RandomSDSS

Release 0.5.0

Martin Chalela

Sep 10, 2021

CONTENTS:

Generate random points in Sloan Digital Sky Survey (SDSS) DR8 to DR16 footprints.

This is a small wrapper around the package pymangle that facilitates the creation of random points in the SDSS fields. I included SDSS polygons for its different data releases (DR8 to DR16).

CHAPTER

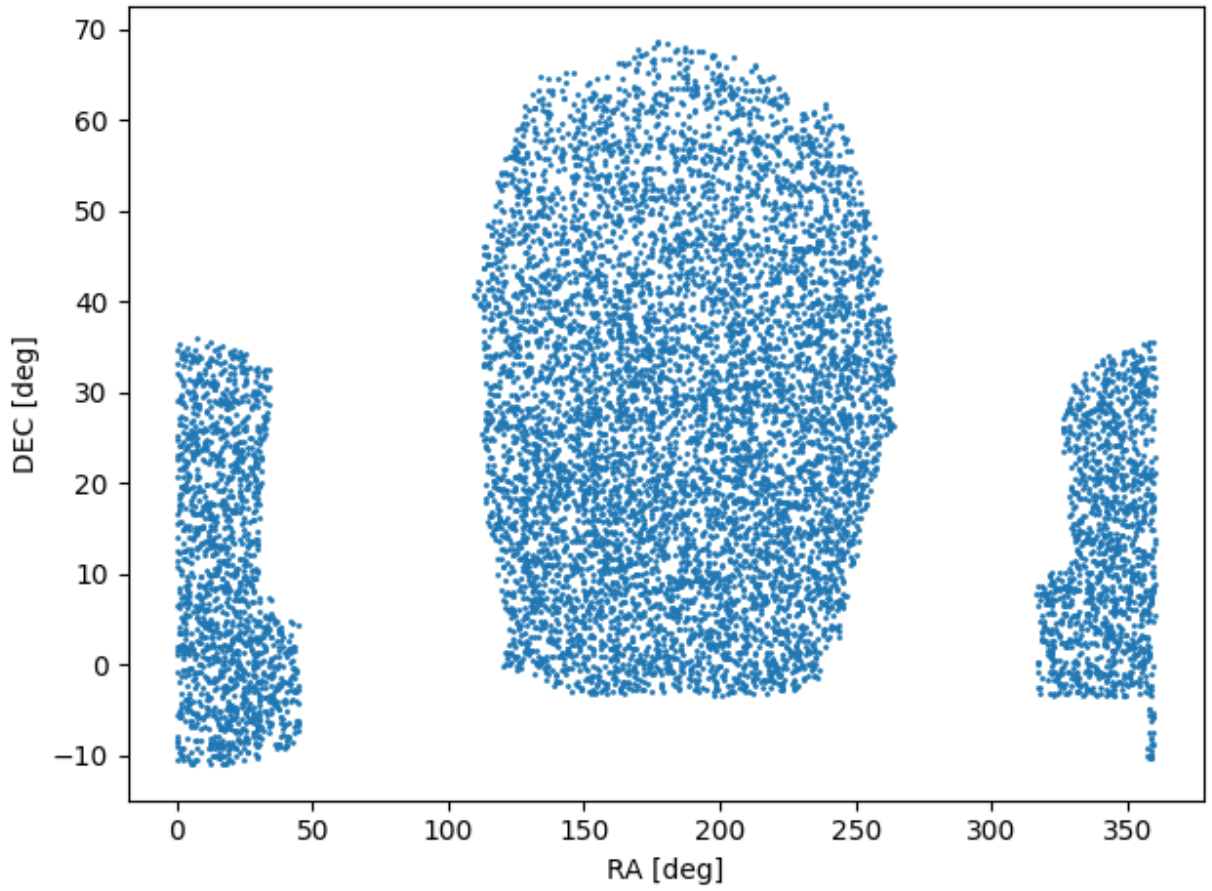
ONE

BASIC USAGE

```
import matplotlib.pyplot as plt
import randomsdss

dr12 = randomsdss.DR12(catalog="BOSS")
ra, dec = dr12.sky_random(size=10_000)

plt.figure()
plt.scatter(ra, dec, s=1)
plt.xlabel('RA [deg]')
plt.ylabel('DEC [deg]')
```



Alternatively, you can get the same result without the need to instantiate an object using:

```
ra, dec = randomsdss.sky_random(dr="DR12", catalog="BOSS", size=10_000)
```

If you also need a random redshift distribution you can provide a sample of redshifts and a random set will be generated from the underlying Probability Density Function (PDF):

```
z = randomsdss.z_random(z_array, size=10_000)
```

The z_random is a complementary function since it does not use any information regarding the SDSS catalogs, only the provided redshift array.

Author

Martin Chalela (E-mail: tinchochalela@gmail.com)

CHAPTER

TWO

REPOSITORY AND ISSUES

https://github.com/mchalela/RandomSDSS

2.1 RandomSDSS

Generate random points within SDSS DR8 to DR16 footprint.

exception randomsdss.**PolygonNotFoundError**
Bases: FileNotFoundError

Raised when the .ply file doesn't exists.

class randomsdss.**DR**(*dr*, *catalog*)
Bases: object

Base Data Release class.

