cLASpy_T
User Manual

Version 0.1 - 2021-01-20

Contents

Chapter 1

Introduction

1.1 About cLASpy_T

cLASpy_T means *Tools for classification of LAS files with Python and machine learning libraries* → Classification LAS Python Tools.

cLASpy_T uses scikit-learn machine learning algorithms to classify 3D point clouds, such as LiDAR or photogrammetric point clouds. Data must be provided in a LAS ou CSV file. Other formats should be supported later, such as GEOTIFF or PLY, and other machine learning libraries too, such as TensorFlow.

The project was started in 2020 by Xavier PELLERIN LE BAS and the Remote Sensing Group of the M2C laboratory[1]. The *cLASpy_T* program is distributed under the CeCILL licence, version 2.1, see the licence_en.txt file.

1.2 Purpose of cLASpy_T

cLASpy_T was developped to friendly use machine learning algorithms to classify or segment 3D point clouds.

Roughly, the program formats the input point clouds provided by LAS or CSV files, to pandas DataFrames and numpy arrays in order to be compatible with Python machine learning algorythms, such as scikit-learn or TensorFlow. *cLASpy_T* writes the output classified point clouds in the same format as the input data, *i.e.* LAS or CSV.

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[1]https://m2c.cnrs.fr/en/continental-and-coastal-morphodynamic-laboratory/

Chapter 2

Installation

This chapter describes how to install the Python 3 interpreter, the dependancies and *get the cLASpy_T* program.

2.1 Install Python 3

cLASpy_T is a Python 3 based program. It needs a Python 3.7 64-bit interpreter installed or earlier versions. See the Download section of the Beginners Guide[1] from the Python documentation.

2.2 Install cLASpy_T on Windows

2.2.1 Get cLASpy_T source code

First, open the Command Prompt 'cmd.exe'. You can easily open the Command Prompt by clicking Start and then typing 'cmd' into the search box.

Move to a directory where put the cLASpy_T source code. For example, 'Me' user moves to his 'Code' directory, then gets the cLASpy_T source code with the git command to clone 'cLASpy_T.git':

```
C:\Users\Me>cd Code
C:\Users\Me\Code>git clone https://github.com/TrickyPells/cLASpy_T.git
```

If you do not know what 'git' is, you also can download cLASpy_T source code on the github page. Choose the branch you want to download, click on 'Code', then 'Download ZIP'. Once downloaded, decompress the ZIP archive in the directory you want, for example, in 'Code' directory.

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[1] https://wiki.python.org/moin/BeginnersGuide/Download

Once you clone or download/decompress source code, move to the cLASpy_T directory:

```
C:\Users\Me\Code>cd cLASpy_T
```

2.2.2 Create a Virtual Environment

Python uses many packages, depending of your usages. To prevent a dirty installation and package incompatibilities, it's could be a great idea to use virtual environments. Here, you will create a specific virtual environment for cLASpy_T.

First, create a new directory call '.venv' and use venv command from python to create a new virtual environment call 'claspy_venv':

```
C:\Users\Me\Code\cLASpy_T> mkdir .venv
C:\Users\Me\Code\cLASpy_T>python -m venv .venv\claspy_venv
```

Now, you can use this new virtual environment with:

```
C:\Users\Me\Code\cLASpy_T>.venv\claspy_venv\Scripts\activate
```

Your Command Prompt must return something like this:

```
(claspy_venv) C:\Users\Me\Code\cLASpy_T>
```

If you want to deactivate the virtual environment, just type:

```
(claspy_venv) C:\Users\Me\Code\cLASpy_T>deactivate
```

2.2.3 Install all dependencies

All required packages are listed in the 'requirements.txt' file. We will use 'pip' command to install all dependencies automatically.

Open a Command Prompt, go to the cLASpy_T directory and activate the already created virtual environment:

```
C:\Users\Me\Code\cLASpy_T>.venv\claspy_venv\Scripts\activate
```

First, check if 'pip' needs to be upgraded:

```
(claspy_venv) C:\Users\Me\Code\cLASpy_T>python -m pip install --upgrade pip
```

Once done, you will install all dependencies:

```
(claspy_venv) C:\Users\Me\Code\cLASpy_T>python -m pip install -r requirements.txt
```

2.3   Install cLASpy_T on Linux

2.3.1   Get cLASpy_T source code

First, open the Command Prompt 'cmd.exe'. You can easily open the Command Prompt by clicking Start and then typing 'cmd' into the search box.

Move to a directory where put the cLASpy_T source code. For example, 'Me' user moves to his 'Code' directory, then gets the cLASpy_T source code with the git command to clone 'cLASpy_T.git':

```
C:\Users\Me>cd Code
C:\Users\Me\Code>git clone https://github.com/TrickyPells/cLASpy_T.git
```

If you do not know what 'git' is, you also can download cLASpy_T source code on the github page. Choose the branch you want to download, click on 'Code', then 'Download ZIP'. Once downloaded, decompress the ZIP archive in the directory you want, for example, in 'Code' directory.

Once you clone or download/decompress source code, move to the cLASpy_T directory:

```
C:\Users\Me\Code>cd cLASpy_T
```

2.3.2   Create a Virtual Environment

Python uses many packages, depending of your usages. To prevent a dirty installation and package incompatibilities, it's could be a great idea to use virtual environments. Here, you will create a specific virtual environment for cLASpy_T.

First, create a new directory call '.venv' and use venv command from python to create a new virtual environment call 'claspy_venv':

```
C:\Users\Me\Code\cLASpy_T> mkdir .venv
C:\Users\Me\Code\cLASpy_T>python -m venv .venv\claspy_venv
```

Now, you can use this new virtual environment with:

```
C:\Users\Me\Code\cLASpy_T>.venv\claspy_venv\Scripts\activate
```

Your Command Prompt must return something like this:

```
(claspy_venv) C:\Users\Me\Code\cLASpy_T>
```

If you want to deactivate the virtual environment, just type:

```
(claspy_venv) C:\Users\Me\Code\cLASpy_T>deactivate
```

2.3.3   Install all dependencies

All required packages are listed in the 'requirements.txt' file. We will use 'pip' command to install all dependencies automatically.

Open a Command Prompt, go to the cLASpy_T directory and activate the already created virtual environment:

```
C:\Users\Me\Code\cLASpy_T>.venv\claspy_venv\Scripts\activate
```

First, check if 'pip' needs to be upgraded:

```
(claspy_venv) C:\Users\Me\Code\cLASpy_T>python -m pip install --upgrade pip
```

Once done, you will install all dependencies:

```
(claspy_venv) C:\Users\Me\Code\cLASpy_T>python -m pip install -r requirements.txt
```

2.4   List of dependencies

package (minimal version)

- colorclass (2.2.0)
- cycler (0.10.0)

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- joblib (1.0.1)

- kiwisolver (1.3.1)

- laspy (1.7.0)

- matplotlib (3.3.4)

- numpy (1.20.1)

- pandas (1.2.3)

- Pillow (8.1.1)

- pyparsing (2.4.7)

- PyQt5 (5.15.3)

- PyQt5-Qt (5.15.2)

- PyQt5-sip (12.8.1)

- python-dateutil (2.8.1)

- pytz (2021.1)

- PyYAML (5.4.1)

- scikit-learn (0.24.1)

- scipy (1.6.1)

- six (1.15.0)

- terminaltables (3.1.0)

- threadpoolctl (2.1.0)

Chapter 3

Usage

3.1   on Windows

3.2   on Linux