Remote Sensing Lab
Spring Semester 2021

Lab 1 Week 4 (L1W4)
Quality Control

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Overview

- Convert point clouds into .xyz format
- Interpolate points using a regular grid
- Align raster with reference LIDAR data
- Calculate metrics

Convert Point Clouds to XYZ

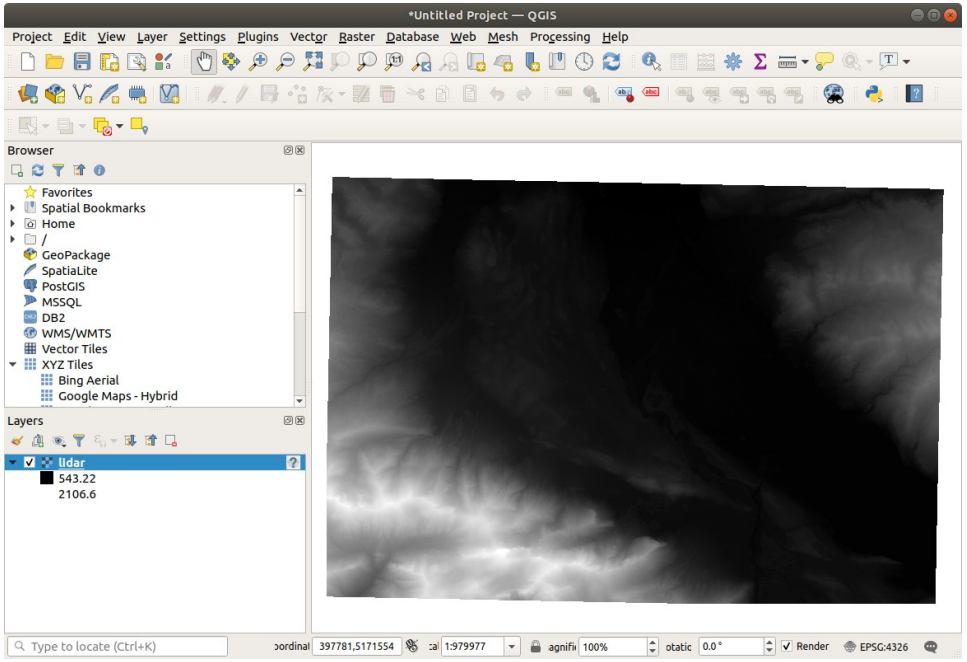
- Use *L1W4_1_convert_to_xyz.** to convert points calculated in L1W3 to .xyz format.
- Set the path to the directory containing *points_ *.npz*, the script will do the rest.
- The .xyz files will be created in ./xyz_files

Interpolation

- Interpolation and raster alignment are done using QGIS 3 (tested with v3.16).
- The instructions in the following slides should be followed carefully, any deviation will probably break the processing pipeline.
- The following procedure should be done four times following L1W3:
  - Scene 1 7x7
  - Scene 1 15x15
  - Scene 2 7x7
  - Scene 2 15x15

