Importing Data: Python Data Playbook

IMPORTING TEXT DATA INTO PYTHON USING NUMPY

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```
which_file = "Creative Commons Attribution-ShareAlike 3.0"
license_file = open(which_file, mode='r')
license_name = license_file.readline()
license = license_file.read()
license_file.close()
print(license_name)
print(license)
```

Reading Text Files

Import plain text files using open() with mode='r' ***(for read-only)***

Now you can read() or readline() and show contents using print()

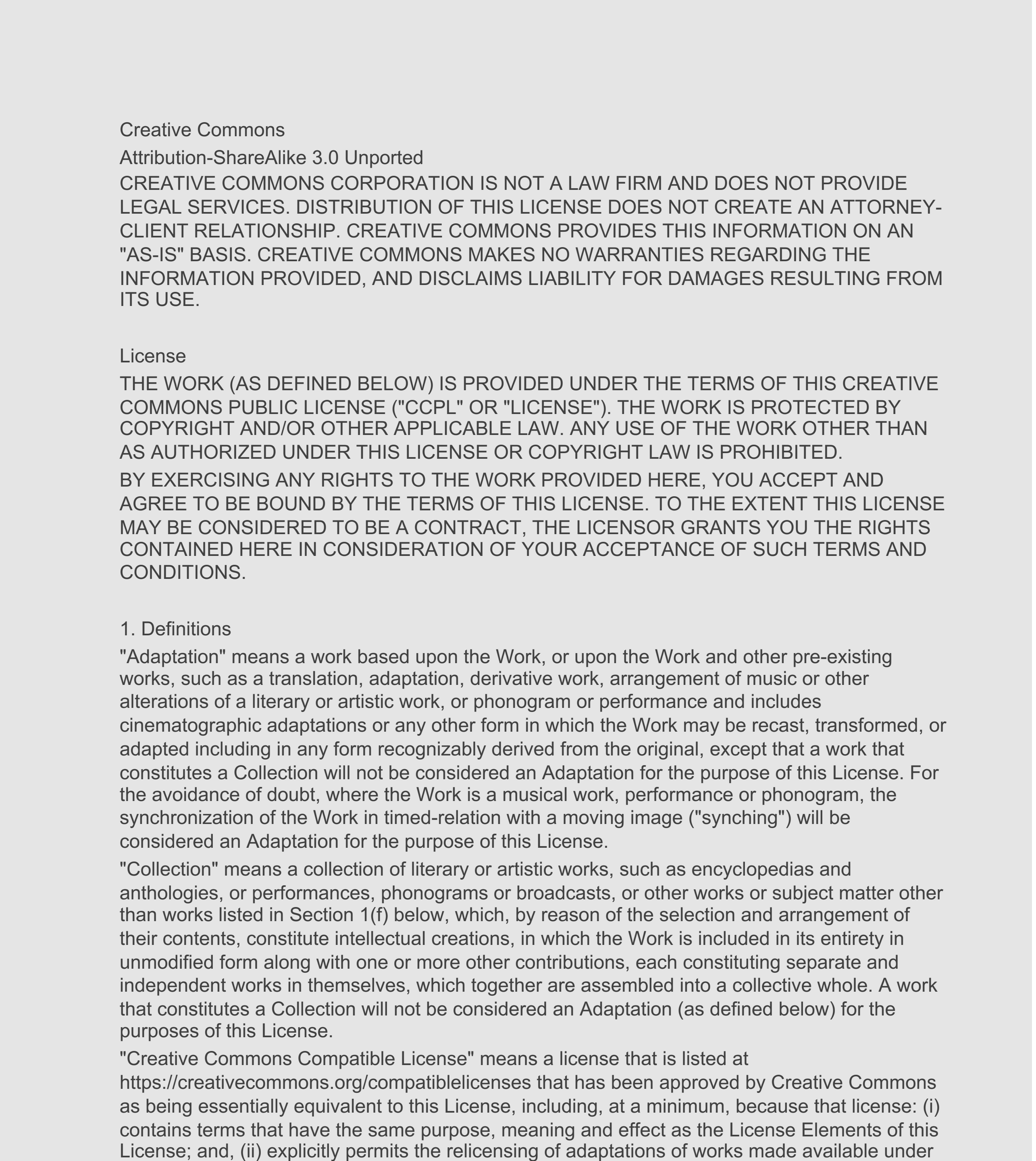
But don't forget to close()

```
with open (which_file, 'r') as file:
    print(file.read())
```

Using a Context Manager

Control when to allocate and release resources

- Using with
- No need to use close()



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Plain text

Useful for certain scenarios

Not so much for others

Better alternatives

Flat files and numeric data

