Creating Dates and Times

- ▶ Dates are created using date by providing integer values for year, month and day and times are created using time using hours, minutes, seconds and microseconds.

- ▶ Date and time manipulation is provided by a built-in Python module datetime. This chapter assumes that datetime has been imported using import datetime as dt.

Creating Dates and Times

```
>>> import datetime as dt

>>> yr, mo, dd = 2012, 12, 21

>>> dt.date(yr, mo, dd)
datetime.date(2012, 12, 21)

>>> hr, mm, ss, ms= 12, 21, 12, 21

>>> dt.time(hr, mm, ss, ms)
dt.time(12,21,12,21)
```

Creating Dates and Times

Dates created using date do not allow times, and dates which
require a time stamp can be created using datetime, which
combine the inputs from date and time, in the same order.

```
>>> dt.datetime(yr, mo, dd, hr, mm, ss, ms)
datetime.datetime(2012, 12, 21, 12, 21, 12, 21)
```

Creating Dates and Times

```
>>> datetime64(2013)
numpy.datetime64(2013)

>>> datetime64(201309)
numpy.datetime64(201309)

>>> datetime64(20130901)
numpy.datetime64(20130901)

>>> datetime64(20130901T12:
00) # Time
numpy.datetime64(20130901T12:
00+0100)
```

Creating Dates and Times

```
>>> datetime64(20130901T12:
00:01) # Seconds
numpy.datetime64(20130901T12:
00:01+0100)

>>> datetime64(20130901T12:
00:01.123456789) # Nanoseconds
numpy.datetime64(20130901T12:
00:01.123456789+0100)
```

Creating Dates and Times

- ▶ Date or time units can be explicitly included as the second input.
- ▶ The final example shows that rounding can occur if the date input is not exactly representable using the date unit chosen.

```
>>> datetime64(20130101T00,
h)
numpy.datetime64(20130101T00:
00+0000,h)
>>> datetime64(20130101T00,
s)
numpy.datetime64(20130101T00:
00:00+0000)
>>> datetime64(20130101T00,
ms)
numpy.datetime64(20130101T00:
00:00.000+0000)
>>> datetime64(20130101,
W)
numpy.datetime64(20121227)
```

NumPy datetimes can also be initialized from arrays.

```
>>> dates = array([20130901,
20130902],
dtype=datetime64)
>>> dates
array([20130901,
20130902],
dtype=datetime64[D])
>>> dates[0]
numpy.datetime64(20130901)
```

14.2 Dates Mathematics

- Date-times and dates (but not times, and only within the same type) can be subtracted to produce a timedelta, which consists of three values, days, seconds and microseconds.
- Time deltas can also be added to dates and times compute different dates although date types will ignore any information in the time delta hour or millisecond fields.

14.2 Dates Mathematics

```
>>> d1 = dt.datetime(yr, mo, dd, hr, mm, ss, ms)
>>> d2 = dt.datetime(yr + 1, mo, dd, hr, mm, ss, ms)
>>> d2d1
datetime.timedelta(365)
```