

Exercise 6a:  
**Using free and/or open source tools to build workflows to manipulate  
and process LiDAR data:**

**LAStools**

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Exercises in this series:

1. **LAStools – LAS binary points to ascii points**
2. GEON Points2Grid (see Points2Grid instructions or integrated help) – DEM generation from ascii point data
3. GDAL – Raster file format conversion and projection

The goal of this suite of exercises is demonstrate how you can use a set of free and/or open source tools to build workflows to manipulate LiDAR data from point cloud formats to meaningful grid products. Many of the tools illustrated here require that they be executed from the command line and are initially less user friendly since they lack a graphical user interface (GUI). However, once comfortable with these tools you will hopefully see how powerful they can be. In order to manage large dataset or batch process data, these tools could be scripted to semi-automate processing.

Potentially helpful basic MS-DOS navigation:

**Start > Run > cmd** to get command line window

- **cd *directory*** - go into directory
- **cd ..** - up a directory
- **cd ../..** – up two directories
- **dir** to list contents of a directory
- **help *command*** - lists flags and usage
- **exit** - ...
- **tab** – auto completes

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**LAStools:**

- <http://www.cs.unc.edu/~isenburg/lastools/>
- Martin Isenburg, Jonathan Shewchuk - UNC
- “converting, viewing, and compressing LIDAR data in LAS format”
- MS-DOS command line tools

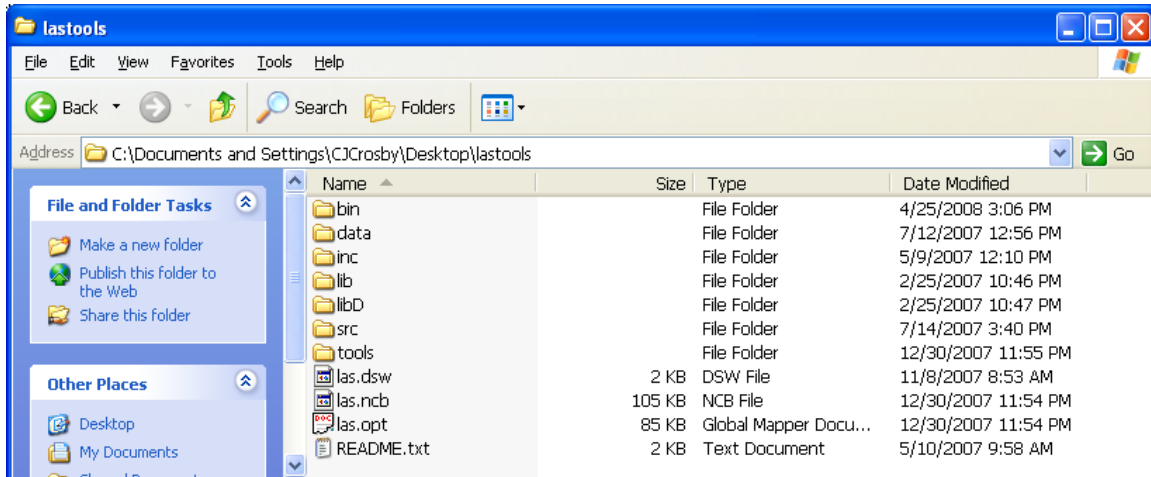
## EXERCISE – Convert LAS binary point cloud data to ASCII format

Download lastools.zip here:

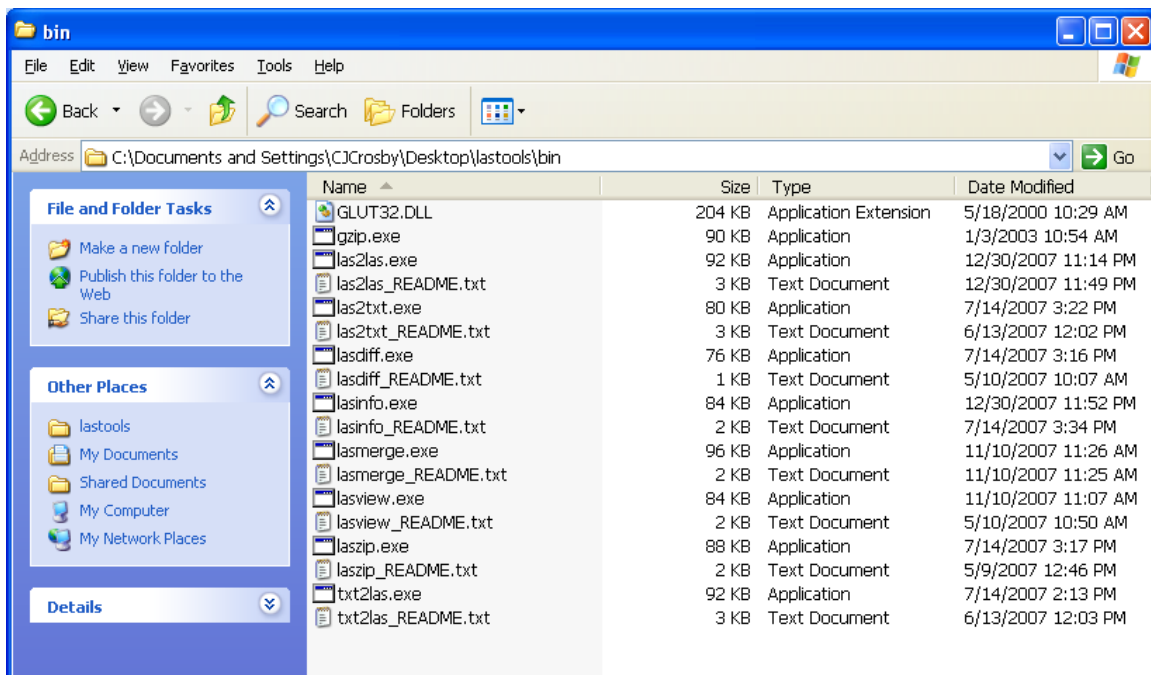
<http://www.cs.unc.edu/~isenburg/lastools/download/lastools.zip>