```
Id,Rep,Address,Name
0,100,"on the server farm","Community"
1,101,"New York, NY","Xavier Morera"
2,101,"Alpharetta, GA","Irene Gurdian"
3,101,"","Juli Luci"
```

Text Files: Delimited Files and CSV

Data stored in a text file, in rows with columns

Each row is an entry or a record, and each column is a field

- Separated by a delimiter and potentially with a header

RFC 4180

Id	Rep	Address	Name
0	100	on the server farm	Community
1	101	New York, NY	Xavier Morera
2	101	Alpharetta, GA	Irene Gurdian
3	101		Juli Luci

Fixed-width Text File

Not covered in this training

```
Id,Name,Address

1,Xavier Morera,600 meters north, 75 east from a landmark

1,Xavier Morera,"600 meters north, 75 east from a landmark"
```

Text Files: Delimited Files and CSV

Delimited files separate fields using a specific character

- Comma, tab, pipe…

CSV also have enclosing character

```
1.000000000000000000e+00 1.000000000000000000e+00
2.000000000000000000e+00 2.000000000000000000e+00
3.000000000000000000e+00 4.000000000000000000e+00
4.000000000000000000e+00 5.000000000000000000e+00
5.000000000000000000e+00 8.000000000000000000e+00
```

Text Files: NumPy

We may run into some files that look like this

Created using NumPy

- Learn how to load them shortly

```
[[ 0., 0., 7.],
 [ 3., 1., 3.],
 [ 3., 0., 5.]]
```

Importing Text Files Using NumPy

Homogeneous multidimensional array, called ndarray

Table of elements, usually numbers, of the same type

- Dimensions are called axes

Several functions available for loading data

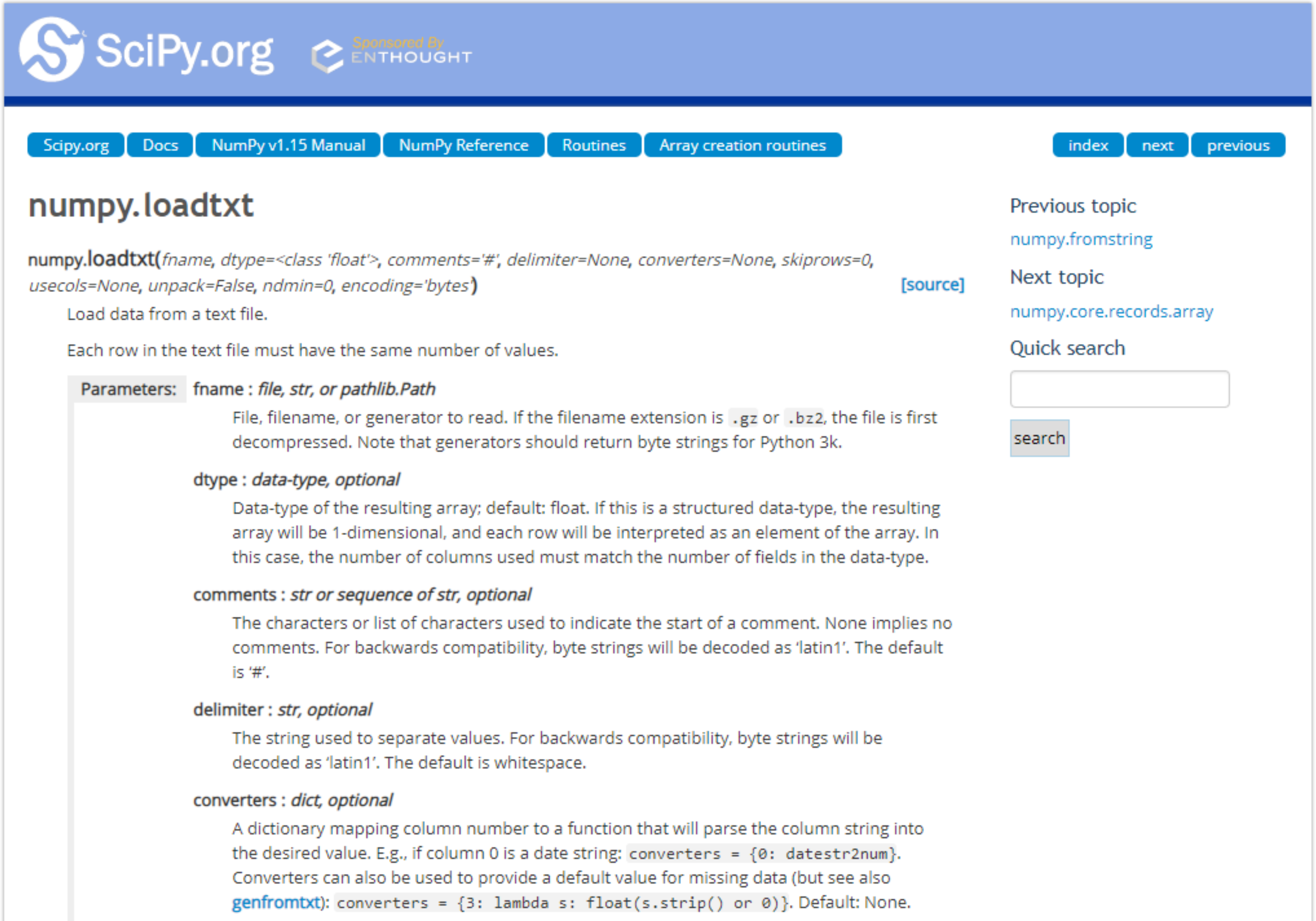
```
import numpy as np