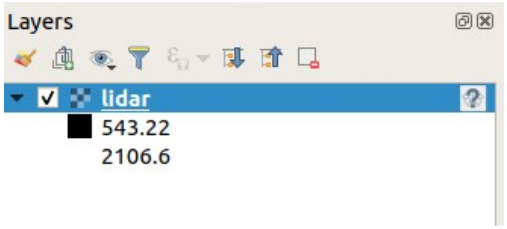
Interpolation

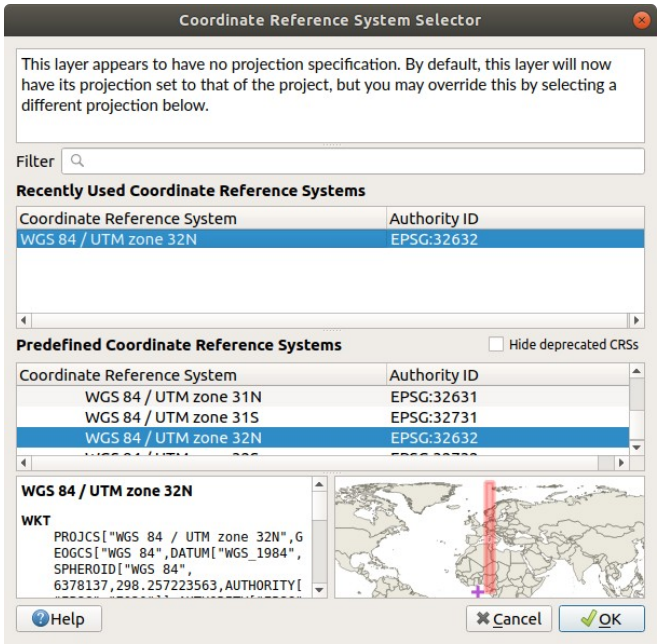
- Open a new QGIS project and load the LIDAR measurements provided in data/lidar_WGS84.tif. This file contains high quality LIDAR measurements that are used as reference data.



Interpolation

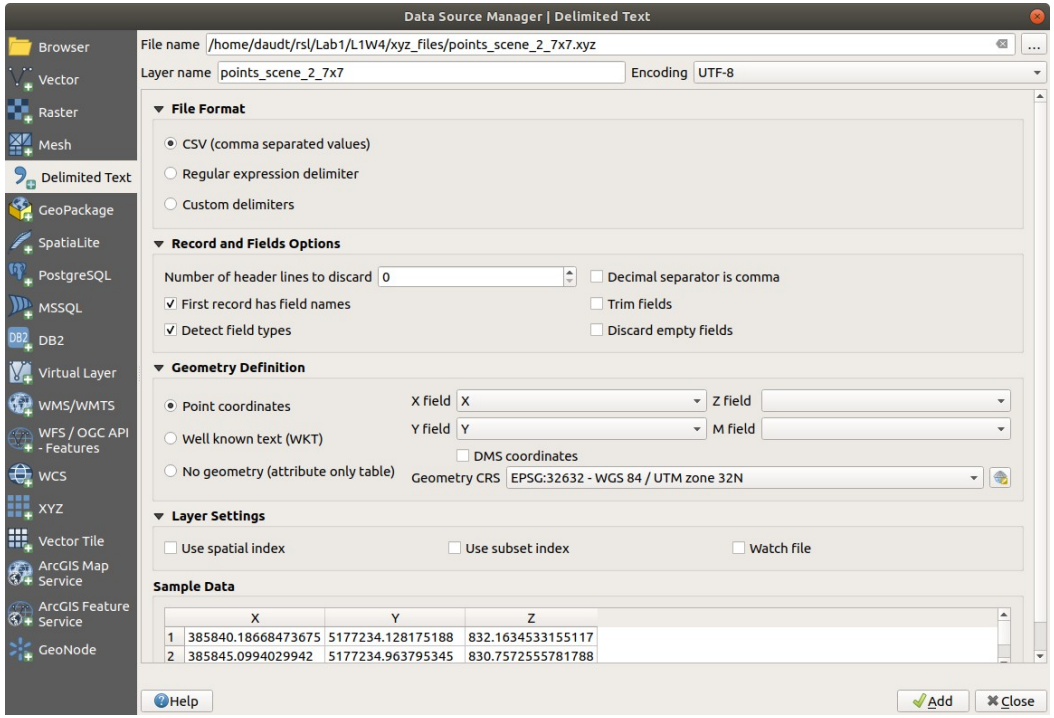
- Click on the “?” symbol next to the lidar layer to define the Coordinate Reference System (CRS). Choose UTM 32 N / EPSG:32632.
  - Note: if there is no “?” that means that this has been done automatically
- Right click on the lidar layer, then on Zoom to Layer.





