hw4

April 6, 2025

[ ]:
```
'''
1. Install and use Jupyter/Python
2. Choose las file library: laspy
3. Download and read dataset.las
'''
import laspy
import numpy as np
import matplotlib.pyplot as plt

lidar_data = laspy.read("dataset.las")
```

[14]:
```
'''
4. Obtain the following information from the file:
    Your name, date, course number in a markdown cell
    Number of points in the dataset
    Version of the .las file
    A printout of the header fields for this file version
    Data point format of the las data
    A paragraph summary of the methods and sources you used in a markdown cell.
'''
point_format = lidar_data.header.point_format

print(f"Number of points: {len(lidar_data.points)}")
print(f"LAS file version: {lidar_data.header.version.major}.{lidar_data.header.
  ↪version.minor}")
print("Header fields:")
print(lidar_data.header)
print(f"Data point format (PointFormat): {lidar_data.header.point_format}")
list(point_format.dimension_names)
print("Dimension names:")
print(list(point_format.dimension_names))
```

```
Number of points: 6609829
LAS file version: 1.3
Header fields:
<LasHeader(1.3, <PointFormat(1, 0 bytes of extra dims)>)>
Data point format (PointFormat): <PointFormat(1, 0 bytes of extra dims)>
Dimension names:
```

```
['X', 'Y', 'Z', 'intensity', 'return_number', 'number_of_returns',
'scan_direction_flag', 'edge_of_flight_line', 'classification', 'synthetic',
'key_point', 'withheld', 'scan_angle_rank', 'user_data', 'point_source_id',
'gps_time']
```

1 4. File Information

1. Jonathan Roberts, 17648 (Sensor-Based Systems)
2. Number of points in the dataset: **6609829**
3. Version of the .las file: **1.3**
4. Header Fields printout: **<LasHeader(1.3, <PointFormat(1, 0 bytes of extra dims)>)>**
5. Data point format: **Point Format 1**
   - Really just data.header.point_format to get as it's part of the header printout above.
   - 5a. Dimension Names:

   'X', 'Y', 'Z', 'intensity', 'return_number', 'number_of_returns', 'scan_direction_flag', 'edge_of_flight_line', 'classification', 'synthetic', 'key_point', 'withheld', 'scan_angle_rank', 'user_data', 'point_source_id', 'gps_time'
6. Source: laspy- https://laspy.readthedocs.io/en/latest/index.html

I went to the laspy documentation above, and followed the pretty easy to follow What is a LAS file?, Basic Manipulation, and Basic Manipulation/Accessing Points Records tabs to get what I want regarding code to read the data from the file, print the headers and point format, and access the x,y,z points for plotting, respectively.

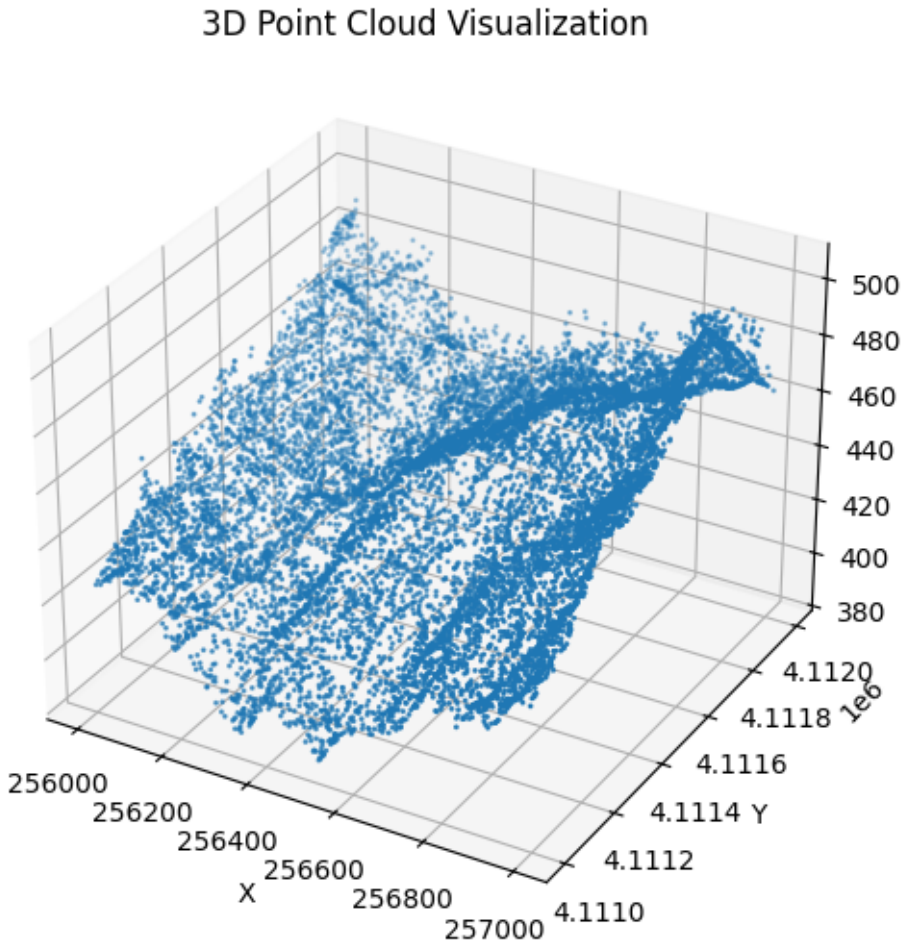
[15]:
```
'''
3D Plot
Tried steps at:
10- Too much blue to see anything
100- You can tell contours exist but can't really see them
200- getting better
500- looks like you can actually see contours
1000- not enough datapoints really to see the nice contours
'''
step = 500
x = lidar_data.x[::step]
y = lidar_data.y[::step]
z = lidar_data.z[::step]

fig = plt.figure(figsize=(8, 6))
ax = fig.add_subplot(projection='3d')

ax.scatter(x, y, z, s=1)
```

```
ax.set_xlabel('X')
ax.set_ylabel('Y')
ax.set_zlabel('Z')
ax.set_title('3D Point Cloud Visualization')

plt.show()
```



[ ]: