Numpy introduction

Husein zolkepli

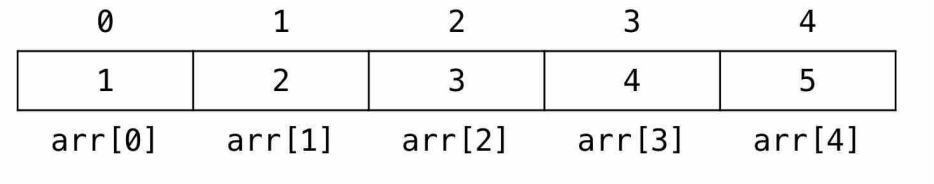
What is numpy

Python C extension for vector programming

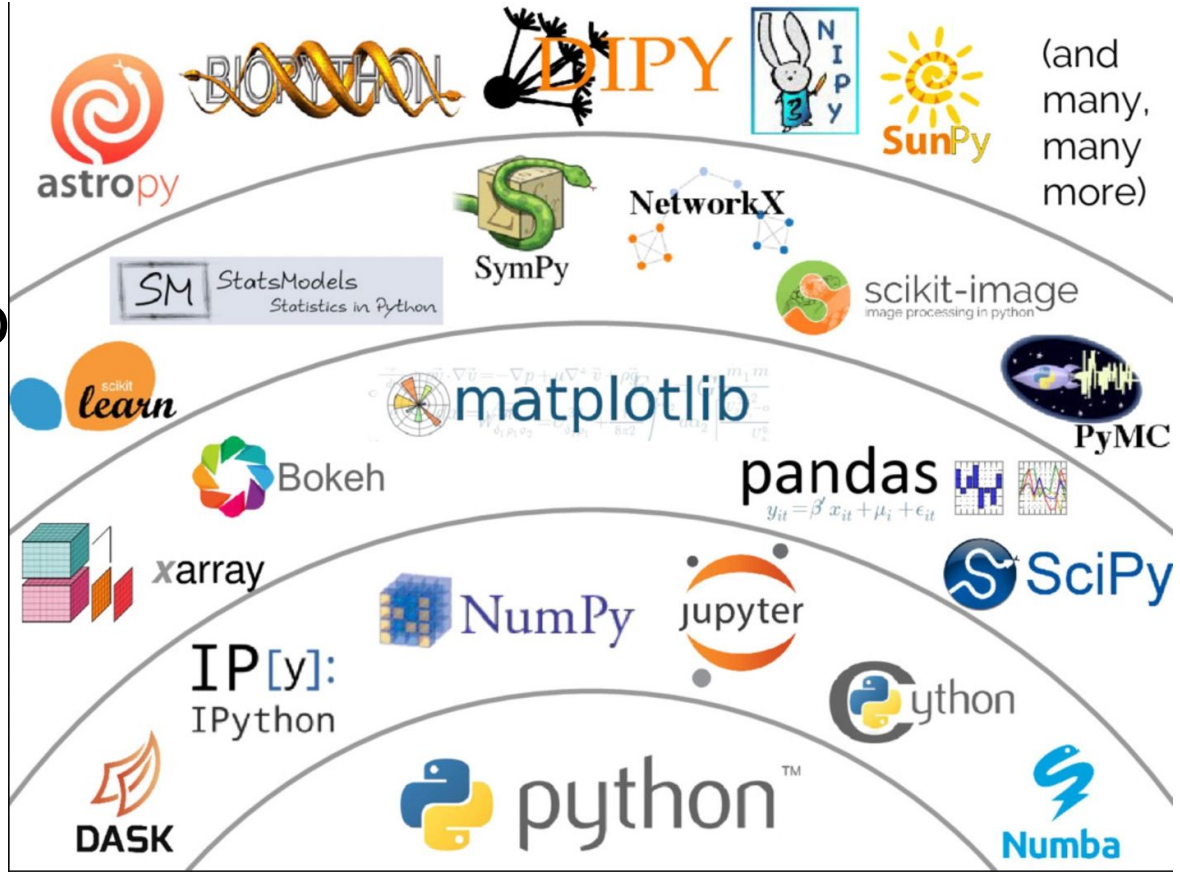
- Efficient
- In-memory (really fast)
- Homogeneous (single type)

Suitable for a lot of applications:

