**Water flow-Geospatial data**

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# Introduction

### What is Lidar data?

The name LIDAR stands for Light Detection and Ranging. Which is a method used to create high-resolution models of ground elevation using tools like laser scanner, a Global Positioning System (GPS), and an Inertial Navigation System (INS), is typically mounted on a small aircraft. Also, it helps for determining [ranges](https://en.wikipedia.org/wiki/Ranging) (variable distance) by targeting an object with a [laser](https://en.wikipedia.org/wiki/Laser) and measuring the time for the reflected light to return to the receiver and to make digital [3-D representations](https://en.wikipedia.org/wiki/3D_modeling) of areas on the earth's surface and ocean bottom, due to differences in laser return times, and by varying laser wavelengths.

 Lidar data is initially collected as a “point cloud” of individual points reflected from everything on the surface, including structures and vegetation. To produce a “bare earth” Digital Elevation Model (DEM), structures and vegetation are stripped away.

### Introduction to Spatial Vector Data

Vector data is classified in to three with different structure: points, lines and polygons. For instance, point data include: sampling locations, the location of individual trees or the location of plots; a road or a stream can be represented by a line and the outlines of plot boundaries, lakes, oceans, and states or countries are often represented by polygons. Because the structure of this data, each individual shape file geospatial data in vector format are often stored in a shapefile format.

There are 3 key files associated with any and all shapefiles:

.shp**:** the file that contains the geometry for all features.

.shx**:** the file that indexes the geometry.

.dbf**:** the file that stores feature attributes in a tabular format.

To import shapefiles you use the geopandas function read\_file(). Notice that you call the read\_file() function using gpd.read\_file() to tell python to look for the function within the geopandas library

### Raster data

Raster data can be used to store many different types of scientific data including elevation data, canopy height models, surface temperature, climate model data outputs, land use / land cover data and soon.

# [my\_lidar\_AgriTec](https://github.com/smegnshd/my_lidar_AgriTec) python package

This is simple python package called [my\_lidar\_AgriTec](https://github.com/smegnshd/my_lidar_AgriTec)' used to read, transform and visualize LIDAR cloud data using public data path: <https://s3-us-west-2.amazonaws.com/usgs-lidar-public/>.

### What it did?

This package:

1. Read public data path and change to **ept.json** file.
2. Generate pipeline.json file using Pdal, and recive back .tif and .laz files.
3. Transform .tiff/ laz data
4. Visualize data .

### File formats and software

* [PDAL](https://www.pdal.io/) **P**oint **D**ata **A**bstraction **L**ibrary

Open source: <https://github.com/PDAL/PDAL>

* Python , Jupiter
* Export data in a formats including LAS, LAZ, ASCII, ESRI ASCII GRID and Geotiff.

### Installation

Install by using:

“pip install my\_lidar”

or

“ git clone https://github.com/smegnshd/my\_lidar\_AgriTec”

# Future plan

Develop water flow pipeline framework for data transformation and machine learning.

* train a model
* test a model

# Example

Public data path with file name: "https://s3-us-west-2.amazonaws.com/usgs-lidar-public/IA\_FullState/ept.json"

With "bounds": "([-10425171.940, -10423171.940], [5164494.710, 5166494.710])",

**Raw data looks figure below:**