Parameters

- **dr** (*str*) – Data Release name: e.g DR16.
- **catalog** (*str*) – Catalog name within the specified data release: e.g. BOSS.

box_random(*ra_min*, *ra_max*, *dec_min*, *dec_max*, *size*)
Generate random RA, DEC points within a box.

Parameters

- **ra_min** (*float*) – Right Ascension lower bound in degrees.
- **ra_max** (*float*) – Right Ascension upper bound in degrees.
- **dec_min** (*float*) – Declination lower bound in degrees.
- **dec_max** (*float*) – Declination upper bound in degrees.
- **size** (*int*) – Number of random points to generate.

Returns

- **ra** (*numpy.ndarray*) – Right Ascension in degrees.
- **dec** (*numpy.ndarray*) – Declination in degrees.

contains(*ra*, *dec*)
Check if point is inside the catalog area.

Parameters

- **ra** (*numpy.ndarray*) – Right Ascension in degrees.

- **dec** (*numpy.ndarray*) – Declination in degrees.

Returns True if inside, False otherwise.

Return type bool

polyid(*ra*, *dec*)
Get polygon id of input point.

Parameters

- **ra** (*numpy.ndarray*) – Right Ascension in degrees.
- **dec** (*numpy.ndarray*) – Declination in degrees.

Returns **pid** – Polygon id. -1 if outside of catalog area.

Return type numpy.ndarray

polyid_and_weight(*ra*, *dec*)
Get polygon id and weight of input point.

Parameters

- **ra** (*numpy.ndarray*) – Right Ascension in degrees.
- **dec** (*numpy.ndarray*) – Declination in degrees.

Returns

- **pid** (*numpy.ndarray*) – Polygon id. -1 if outside of catalog area.
- **weight** (*numpy.ndarray*) – Poligon weight. 0 if outside of catalog area.

set_weights(*weights*)
Set new weights for polygons.

Parameters **weight** (*float or numpy.ndarray*) – Poligons weights.

sky_random(*size*)
Generate random RA, DEC points.

Parameters **size** (*int*) – Number of random points to generate.

Returns

- **ra** (*numpy.ndarray*) – Right Ascension in degrees.
- **dec** (*numpy.ndarray*) – Declination in degrees.

weight(*ra*, *dec*)
Get polygon weight of input point.

Parameters

- **ra** (*numpy.ndarray*) – Right Ascension in degrees.
- **dec** (*numpy.ndarray*) – Declination in degrees.

Returns **weight** – Poligon weight. 0 if outside of catalog area.

Return type numpy.ndarray

property area
Get the area of the catalog.

property npoly
Get the number of polygons.

property weights
Array of polygons weights.

class randomsdss.**DR10**(*catalog='SDSS'*)
Bases: *randomsdss.randomsdss.DR*

class randomsdss.**DR11**(*catalog='SDSS'*)
Bases: *randomsdss.randomsdss.DR*

class randomsdss.**DR12**(*catalog='SDSS'*)
Bases: *randomsdss.randomsdss.DR*

class randomsdss.**DR13**(*catalog='SDSS'*)
Bases: *randomsdss.randomsdss.DR*

class randomsdss.**DR14**(*catalog='SDSS'*)
Bases: *randomsdss.randomsdss.DR*

class randomsdss.**DR15**(*catalog='SDSS'*)
Bases: *randomsdss.randomsdss.DR*

class randomsdss.**DR16**(*catalog='SDSS'*)
Bases: *randomsdss.randomsdss.DR*

class randomsdss.**DR8**(*catalog='SDSS'*)
Bases: *randomsdss.randomsdss.DR*

class randomsdss.**DR9**(*catalog='SDSS'*)
Bases: *randomsdss.randomsdss.DR*

randomsdss.**sky_random**(*dr='DR16'*, *catalog='SDSS'*, *size=10000*)
Generate random RA, DEC values within the specified DR and catalog.

Parameters

- **dr** (*str*) – Data Release name: e.g DR16.
- **catalog** (*str*) – Catalog name within the specified data release: e.g. BOSS.
- **size** (*int*) – Number of random points to generate.

Returns

- **ra** (*numpy.ndarray*) – Right Ascension in degrees.
- **dec** (*numpy.ndarray*) – Declination in degrees.

randomsdss.**z_random**(*z*, *size=10000*, *weights=None*, *seed=None*)
Generate random redshift values following the input distribution.

This function uses scipy.stats.gaussian_kde to compute the Probability Density Distribution (PDF).

Parameters

- **z** (*numpy.ndarray*) – Redhisft sample to generate a PDF and extract random points.
- **size** (*int*) – Number of random points to generate.
- **weights** (*numpy.ndarray*) – Weigths of each redshift value to compute a weigthed PDF.
- **seed** (*int*) – Set random seed.

Returns **z_rand** – Random redshifts.

Return type numpy.ndarray

2.2 Requirements

For the moment you will need to install numpy before installing RandomSDSS.

```
$ pip install numpy
```

2.3 Installation

The easiest way to install is using pip:

```
$ pip install randomsdss
```

This will install the latest stable version on PyPI.

If you want to use the latest development version from github, unpack or clone the *repo <https://github.com/mchalela/RandomSDSS>* on your local machine, change the directory to where setup.py is, and install using setuptools:

```
$ python setup.py install
```

or pip:

```
$ pip install -e .
```

2.4 Licence

PYTHON MODULE INDEX

r

randomsdss, 5

INDEX