
CACTUS

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INTRODUCTION

The **Cosmic web Classification Toolkit** or **CaCTus** for short, is a public python library for classifying cosmological fields into different cosmic web environments. The package is designed to work directly from simulation particles to the computation of cosmic web environments using either the T-web, V-web or NEXUS algorithms.

CaCTus is designed with the intent of making reliable cosmic web classification algorithms readily available to the community and allowing us to tackle some of the challenges presented by modern cosmological observations. Including better understanding of higher-order statistical information contained in the cosmic web as well as the role of environments on galaxy formation and evolution.

DEPENDENCIES

CaCTus is being developed in Python 3.9 but should work on all versions ≥ 3.4 . CaCTus is written mostly in python, with some backend functions written in fortran. For this reason a fortran compiler is required and we are limited to a version of numpy which still contains distutils (i.e a version < 1.23).

For installation on a local machine, a gnu fortran compiler can be installed from [GFortran](#) while for installations on a HPC, this can usually be satisfied by simply loading a gnu compiler. Once fortran has been installed you will need the following python packages:

- [h5py](#)
- [numpy](#)
- [mpi4py](#)
- [pyyaml](#)
- [scipy](#)

INSTALLATION

Clone the github repository and run the following

```
git clone https://github.com/knaidoo29/cactus.git
cd CACTUS
python setup.py build
python setup.py install
```

Once this is done you should be able to call CaCTus from python:

```
import cactus
```

which will allow you to use CaCTus directly as an imported module. However, in most cases you will want to use the `cactus-run.py` script located in the `scripts/` folder. This script is designed to run at scale, parallelised using `OpenMPI`, and can handle the generation of density and velocity fields to the cosmic web classification maps. The script takes a `yaml` parameter file – an example is also located in the `scripts/` folder. To run the script (across 4 cores), you simply run the following

```
mpirun -np 4 python cactus-run.py params.yaml
```

taking care to copy the `cactus-run.py` scripts to the directory where you are running. It is important to note that you should never need to edit the `cactus-run.py` script but rather the input parameter files.

TUTORIALS AND API

5.1 API

CONTRIBUTORS

CaCTus was written by *Krishna Naidoo* in collaboration with *Wojciech Hellwing*.

The software products have been extensively tested by the Computational Cosmology Group at the Center for Theoretical Physics at the Polish Academy of Sciences, in particular by *Feven Hunde* and *Oliver Newton*. Additional testing was also provided by *Simon Pfeifer* and *Mariana Jaber*.

If you would like to add additional tools or algorithms to the CaCTus package, please get in touch.

SUPPORT

If you have any issues with the code or want to suggest ways to improve it please open a new issue ([here](#)) or (if you don't have a github account) email krishna.naidoo.11@ucl.ac.uk.

VERSION HISTORY

- **Version 0.0.0:**