Numpy

- stands for numerical python
- NumPy is a Python library used for working with arrays.

In [1]:

```
import numpy as np
```

In [2]:

```
np.__version__
```

Out[2]:

```
'1.20.1'
```

In [3]:

```
# create 1D array
a1 = np.array([1,2,3,4,5])
print(a1)
print(a1.ndim) #'ndim' is uesd for which array is showed.
```

```
[1 2 3 4 5]
1
```

In [6]:

```
# create 2D array
a2 = np.array([[1,2,3],[4,5,6],[7,8,9],[10,11,12]])
print(a2)
print(a2.ndim)
print(a2.shape)
```

```
[[ 1  2  3]
 [ 4  5  6]
 [ 7  8  9]
 [10 11 12]]
2
(4, 3)
```

In [9]:

```
# create 3D array
a3 = np.array([[[1,2,3],[4,5,6],[7,8,9],[10,11,12]]])
print(a3)
print(a3.ndim)
print(a3.shape)
```

```
[[[ 1  2  3]
  [ 4  5  6]
  [ 7  8  9]
  [10 11 12]]]
3
(1, 4, 3)
```

In [15]:

```
a4 = np.array([[[1,2],[3,4]],[[5,6],[9,8]]])
print(a4)
print(a4.ndim)
print(a4.shape)
print(a4.size)
print(a4.itemsize)
```

```
[[[1 2]
  [3 4]]

 [[5 6]
  [9 8]]]
3
(2, 2, 2)
8
4
```

creating an array using range()

- np.array(range(start,end,step))
- np.array(range(start,end,step)).reshape(rows,columns)

In [16]:

```
a1 =np.array(range(10))
print(a1)
print(a1.ndim)
```

```
[0 1 2 3 4 5 6 7 8 9]
1
```

In [17]:

```
#reshape()
a1 =np.array(range(10)).reshape(5,2)
print(a1)
print(a1.ndim)
```

```
[[0 1]
 [2 3]
 [4 5]
 [6 7]
 [8 9]]
2
```

In [21]:

```
a1 =np.array(range(10)).reshape(2,5,1)
print(a1)
print(a1.ndim)
print(a1.shape)
```

```
[[[0]
  [1]
  [2]
  [3]
  [4]]

 [[5]
  [6]
  [7]
  [8]
  [9]]]
3
(2, 5, 1)
```

In [25]:

```
a1 =np.array(range(10,40)).reshape(1,5,6)
print(a1)
print(a1.ndim)
print(a1.shape)
```

```
[[[10 11 12 13 14 15]
  [16 17 18 19 20 21]
  [22 23 24 25 26 27]
  [28 29 30 31 32 33]
  [34 35 36 37 38 39]]]
3
(1, 5, 6)
```

Create an array using arrange()

- np.arrange(start,end,step).reshape

In [27]:

```
a5 = np.arange(10,40).reshape(5,6)
print(a5)
print(a5.ndim)
print(a5.shape)
print(a5.size)
print(a5.itemsize)

```

```
[[10 11 12 13 14 15]
 [16 17 18 19 20 21]
 [22 23 24 25 26 27]
 [28 29 30 31 32 33]
 [34 35 36 37 38 39]]
2
(5, 6)
30
4
```

In [29]:

```
a5 = np.arange(1,40,2).reshape(5,4)
print(a5)
print(a5.ndim)
print(a5.shape)
print(a5.size)
print(a5.itemsize)

```

```
[[ 1  3  5  7]
 [ 9 11 13 15]
 [17 19 21 23]
 [25 27 29 31]
 [33 35 37 39]]
2
(5, 4)
20
4
```

In [34]:

```
# zero matrix
z = np.zeros((5,5))
print(z)
print(z[1][1])
print(type(z[3][1]))
```

```
[[0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]]
0.0
<class 'numpy.float64'>
```

In [35]:

```
# convert float to integer
z = np.zeros((5,5),dtype = 'int')
print(z)
print(z[1][1])
print(type(z[3][1]))
```

```
[[0 0 0 0 0]
 [0 0 0 0 0]
 [0 0 0 0 0]
 [0 0 0 0 0]
 [0 0 0 0 0]]
0
<class 'numpy.int32'>
```