sample_array = np.array([0,0,7])

type(sample_array)

dir(sample_array)
```

Importing Text Files Using NumPy

Start by importing NumPy

Create arrays using array()

- Create an object of type numpy.ndarray



numpy.loadtxt

numpy.loadtxt(*fname, dtype=<class 'float'>, comments='#', delimiter=None, converters=None, skiprows=0, usecols=None, unpack=False, ndmin=0, encoding='bytes'*) [source]

Load data from a text file.

Each row in the text file must have the same number of values.

Parameters:

fname : *file, str, or pathlib.Path*

File, filename, or generator to read. If the filename extension is `.gz` or `.bz2`, the file is first decompressed. Note that generators should return byte strings for Python 3k.

dtype : *data-type, optional*

Data-type of the resulting array; default: float. If this is a structured data-type, the resulting array will be 1-dimensional, and each row will be interpreted as an element of the array. In this case, the number of columns used must match the number of fields in the data-type.

comments : *str or sequence of str, optional*

The characters or list of characters used to indicate the start of a comment. None implies no comments. For backwards compatibility, byte strings will be decoded as 'latin1'. The default is '#'.

delimiter : *str, optional*

The string used to separate values. For backwards compatibility, byte strings will be decoded as 'latin1'. The default is whitespace.

converters : *dict, optional*

A dictionary mapping column number to a function that will parse the column string into the desired value. E.g., if column 0 is a date string: `converters = {0: datestr2num}`. Converters can also be used to provide a default value for missing data (but see also genfromtxt): `converters = {3: lambda s: float(s.strip() or 0)}`. Default: None.

```
# cat badges-five-numpy.txt

badges_saved_np = np.loadtxt('badges-five-numpy.txt')

badges_saved_np

badges_saved_np.size

badges_saved_np.shape
```

Importing Data Using Numpy: loadtxt()

Load a file that was created with NumPy using loadtxt

Into ndarray

- Items of same type and same number of values

```
# cat badges-five.txt

badges_comma = np.loadtxt('badges-five.txt') # error

badges_comma = np.loadtxt('badges-five.txt', delimiter=',’)

badges_comma = np.loadtxt('badges-five.txt', delimiter=‘,’, usecols=0)

