

## 1 Command Line Tools and GUI

We suggest to install the point-cloud viewer [displaz](#). This is not as powerful as Cloud Compare, but is very fast and can be used from various environments. It can be run from python, but can be run via the command line and menu.

- *Windows Users:* Download the binary and run.
- *Ubuntu Users:* This likely will need to be compiled on your machine - follow the instructions on the github page
- *Mac Users:* Due to the recent updates for the X11 Server, this doesn't properly compile.

## 2 Python and Python Packages - Installation via conda

You can install anaconda or the standard python distribution. Please use python **version 3.9** - at present, Open3D will not work with Python 3.10.

**We strongly suggest to install a conda environment (see below).**

We will rely on the following *python* packages and environments as well as several tools for pointcloud analysis, some python programming, and general data analysis:

- [Python 3.x](#)
- [PDAL](#)
- [LAStools/LASlib](#)
- [Open3D](#) (will need to be installed via pip)
- [GDAL](#)
- [scipy](#)
- [numpy](#)
- [pandas](#)
- [pylidar](#)
- [laspy](#)
- and several other tools

### 2.1 Windows Users: Install command line tools and Python packages

One option is to install this via [Anaconda](#) and select the packages *gdal*, *pdal*, *Pylidar*, *pdal*, *lastools*, *numpy*, *pandas* and *matplotlib*.

You can also install the required packages via the [anaconda shell](#). Depending on your installation, you may need to add the channel *conda-forge* to the search environment:

```
conda config --prepend channels conda-forge
```

I suggest to create a separate conda environment dedicated to the analysis of pointcloud data (e.g. Py3\_PC):

```
conda config --prepend channels conda-forge
conda create -y -n Py3_PC python=3.9 pip scipy pandas ^
  numpy matplotlib scikit-image gdal ipython spyder ^
  statsmodels jupyter pyproj lastools pdal python-pdal ^
  pykdtree h5py
conda activate Py3_PC
pip install open3d laspy laszip
```

This should install open3d-0.15.x.

Make sure to add your conda environment to the Jupyter Notebook environment:

```
conda activate Py3_PC
python -m ipykernel install --user --name=Py3_PC
```

## 2.2 Linux and Mac Users: Install command line tools and Python packages

You can install Anaconda for Mac, but you may prefer the command line approach described below. Install [miniconda3](#) and the packages via `conda install`. Download and install the required software via the command line/shell:

```
cd ~
wget https://repo.anaconda.com/miniconda/Miniconda3-latest-Linux-x86_64.sh
sh ./Miniconda3-latest-Linux-x86_64.sh
```

You may have to include additional channels for installation:

```
conda config --prepend channels conda-forge
```

Install the conda packages (will take some time):

```
conda config --prepend channels conda-forge
conda create -y -n Py3_PC python=3.9 pip scipy pandas numpy matplotlib scikit-image \
  gdal ipython spyder statsmodels jupyter pyproj lastools pdal pykdtree h5py plotly \
  python-pdal scikit-learn
conda activate Py3_PC
pip install open3d laspy laszip
```

This should install open3d-0.15.x.

Make sure to add your conda environment to the Jupyter Notebook environment:

```
conda activate Py3_PC
python -m ipykernel install --user --name=Py3_PC
```

### 3 Python and Python Packages - Installation via pip and virtual environments

Following the description above, you can use *pip* to install a virtual environment. If you are already familiar with this setup, it may be the most eloquent way to run a python environment for point-cloud processing.

#### 3.1 Linux

If you have previously not worked with virtual environment, you may have to install additional packages. Make sure that you are using **python version 3.9** (this may not be the case for older Ubuntu version, e.g. LTS 20.04):

```
python -V
```

If so, go ahead and install the virtual environment and required packages:

```
python3 -m pip install --user --upgrade pip
python3 -m pip install --user virtualenv
python3 -m venv Py3_PC
source Py3_PC/bin/activate
```

Install the required packages:

```
python3 -m pip install scipy pandas numpy matplotlib scikit-image gdal ipython spyder \
statsmodels jupyter pyproj pykd tree h5py plotly scikit-learn open3d laspy laszip
```

On older Ubuntu systems (e.g., LTS 20.04), you may have to do:

```
sudo apt install python3.9
sudo apt install python3.9-venv
curl https://bootstrap.pypa.io/get-pip.py -o get-pip.py
python3.9 get-pip.py
```

You can then call `python3.9` to install the required modules:

```
python3.9 -m pip install --user --upgrade pip
python3.9 -m pip install --user virtualenv
python3.9 -m venv Py3_PC
source Py3_PC/bin/activate
```

```
python3.9 -m pip install scipy pandas numpy matplotlib scikit-image gdal ipython \
    spyder statsmodels jupyter pyproj pykd tree h5py plotly scikit-learn open3d laspy \
    laszip
```

### 3.2 Window

Installing a python virtual environment is described [here](#).

Install the following packages:

```
py -m pip install scipy pandas ^
numpy matplotlib scikit-image gdal ^
ipython spyder statsmodels jupyter ^
pyproj pykd tree h5py plotly ^
scikit-learn open3d laspy laszip
```

## 4 Additional considerations

### 4.1 Editor

We will be doing some coding and it may be useful to use an editor to take notes as well. However, you can work fully in Jupyter Notebooks if you are familiar with that. Install your favorite editor - for example [Atom](#) or [Notepad++ on Windows](#) or [Spyder](#). Spyder is included in the Windows Anaconda distribution and is installed via the command line above. Spyder is a professional Python environment that also allows you to create larger projects. If you intend to continue with data analysis methods and plan to deepen your python knowledge, you should look into Spyder.