

Data and Variables

- Grammar of Graphics -

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Sets and Bags

Set

- an unordered collection of unique objects.
use Python's set type to turn a list to a set

Bag

- a set in which duplicate elements are allowed.
use Python's vanilla list to represent a bag

There are more interesting ways!

Working with Sets in NumPy

Find the unique elements of an array.

```
numpy.unique(ar,  
            return_index=False,  
            return_inverse=False,  
            return_counts=False)
```

Working with Sets in NumPy

`numpy.union1d(ar1, r2)`

unique, sorted array of values that are in either of the two input arrays.

`numpy.intersect1d(ar1, ar2, assume_unique=False)`

sorted, unique values that are in both of the input arrays.

`numpy.setdiff1d(ar1, ar2, assume_unique=False)`

sorted, unique values in ar1 that are not in ar2.

Intervals

Open interval

- $(a, b) = \{ x \mid a < x < b \}$

Closed interval

- $[a, b] = \{ x \mid a \leq x \leq b \}$

Mixed intervals

$(a, b]$ - open on the left and closed on the right

$[a, b)$ - closed on the left and open on the right

Creating an Interval with NumPy

`numpy.arange` ([start,] stop, [step,] dtype=None)

creates an interval that is closed on the left and open on the right - [start, stop)

$\{ x \mid \text{start} \leq x < \text{stop} \ \& \ x_{i+1} - x_i = \text{step} \}$

can create intervals of integers or reals.

Linear Closed Interval with NumPy

`numpy.linspace` (start, stop, num=50, endpoint=True,
retstep=False, dtype=None)

- return evenly spaced numbers over a specified interval.
- returns num evenly spaced samples
- interval is calculated over the closed interval [start, stop].
- endpoint of the interval can optionally be excluded.