])
```

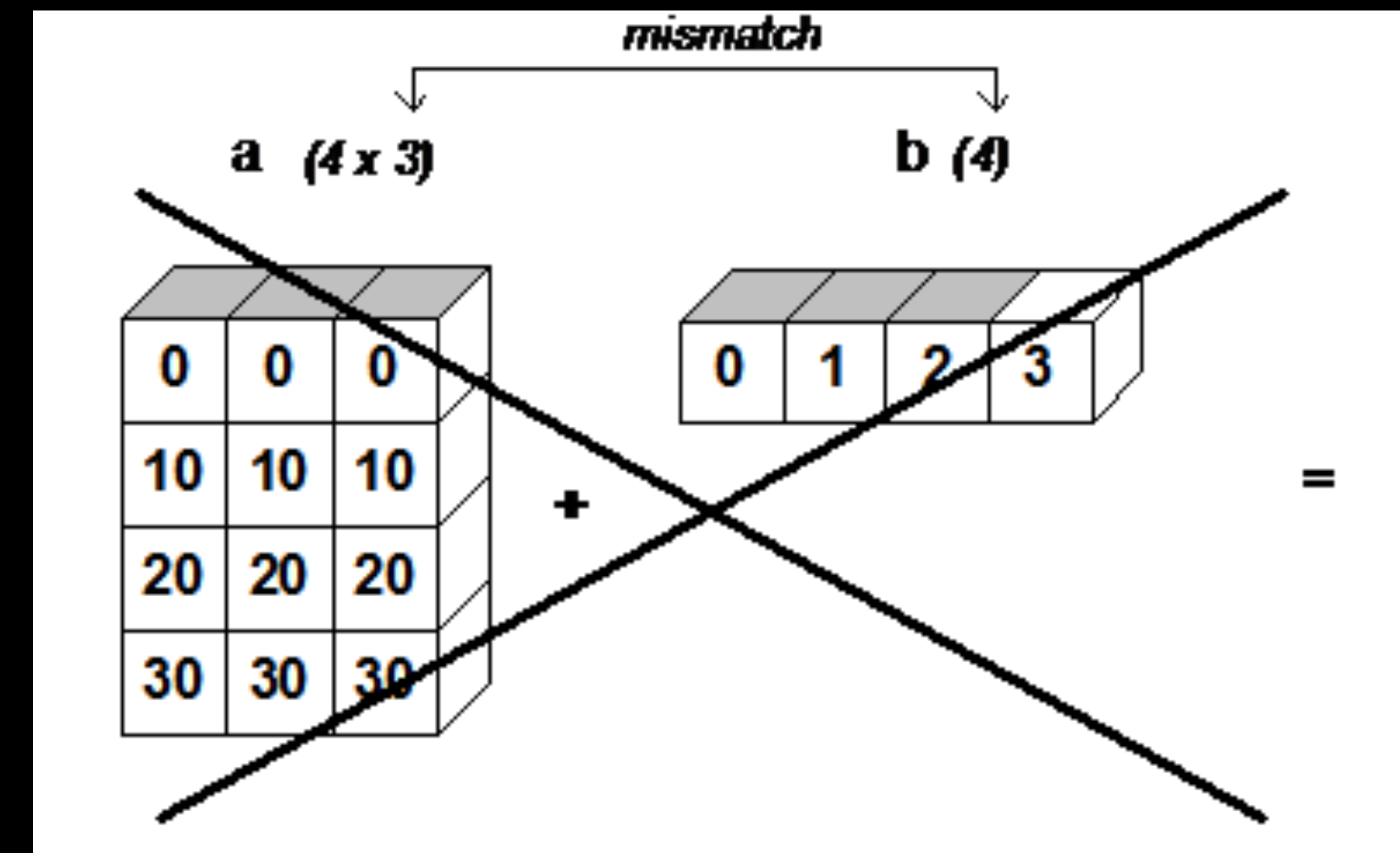
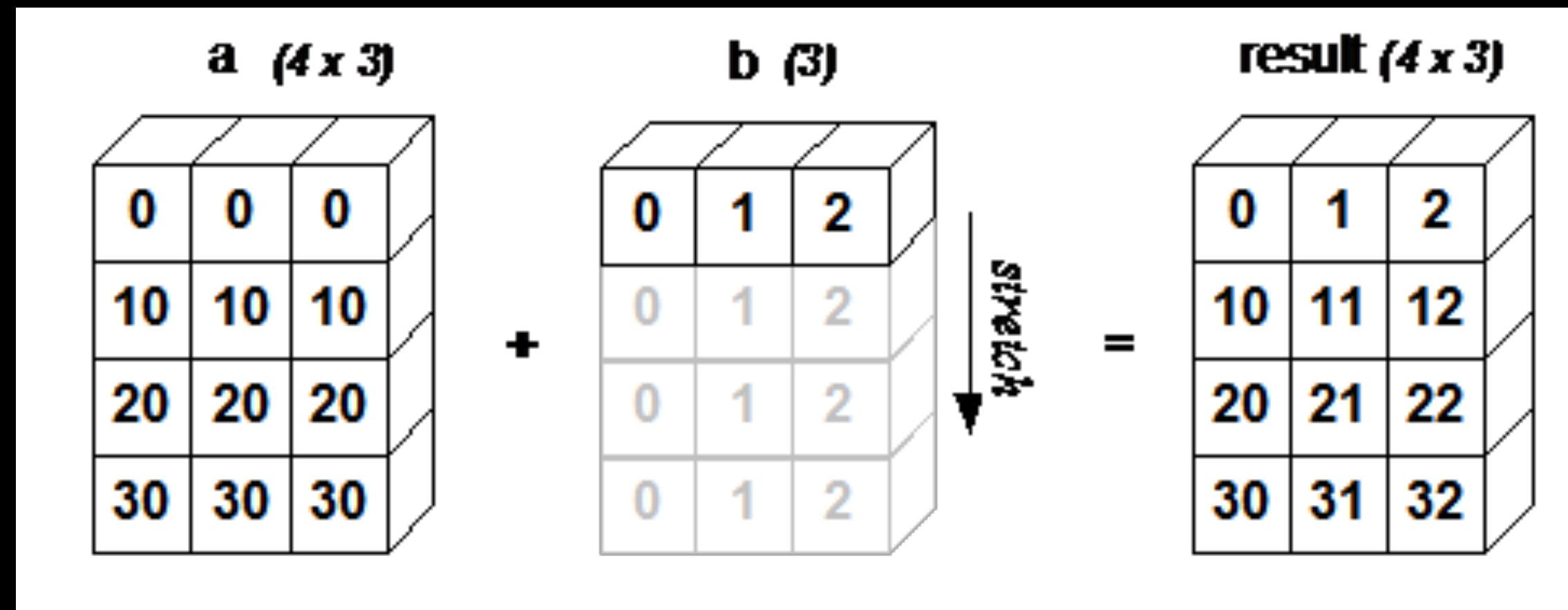


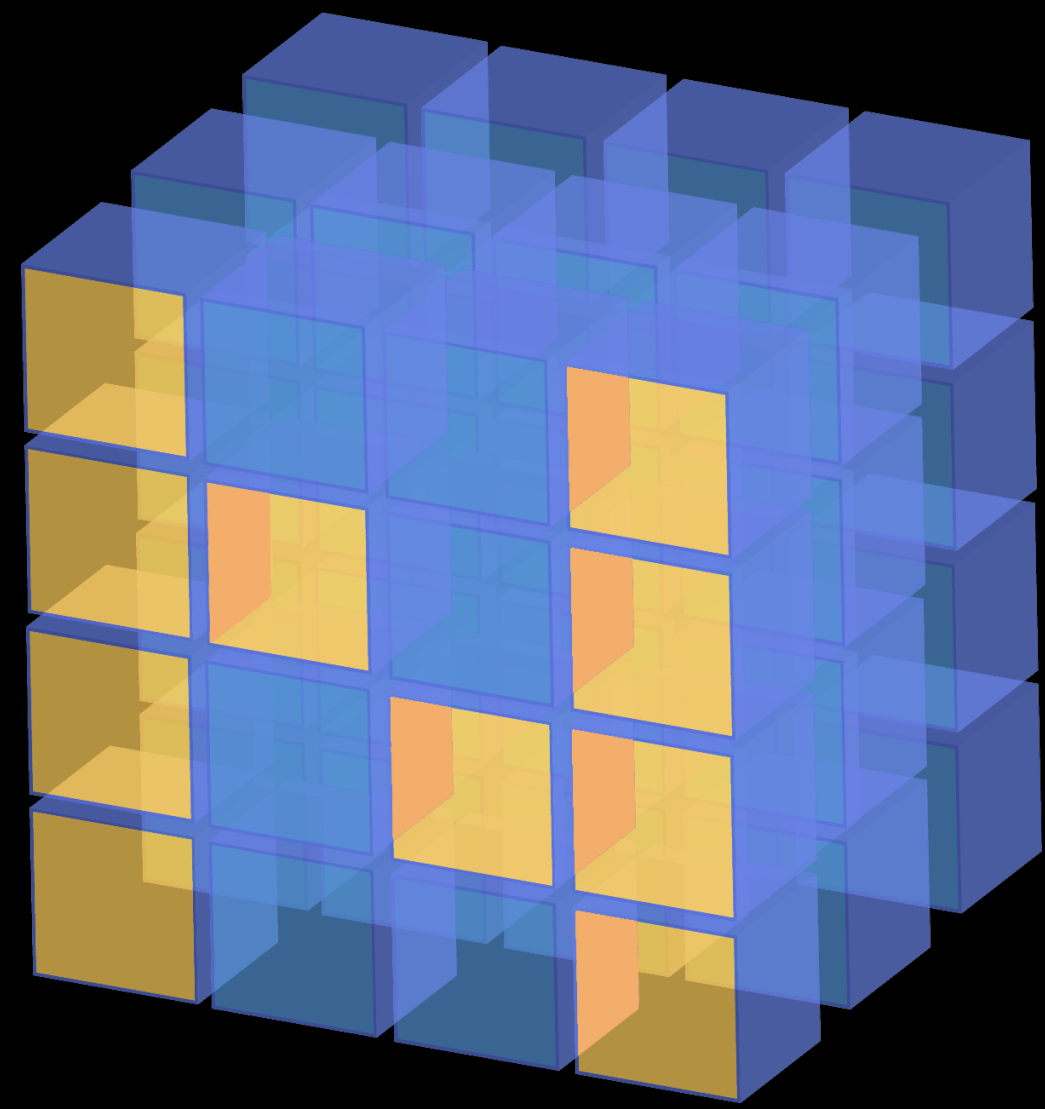




# More about NumPy arrays

- Arrays can be “broadcast” together





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