In [36]:

```
# one matrix- 'ones' keyword
o = np.ones((5,4))
print(o)

```

```
[[1. 1. 1. 1.]
 [1. 1. 1. 1.]
 [1. 1. 1. 1.]
 [1. 1. 1. 1.]
 [1. 1. 1. 1.]]
```

In [38]:

```
o = np.ones((5,4),dtype=int)
print(o*5)
```

```
[[5 5 5 5]
 [5 5 5 5]
 [5 5 5 5]
 [5 5 5 5]
 [5 5 5 5]]
```

In [39]:

```
1 print(dir(np))
```

```
['ALLOW_THREADS', 'AxisError', 'BUFSIZE', 'Bytes0', 'CLIP', 'ComplexWarni
ng', 'DataSource', 'Datetime64', 'ERR_CALL', 'ERR_DEFAULT', 'ERR_IGNORE',
'ERR_LOG', 'ERR_PRINT', 'ERR_RAISE', 'ERR_WARN', 'FLOATING_POINT_SUPPOR
T', 'FPE_DIVIDEBYZERO', 'FPE_INVALID', 'FPE_OVERFLOW', 'FPE_UNDERFLOW',
'False_', 'Inf', 'Infinity', 'MAXDIMS', 'MAY_SHARE_BOUNDS', 'MAY_SHARE_EX
ACT', 'MachAr', 'ModuleDeprecationWarning', 'NAN', 'NINF', 'NZERO', 'Na
N', 'PINF', 'PZERO', 'RAISE', 'RankWarning', 'SHIFT_DIVIDEBYZERO', 'SHIFT
_INVALID', 'SHIFT_OVERFLOW', 'SHIFT_UNDERFLOW', 'ScalarType', 'Str0', 'Te
ster', 'TooHardError', 'True_', 'UFUNC_BUFSIZE_DEFAULT', 'UFUNC_PYVALS_NA
ME', 'Uint64', 'VisibleDeprecationWarning', 'WRAP', '_NoValue', '_UFUNC_A
PI', '__NUMPY_SETUP__', '__all__', '__builtins__', '__cached__', '__confi
g__', '__deprecated_attrs__', '__dir__', '__doc__', '__expired_functions_
_', '__file__', '__getattr__', '__git_revision__', '__loader__', '__mkl_v
ersion__', '__name__', '__package__', '__path__', '__spec__', '__version_
_', '_add_newdoc_ufunc', '_distributor_init', '_financial_names', '_globa
ls', '_mat', '_pytesttester', 'abs', 'absolute', 'add', 'add_docstring',
'add_newdoc', 'add_newdoc_ufunc', 'alen', 'all', 'allclose', 'alltrue',
'amax', 'amin', 'angle', 'any', 'append', 'apply_along_axis', 'apply_over
_axes', 'arange', 'arccos', 'arccosh', 'arcsin', 'arcsinh', 'arctan', 'ar
ctan2', 'arctanh', 'argmax', 'argmin', 'argpartition', 'argsort', 'argwhe
re', 'around', 'array', 'array2string', 'array_equal', 'array_equiv', 'ar
ray_repr', 'array_split', 'array_str', 'asanyarray', 'asarray', 'asarray_
chkfinite', 'ascontiguousarray', 'asfarray', 'asfortranarray', 'asmatri
x', 'asscalar', 'atleast_1d', 'atleast_2d', 'atleast_3d', 'average', 'bar
tlett', 'base_repr', 'binary_repr', 'bincount', 'bitwise_and', 'bitwise_n
ot', 'bitwise_or', 'bitwise_xor', 'blackman', 'block', 'bmat', 'bool8',
'bool_', 'broadcast', 'broadcast_arrays', 'broadcast_shapes', 'broadcast_
to', 'busday_count', 'busday_offset', 'busdaycalendar', 'byte', 'byte_bou
nds', 'bytes0', 'bytes_', 'c_', 'can_cast', 'cast', 'cbrt', 'cdouble', 'c
eil', 'cfloat', 'char', 'character', 'chararray', 'choose', 'clip', 'clon
gdouble', 'clongfloat', 'column_stack', 'common_type', 'compare_chararray
s', 'compat', 'complex128', 'complex64', 'complex_', 'complexfloating',
'compress', 'concatenate', 'conj', 'conjugate', 'convolve', 'copy', 'copy
