

INF100 – 13

numpy

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```
import numpy
```

```
import numpy as np
```

- The array is the basic, essential unit of NumPy
 - Designed to be accessed just like Python lists
 - All elements are of the same type
 - Ideally suited for storing and manipulating large numbers of elements

```
>>> a = np.array([1., 4., 5., 8.])
```

```
>>> a  
array([1., 4., 5., 8.])
```

```
>>> type(a)  
<type 'numpy.ndarray'>
```

```
>>> a[:2]  
array([1., 4.])
```

```
>>> a[3]  
8.0
```

```
>>> a = np.array([[1., 2., 3.], [4., 5., 6.]])
```

```
>>> a  
array([[1., 2., 3.],  
       [4., 5., 6.]])
```

```
>>> a[0,0]  
1.0
```

```
>>> a[0,1]  
2.0
```

```
>> a.shape  
(2,3)
```

```
>>> np.arange(5.)  
array([ 0., 1., 2., 3., 4.])
```

```
>>> np.linspace(30,40,5)  
array([ 30. , 32.5, 35. , 37.5, 40. ])
```

```
>>> np.ones((2,3))  
array([[ 1., 1., 1.],  
       [ 1., 1., 1.]])
```

```
>>> np.zeros(7)  
array([0., 0., 0., 0., 0., 0., 0.]
```

```
>>> np.full((2,2), 7.)  
array([[7., 7.], [7., 7.]])
```

```
>>> np.random.random_sample((2,2))  
array([[0.33896244, 0.75553158],  
       [0.42116679, 0.32801477]])
```

```
>>> a = np.array([1., 2., 3.])
```

```
>>> a  
array([1.0, 2.0, 3.0])
```

```
>>> a.fill(0)  
array([0.0, 0.0, 0.0])
```

```
>>> a = np.array(range(6)).reshape((2, 3))
```

```
>>> a  
array([[ 0.,  1.,  2.],  
       [ 3.,  4.,  5.]])
```

```
>>> a.transpose() # or a.T  
array([[ 0.,  3.],  
       [ 1.,  4.],  
       [ 2.,  5.]])
```

```
>>> a = np.array([1.,2.,3.])
>>> b = np.array([5.,2.,6.])

>>> a + b
array([6., 4., 9.])

>>> a - b
array([-4., 0., -3.])

>>> a * b # is _not_ a dot-product!
array([5., 4., 18.])

>>> b / a
array([5., 1., 2.])

>>> a % b
array([1., 0., 3.])

>>> b**a
array([5., 4., 216.])
```

NumPy offers a large library of common mathematical functions that can be applied elementwise to arrays

– Among these are: `abs`, `sign`, `sqrt`, `log`, `log10`, `exp`, `sin`, `cos`, `tan`, `arcsin`, `arccos`, `arctan`, `sinh`, `cosh`, `tanh`, `arcsinh`, `arccosh`, and `arctanh`

```
>>> a = np.linspace(0.3, 0.6, 4)
array([ 0.3,  0.4,  0.5,  0.6])

>>> np.sin(a)
>>> array([ 0.29552021,  0.38941834,  0.47942554,  0.56464247])
```

Oppgave

- Bruk `matplotlib.pyplot.plot()` for å vise (mellom $x=0..15$)
- $y = \sin x$
- $y = \sin x + \frac{1}{3} \sin 3x$
- $y = \sin x + \frac{1}{3} \sin 3x + \frac{1}{5} \sin 5x$
- OSV....