Numpy

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NumPy

- Support one- and multi-dimensional floating point arrays
  - Support fast operations on them
  - For numerical / scientific computations
- Around since 2005
- Additional functionality in SciPy

Numpy Resources

- Jake VanderPlas: Python Data Science Handbook: Essential Tools for Working with Data
  - https://jakevdp.github.io
- Wes McKinney: Python for Data Analysis
  - https://github.com/wesm/pydata-book

NumPy Arrays

- Python lists can contain objects of any type
- If you walk through a Python list adding one to each element:
    - Python code will determine:
        - What is the type of the element
        - Does the type support the + operation
        - Look up the code for the + and execute
- This is slow

NumPy Arrays

- NumPy is implemented in C
  - Operations are faster than using Python

NumPy Arrays

- NumPy Arrays are containers for numerical values
- Numpy arrays have dimensions
  - Vectors: one-dimensional
  - Matrices: two-dimensional
  - Tensors: more dimensions, but much more rarely used
- Nota bene: A matrix can have a single row and a single column, but has still two dimensions

NumPy Arrays

- After installing, try out `import numpy as np`
- Making arrays:
  - Can use lists, though they better be of the same type

```
import numpy as np
my_list = [1,5,4,2]
my_vec = np.array(my_list)
my_list = [[1,2],[4,3]]
my_mat = np.array(my_list)
```