sign', 'copyto', 'core', 'corrcoef', 'correlate', 'cos', 'cosh', 'count_n
onzero', 'cov', 'cross', 'csingle', 'ctypeslib', 'cumprod', 'cumproduct',
'cumsum', 'datetime64', 'datetime_as_string', 'datetime_data', 'deg2rad',
'degrees', 'delete', 'deprecate', 'deprecate_with_doc', 'diag', 'diag_ind
ices', 'diag_indices_from', 'diagflat', 'diagonal', 'diff', 'digitize',
'disp', 'divide', 'divmod', 'dot', 'double', 'dsplit', 'dstack', 'dtype',
'e', 'ediff1d', 'einsum', 'einsum_path', 'emath', 'empty', 'empty_like',
'equal', 'errstate', 'euler_gamma', 'exp', 'exp2', 'expand_dims', 'expm
1', 'extract', 'eye', 'fabs', 'fastCopyAndTranspose', 'fft', 'fill_diagon
al', 'find_common_type', 'finfo', 'fix', 'flatiter', 'flatnonzero', 'flex
ible', 'flip', 'fliplr', 'flipud', 'float16', 'float32', 'float64', 'floa
t_', 'float_power', 'floating', 'floor', 'floor_divide', 'fmax', 'fmin',
'fmod', 'format_float_positional', 'format_float_scientific', 'format_par
ser', 'frexp', 'frombuffer', 'fromfile', 'fromfunction', 'fromiter', 'fro
mpyfunc', 'fromregex', 'fromstring', 'full', 'full_like', 'gcd', 'generi
c', 'genfromtxt', 'geomspace', 'get_array_wrap', 'get_include', 'get_prin
toptions', 'getbufsize', 'geterr', 'geterrcall', 'geterrobj', 'gradient',
'greater', 'greater_equal', 'half', 'hamming', 'hanning', 'heaviside', 'h
istogram', 'histogram2d', 'histogram_bin_edges', 'histogramdd', 'hsplit',
'hstack', 'hypot', 'i0', 'identity', 'iinfo', 'imag', 'in1d', 'index_ex
p', 'indices', 'inexact', 'inf', 'info', 'infty', 'inner', 'insert', 'int
0', 'int16', 'int32', 'int64', 'int8', 'int_', 'intc', 'integer', 'inter
p', 'intersect1d', 'intp', 'invert', 'is_busday', 'isclose', 'iscomplex',
```

```
'iscomplexobj', 'isfinite', 'isfortran', 'isin', 'isinf', 'isnan', 'isna
t', 'isneginf', 'isposinf', 'isreal', 'isrealobj', 'isscalar', 'issctyp
e', 'issubclass_', 'issubdtype', 'issubsctype', 'iterable', 'ix_', 'kaise
r', 'kron', 'lcm', 'ldexp', 'left_shift', 'less', 'less_equal', 'lexsor
t', 'lib', 'linalg', 'linspace', 'little_endian', 'load', 'loads', 'loadt
xt', 'log', 'log10', 'log1p', 'log2', 'logaddexp', 'logaddexp2', 'logical
_and', 'logical_not', 'logical_or', 'logical_xor', 'logspace', 'longcompl
ex', 'longdouble', 'longfloat', 'longlong', 'lookfor', 'ma', 'mafromtxt',
'mask_indices', 'mat', 'math', 'matmul', 'matrix', 'matrixlib', 'max', 'm
aximum', 'maximum_sctype', 'may_share_memory', 'mean', 'median', 'memma
p', 'meshgrid', 'mgrid', 'min', 'min_scalar_type', 'minimum', 'mintypecod
e', 'mkl', 'mod', 'modf', 'moveaxis', 'msort', 'multiply', 'nan', 'nan_to
_num', 'nanargmax', 'nanargmin', 'nancumprod', 'nancumsum', 'nanmax', 'na
nmean', 'nanmedian', 'nanmin', 'nanpercentile', 'nanprod', 'nanquantile',