- Image processing
- Signal processing
- Physics simulation

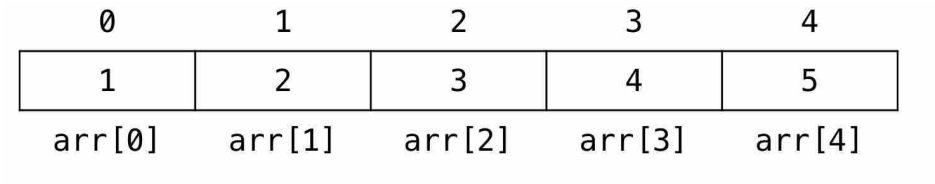


One of scientific libraries for Pytho



Array shape

One dimensional arrays have a 1-tuple for their shape



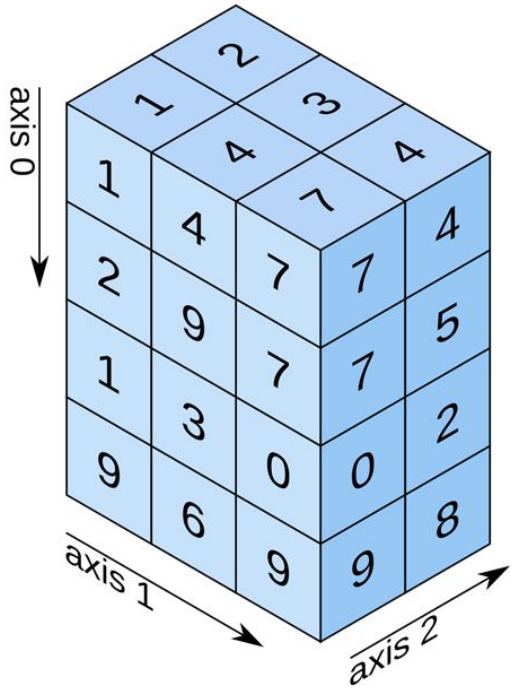
Shape: (5,)

Two dimensional array

	0	1	2	3
0	1	2	3	4
1	5	6	7	8
2	9	10	11	12

Shape: (3,4)

Three dimensional array



Shape: (4,3,2)

Array element type (dtype)

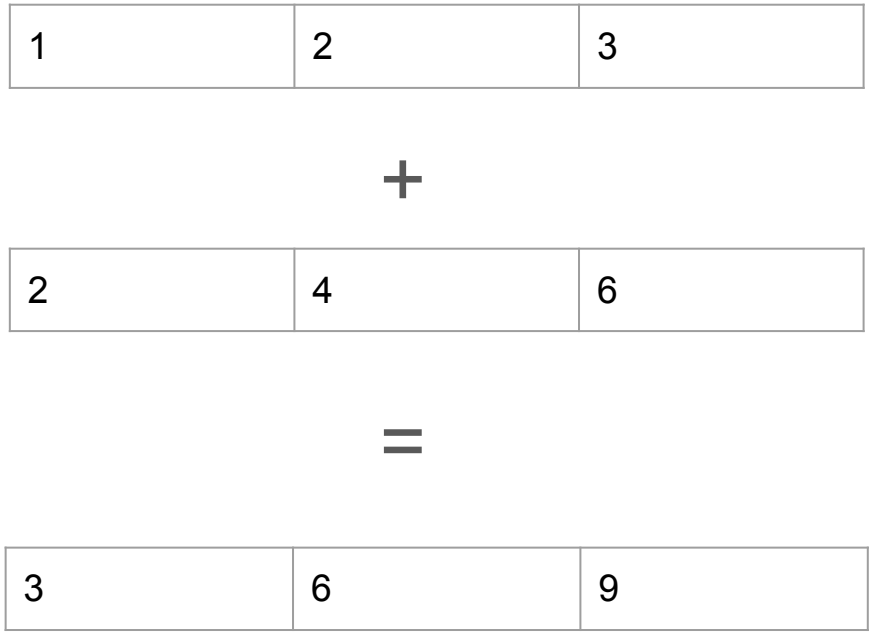
- Numpy arrays comprise elements of a single data type
- We can check type through using `.dtype` attribute

- `.dtype.byteorder` : big or little endian (depends on our machine)
- `.dtype.itemsize` : element size of this dtype
- `.dtype.name` : a name for this dtype object
- `.dtype.type` : type object used to create scalars

Numpy built-in functions

- Comparison: <, <=, ==, !=, >=, >
- Arithmetic: +, -, *, /
- Exponential: exp, expm1, exp2, log, log10, log1p, log2, power, sqrt
- Trigonometric: sin, cos, tan, ascin, arcos, atctan
- Hyperbolic: sinh, cosh, tanh, ascinh, arccosh, atctanh
- Bitwise: &, |, ~, ^, left_shift, right_shift
- logical : and, logical_xor, not, or
- predicates: isfinite, isinf, isnan, signbit
- other: abs, ceil, floor, mod, modf, round, sinc, sign, trunc

broadcasting



We can treat those arrays like normal variable and do direct arithmetic

Array methods

- predicates

a.any(), a.all()

- reductions

a.mean(), a.std(), a.argmin(), a.min(), a.max(), a.argmax()

- manipulation

a.argsort(), a.transpose(), a.reshape()

Numpy functions

- Data i/o

Fromfile, genfromtxt, load, loadtxt, save, savetxt

- Mesh creation

Mgrid, meshgrid, ogrid

- manipulation

Einsum, hstack, take, vstack

Important subpackages

- numpy.fft - fast fourier transform
- numpy.polynomial - efficient polynomials
- numpy.linalg - linear algebra

cholesky, det, eig, eigvals, inv, lstsq, norm, qr, svd

- numpy.math - C standard math library
- numpy.random - random number generator

beta, gamma, geometric, hypergeometric, lognormal, normal, poisson, uniform