badges_comma
```

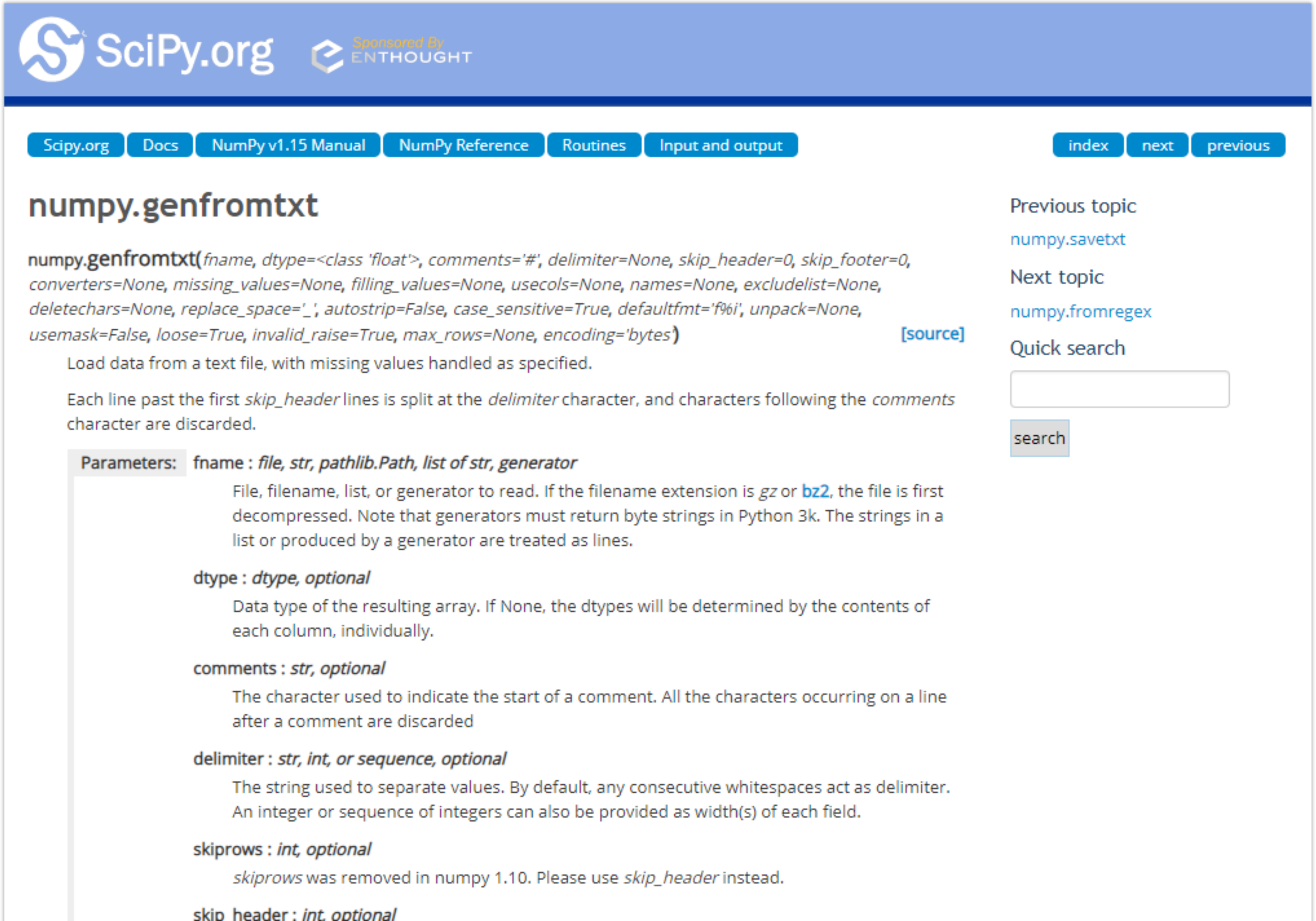
Importing Data Using Numpy: loadtxt()

Files not generated with NumPy

- With delimiter, useful for files created by other means
- Options like usecols, skiprows, dtype, converter, and comments

Certain limitations, i.e. missing values

```
# cat badges-five-header.txt
badges_header = np.loadtxt('badges-five-header.txt', delimiter=',') # error
badges_header = np.loadtxt('badges-five-header.txt', delimiter=',', skiprows=1)
badges_header
badges_header.dtype
badges_str = np.loadtxt('badges-five-header.txt', delimiter=',', skiprows=1, dtype=np.uint)
badges_header.dtype
def Increase(the_id):
    return int(the_id) + 1000
badges_increased = np.loadtxt('badges-five.txt', delimiter=',', dtype=int, converters={0:
Increase})
badges_increased
```



numpy.genfromtxt

numpy.genfromtxt(*fname, dtype=<class 'float'>, comments='#', delimiter=None, skip_header=0, skip_footer=0, converters=None, missing_values=None, filling_values=None, usecols=None, names=None, excludelist=None, deletechars=None, replace_space='_', autostrip=False, case_sensitive=True, defaultfmt='f%i', unpack=None, usemask=False, loose=True, invalid_raise=True, max_rows=None, encoding='bytes'*) [source]

Load data from a text file, with missing values handled as specified.

Each line past the first *skip_header* lines is split at the *delimiter* character, and characters following the *comments* character are discarded.

Parameters:

fname : *file, str, pathlib.Path, list of str, generator*

File, filename, list, or generator to read. If the filename extension is *gz* or bz2, the file is first decompressed. Note that generators must return byte strings in Python 3k. The strings in a list or produced by a generator are treated as lines.

dtype : *dtype, optional*

Data type of the resulting array. If None, the dtypes will be determined by the contents of each column, individually.

comments : *str, optional*

The character used to indicate the start of a comment. All the characters occurring on a line after a comment are discarded

delimiter : *str, int, or sequence, optional*

The string used to separate values. By default, any consecutive whitespaces act as delimiter. An integer or sequence of integers can also be provided as width(s) of each field.

skiprows : *int, optional*

skiprows was removed in numpy 1.10. Please use *skip_header* instead.

skip_header : *int, optional*

```
# cat badges-five-missing-value.txt
badges_missing_value = np.genfromtxt('badges-five-missing-value.txt', delimiter=',')
badges_missing_value = np.genfromtxt('badges-five-missing-value.txt', delimiter=',', skip_header=1)
```

Importing Data Using Numpy: genfromtext()

Data with missing values can be imported with genfromtext

We have:

- First, missing_values **to specify what is considered a missing value**
- And filling_values to specify how to handle