'nanstd', 'nansum', 'nanvar', 'nbytes', 'ndarray', 'ndenumerate', 'ndfrom
txt', 'ndim', 'ndindex', 'nditer', 'negative', 'nested_iters', 'newaxis',
'nextafter', 'nonzero', 'not_equal', 'numarray', 'number', 'obj2sctype',
'object0', 'object_', 'ogrid', 'oldnumeric', 'ones', 'ones_like', 'os',
'outer', 'packbits', 'pad', 'partition', 'percentile', 'pi', 'piecewise',
'place', 'poly', 'poly1d', 'polyadd', 'polyder', 'polydiv', 'polyfit', 'p
olyint', 'polymul', 'polynomial', 'polysub', 'polyval', 'positive', 'powe
r', 'printoptions', 'prod', 'product', 'promote_types', 'ptp', 'put', 'pu
t_along_axis', 'putmask', 'quantile', 'r_', 'rad2deg', 'radians', 'rando
m', 'ravel', 'ravel_multi_index', 'real', 'real_if_close', 'rec', 'recarr
ay', 'recfromcsv', 'recfromtxt', 'reciprocal', 'record', 'remainder', 're
peat', 'require', 'reshape', 'resize', 'result_type', 'right_shift', 'rin
t', 'roll', 'rollaxis', 'roots', 'rot90', 'round', 'round_', 'row_stack',
's_', 'safe_eval', 'save', 'savetxt', 'savez', 'savez_compressed', 'sctyp
e2char', 'sctypeDict', 'sctypes', 'searchsorted', 'select', 'set_numeric_
ops', 'set_printoptions', 'set_string_function', 'setbufsize', 'setdiff1
d', 'seterr', 'seterrcall', 'seterrobj', 'setxor1d', 'shape', 'shares_mem
ory', 'short', 'show_config', 'sign', 'signbit', 'signedinteger', 'sin',
'sinc', 'single', 'singlecomplex', 'sinh', 'size', 'sometrue', 'sort', 's
ort_complex', 'source', 'spacing', 'split', 'sqrt', 'square', 'squeeze',
'stack', 'std', 'str0', 'str_', 'string_', 'subtract', 'sum', 'swapaxes',
'sys', 'take', 'take_along_axis', 'tan', 'tanh', 'tensordot', 'test', 'te
sting', 'tile', 'timedelta64', 'trace', 'tracemalloc_domain', 'transpos
e', 'trapz', 'tri', 'tril', 'tril_indices', 'tril_indices_from', 'trim_ze
ros', 'triu', 'triu_indices', 'triu_indices_from', 'true_divide', 'trun
c', 'typeDict', 'typecodes', 'typename', 'ubyte', 'ufunc', 'uint', 'uint
0', 'uint16', 'uint32', 'uint64', 'uint8', 'uintc', 'uintp', 'ulonglong',
'unicode_', 'union1d', 'unique', 'unpackbits', 'unravel_index', 'unsigned
integer', 'unwrap', 'use_hugepage', 'ushort', 'vander', 'var', 'vdot', 'v
ectorize', 'version', 'void', 'void0', 'vsplit', 'vstack', 'warnings', 'w
here', 'who', 'zeros', 'zeros_like']
```

In [48]:

```
1 r = np.random.randint(10)
2 r
```

Out[48]:

2

In [52]:

```
r = np.random.randint(10,20,7)
print(r)
```

```
[38 39 38 33 31 15 28]
```

In [53]:

```
r = np.random.randint(10,40,20).reshape(5,4)
print(r)
```

```
[[15 13 30 15]
 [27 35 35 36]
 [17 21 19 19]
 [15 21 36 30]
 [10 32 16 37]]
```

In [54]:

```
np.random.random((2,3))
```

Out[54]:

```
array([[0.91940105, 0.09210345, 0.1655986 ],
       [0.19269614, 0.6987016 , 0.73300556]])
```

In [55]:

```
print(np.log(1))
```

```
0.0
```

In [ ]:

```

```