Uncompress zip on desktop or other location

Note that lastools directory contains both executable files in the “bin” directory as well as source code and other items you don’t need to concern yourself with now.



Within the “bin” directory there are a number of executable files (.exe) that perform simple tasks such as convert LAS point data to ascii point data (las2txt.exe for example). Associated with each tool is a README file that describes usage.



Navigate to your C: drive and create a new folder. Copy the LAS point file as well as las2txt.exe, lasinfo.exe and the associated README.txt files into this directory. NOTE: in order to run las2txt or the other LAStools, the data and tool must be located in the same directory.

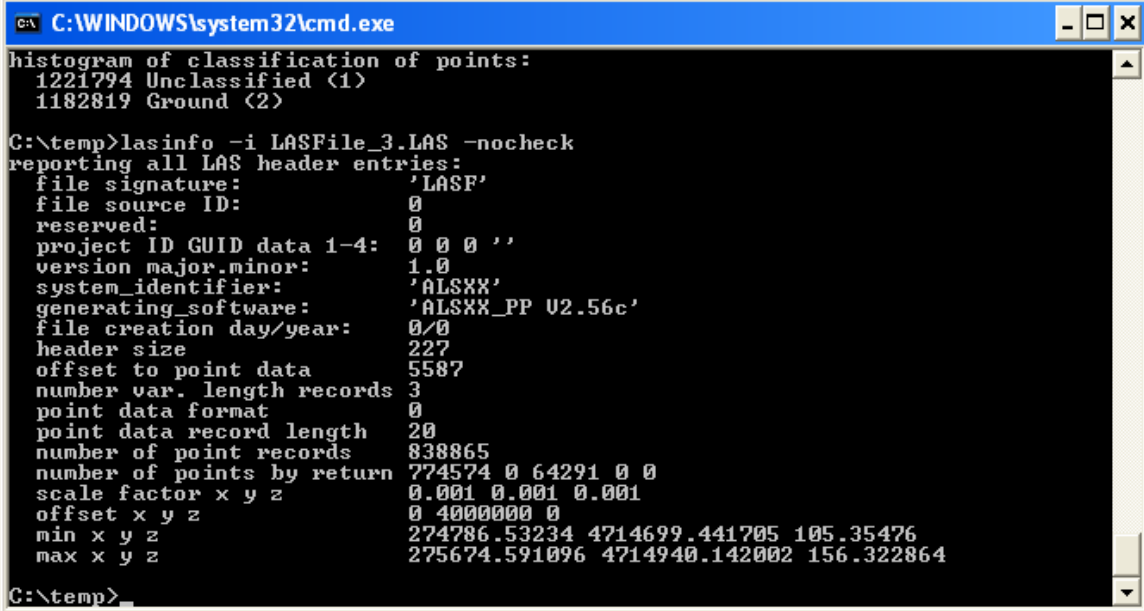
Next, launch a command line window by going to Start > Run > and type: cmd

Using the command line navigation tips at the top of this tutorial, navigate to the directory you placed the las2txt.exe and LAS point file in.

Once in the directory that contains the .exe files and the LAS point file, open the README using standard windows navigation (mouse) so that you can see the exact syntax of how commands should be entered. Use the README files to see the exact syntax of how commands should be entered.

