

This document briefly describes what Software to setup for performing analysis steps and working with gridded data (DEMs) and lidar pointclouds. **Please install this software on your laptop - it will allow you to use it without a computer pool. All software is open source.**

you can use Windows and most of the software will also be easily installed on a Mac. *We suggest to use Ubuntu or some other Linux-based distribution as these are the most flexible systems, but Windows OS will work as well.*

We will rely on the following python packages and environments as well as several tools for flexible programming and data analysis: - [Python 3.x](#), [PDAL](#), [GDAL](#), [landlab](#), [RichDEM](#), [GMT](#), [cython](#), [scipy](#), [numpy](#), [pandas](#), [pylidar](#), [laspy](#) and several other tools

Packages only used for Point-cloud data: - [CloudCompare](#) - Point Cloud analysis and visualization. Includes many useful point-cloud analysis tools, but is slower on the visualization of large pointclouds - [Displaz](#) - Very fast and versatile viewer. Can be run from python. - *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. You may end up using CloudCompare instead (which is slower for visualization). - [LASTools](#) - Commercial Software. However, contains several useful and very fast tools for working with Point Cloud data.

### ***Windows Users:***

One option is to install this via [Anaconda](#) and select the packages **gdal**, **pdal**, **Py lidar**, **pdal**, **lastools**, **numpy**, **pandas** and **matplotlib**. **Landlab** is installed via the conda-forge channel.

Unfortunately, Windows users will not be able to install **richDEM**.

You can install the required packages via the **anaconda shell**:

```
conda install python=3.* pip scipy pandas numpy matplotlib \
    scikit-image gdal ipython spyder statsmodels jupyter \
    pyproj pip pdal xarray packaging h5py lastools pykdtree
conda install -y -c conda-forge landlab
pip install laspy
```

If you want to create a separate conda environment dedicated to the analysis of DEMs (e.g. **Py3\_DEM**):

```
conda create -y -n Py3_DEM python=3.* pip scipy pandas numpy \
    matplotlib scikit-image gdal ipython spyder statsmodels \
    jupyter pyproj
conda activate Py3_DEM
conda install -y -c conda-forge landlab
```

### *Alternative option Windows Users:*

Install [Linux Subsystem on Windows](#) and use miniconda (see next section). Installing the Linux subsystem (use Ubuntu 18.04) is generally a useful thing to do for Windows users.

**This will allow you to run richDEM on Windows machine (via the Ubuntu subsystem)**

### *Ubuntu and Mac Users:*

Install [miniconda3](#) and the packages via `conda install`. Download and install the required software via the command line:

```
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/label/dev
conda config --prepend channels conda-forge
```

### **Option for Ubuntu: Setting up the a conda/anaconda environment for DEM analysis**

```
conda create -y -n Py3_DEM python=3.* pip scipy pandas numpy \
    matplotlib scikit-image gdal pdal ipython spyder \
    statsmodels jupyter pyproj
conda activate Py3_DEM
conda install -c conda-forge richdem landlab
```

We will be using a jupyter notebook and you are now ready to run the Jupyter notebook on your computer. Use the Anaconda Prompt to navigate to the folder that contains the `Gaussian_Hill_DEM.ipynb` and then type:

```
jupyter notebook
```

This will open the repository in your browser. Click on the notebook: `Gaussian_Hill_DEM.ipynb`. We will be working with this notebook during the workshop.

## Setting up the conda/anaconda requirements for working with point cloud (PC) data:

Install the conda packages (will take some time):

```
conda create -y -n Py3_PC python=3.* pip scipy pandas numpy \
    matplotlib scikit-image gdal pdal xarray packaging ipython \
    multiprocessing h5py lastools pykdtree spyder
source activate Py3_PC
pip install laspy
```

Activate the environment `source activate PC_py3` and install laspy with `pip install laspy`

- Editor
  - We will be doing some coding and it may be useful to use an editor to take notes as well. 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.
  - *Windows Users:* There is no X-Windows interface in the Linux/Ubuntu subsystem and you will need to use Spyder from Windows

*Compiled with:*

```
pandoc --listings --variable papersize=a4paper \
    -H auto_linebreak_listings.tex \
    --variable urlcolor=blue \
    -V lang=en-GB \
    -s QGeomorph_Workshop_Required_Software.md \
    -o QGeomorph_Workshop_Required_Software.pdf
```