
SuperRAENN Documentation

Release 0.1.0

Contributors

Jul 31, 2020

Contents

1	Installation	3
2	Usage	5
2.1	Light Curve Data Format	5
2.2	Metatable Data Format	6
3	API Documentation	7
3.1	superraenn.classify module	7
3.2	superraenn.feature_extraction module	7
3.3	superraenn.lc module	7
3.4	superraenn.preprocess module	7
3.5	superraenn.raenn module	7
4	Release History	9
4.1	v0.1.0 (2020-06-11)	9
4.2	v0.1.1 (2020-06-30)	9
4.3	v1.0.0 (2020-07-21)	9

SuperRAENN is an open-source Python package for the photometric classification of supernovae in the following categories: Type I superluminos supernovae, Type II, Type IIn, Type Ia and Type Ib/c. It is described in detail in Villar et al. (in prep.). SuperRAENN is optimized for use with complete (rather than realtime) light curves from the Pan-STARRS Medium Deep Survey. Users will need to train the classifier on their own data for optimal results.

CHAPTER 1

Installation

At the command line:

```
$ pip install superraenn
```

For a development install of SuperRAENN, clone the repository and then install into your Python environment:

```
$ git clone https://github.com/villrv/SuperRAENN
$ cd SuperRAENN
$ python setup.py develop
```


CHAPTER 2

Usage

SuperRAENN can be used on a dataset containing both spectroscopically labelled and unlabelled SNe. All events will be used to train the RAENN, while labelled events will be used to train the random forest.

A minimal working example is shown below:

```
superraenn-prep example_LCs/ example_meta_table.dat
superraenn-raenn ./products/lcs.npz --n-epoch 10
superraenn-extract products/lcs.npz
superraenn-classify example_meta_table.dat --train --savemodel
superraenn-classify example_meta_table.dat --modelfile ./products/model.sav
```

As shown, SuperRAENN needs two inputs: a directory of light curve files (in *SNANA* <<https://github.com/RickKessler/SNANA>> format) and a metatable containing the SN name, redshifts, SN types, best-guess at explosion time and Milky Way extinction.

2.1 Light Curve Data Format

Light curves used to run SuperRAENN use *SNANA* text format.

Below is an example light curve file:

```
SURVEY: PS1MD
SNID: PSc000001
IAUC: UNKNOWN
RA: 52.4530625 deg
DECL: -29.0749750 deg
MWEBV: 0.0075 +- 0.0003 MW E(B-V)
REDSHIFT_FINAL: 0.0713 +- 0.0010 (CMB)
SEARCH_PEAKMJD: 55207.0
FILTERS: griz

# =====
```

(continues on next page)

(continued from previous page)

```
# TERSE LIGHT CURVE OUTPUT
#
NOBS: 306
NVAR: 7
VARLIST: MJD   FLT FIELD   FLUXCAL   FLUXCALERR   MAG       MAGERR

OBS: 55086.6 g NULL  -243.440 231.478 nan -1.032
OBS: 55089.6 g NULL  -62.931 13.480 nan -0.233
OBS: 55095.6 g NULL  -15.102 16.238 nan -1.167
OBS: 55098.6 g NULL  -94.646 13.910 nan -0.160
OBS: 55104.6 g NULL  -28.093 12.441 nan -0.481
OBS: 55191.3 g NULL  -27.414 10.304 nan -0.408
OBS: 55203.3 g NULL  1381.526 18.142 -12.851 0.014
OBS: 55446.6 g NULL  -3.432 9.291 nan -2.939
END:
```

2.2 Metatable Data Format

The metatable is necessary for SuperRAENN to understand which files are in the supervised vs. unsupervised portions of the data. The format must match that shown in the example file, shown below:

```
# SN Redshift Type T_explosion MW(EBV)
PSc000001 0.071 SNII 55207.0 0.008
PSc000006 0.2308 SNIa 55207.0 0.008
PSc010411 0.0740 SNIbc 55248.0 0.009
PSc060270 0.9560 SLSN 55389.0 0.034
PSc070763 0.2590 SNIIn 55424.0 0.037
PSc000345 0.5446 - 55215.0 0.009
PSc000349 0.4802 - 55215.0 0.027
PSc000353 0.268 - 55215.0 0.016
PSc000363 0.1964 - 55215.0 0.025
PSc000418 0.6881 - 55216.0 0.020
```

3.1 `superraenn.classify` module

3.2 `superraenn.feature_extraction` module

3.3 `superraenn.lc` module

3.4 `superraenn.preprocess` module

3.5 `superraenn.raenn` module

CHAPTER 4

Release History

4.1 v0.1.0 (2020-06-11)

Initial release.

4.2 v0.1.1 (2020-06-30)

4.3 v1.0.0 (2020-07-21)

4.3.1 Changed

- Updated documentation throughout