To obtain basic header info about the LAS file type the following into into the command line window. NOTE: throughout this exercise I will use “lidar.las” as a generic filename – obviously you’ll want to replace it with the actual filename of the file you are interested in.

```
lasinfo -i lidar.las -no_check  
leave off the -no_check for a more verbose report on the las file)
```



```
C:\WINDOWS\system32\cmd.exe  
histogram of classification of points:  
1221794 Unclassified <1>  
1182819 Ground <2>  
  
C:\temp>lasinfo -i LASFile_3.LAS -nocheck  
reporting all LAS header entries:  
file signature: 'LASF'  
file source ID: 0  
reserved: 0  
project ID GUID data 1-4: 0 0 0 ''  
version major.minor: 1.0  
system_identifier: 'ALSXX'  
generating_software: 'ALSXX_PP U2.56c'  
file creation day/year: 0/0  
header size 227  
offset to point data 5587  
number var. length records 3  
point data format 0  
point data record length 20  
number of point records 838865  
number of points by return 774574 0 64291 0 0  
scale factor x y z 0.001 0.001 0.001  
offset x y z 0 4000000 0  
min x y z 274786.53234 4714699.441705 105.35476  
max x y z 275674.591096 4714940.142002 156.322864  
  
C:\temp>
```

The results, shown above, provide basic information about the file, including number of points in the file and bounding box – for the full LAS header specifications, see: <http://www.lasformat.org/>

Now that we have taken a look at the header of the LAS file, we can convert it to an ascii file using the las2txt tool. las2txt is quite powerful because it allows you to parse the LAS file into a text file with extensive control over file organization, delimiters and attributes included.

For this exercise we would like our text file to have the following, very simple, organization:

**x,y,z**

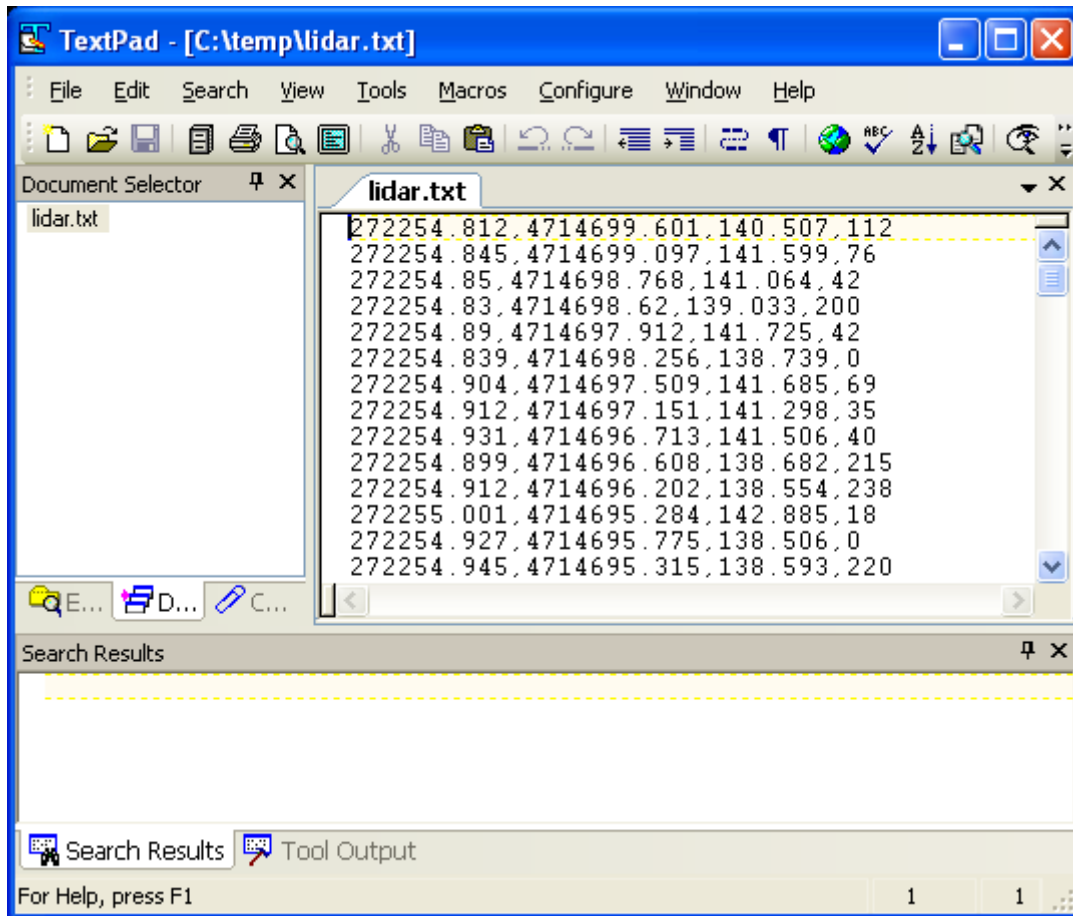
You could choose to export additional attributes if they are useful and the dataset contains them – you’ll need to refer to a metadata document to understand what attributes are contained within the LAS file.

To export the data in the desired format, we will use the following command:

```
las2txt -i lidar.las -o lidarout.txt -parse xyz -sep komma
```

NOTE: Yes, Comma is spelled with a K in LAStools – why? I have no idea.

Next, using the standard windows navigation (mouse) go to the directory that contains your new ascii LiDAR point file and open it in Wordpad or similar text editor (CAUTION: if the file is huge, it may crash windows – this is why the lasinfo command is helpful for getting an idea of the size of the file before you begin to work with it).



This file is now formatted appropriately for use in tools such as GEON Points2Grid for DEM generation and LViz for visualization

If you have extra time, give a few of the other LAStools utilities a try!