Required and suggested software for the workshop: Quantitative Geomorphology

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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, Pylidar, 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  \
    multiprocess 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
```