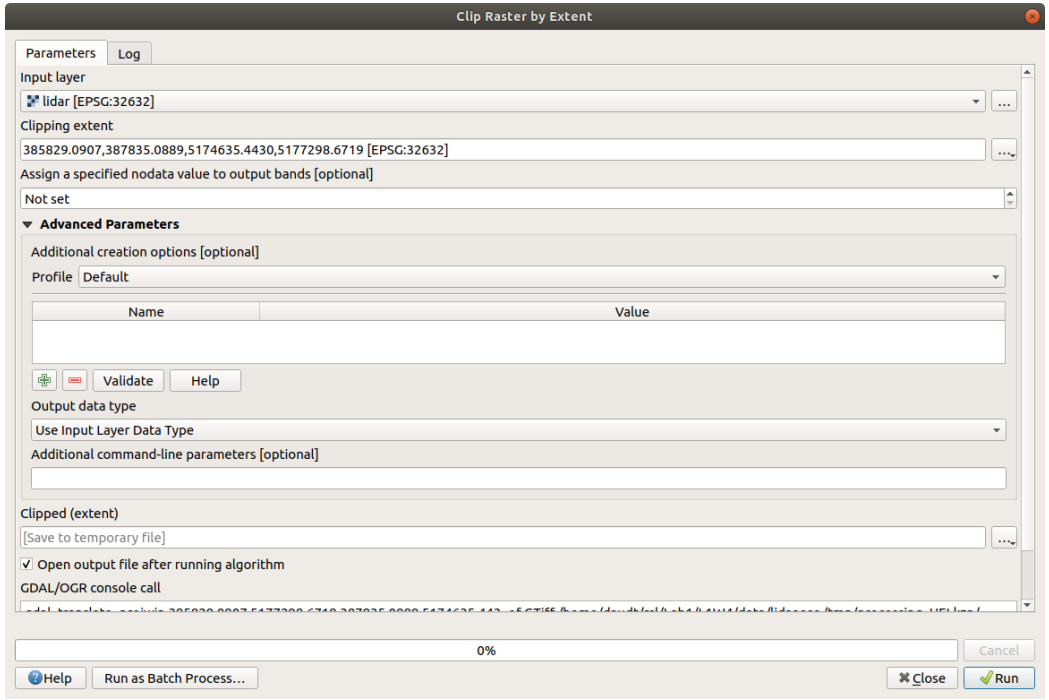
Interpolation

- Click on Layer/Add Layer/Add Delimited Text Layer.
- Open the appropriate xyz file using the same settings as shown below, then click on Close. This will load the matched points on QGIS.



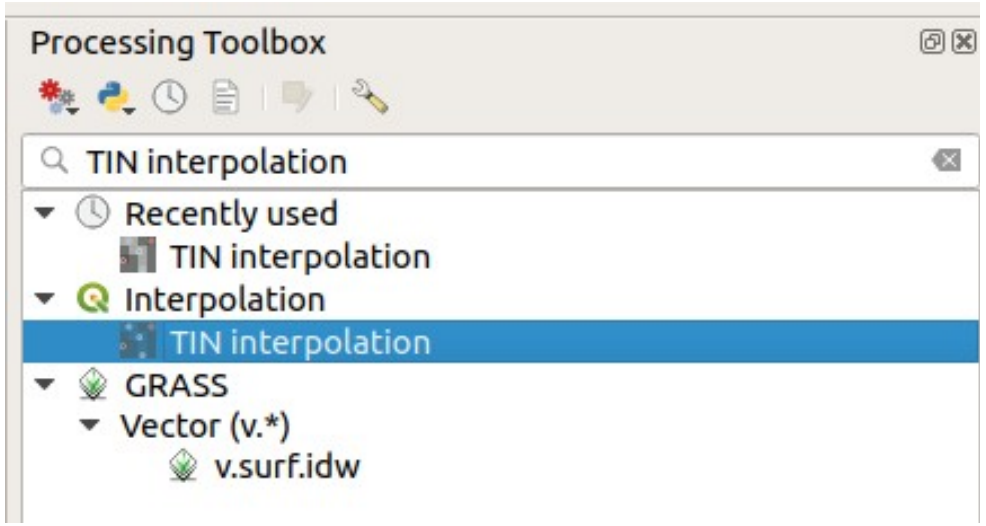
Interpolation

- Click on the lidar layer to select it. Then click on Raster/Extraction/Clip Raster by Extent to crop the smallest rectangle that contains all matched points.
- On the field “Clipping extent”, click the three dots to the right, then Calculate from Layer and select the points layer. Click on Run, then Close.
- Define the CRS of the new “Clipped (extent)” layer to UTM 32 N as before.



Interpolation

- Open the Processing Toolbox by clicking on the gear symbol on the top bar.
- Search for TIN interpolation and open the interpolation wizard.

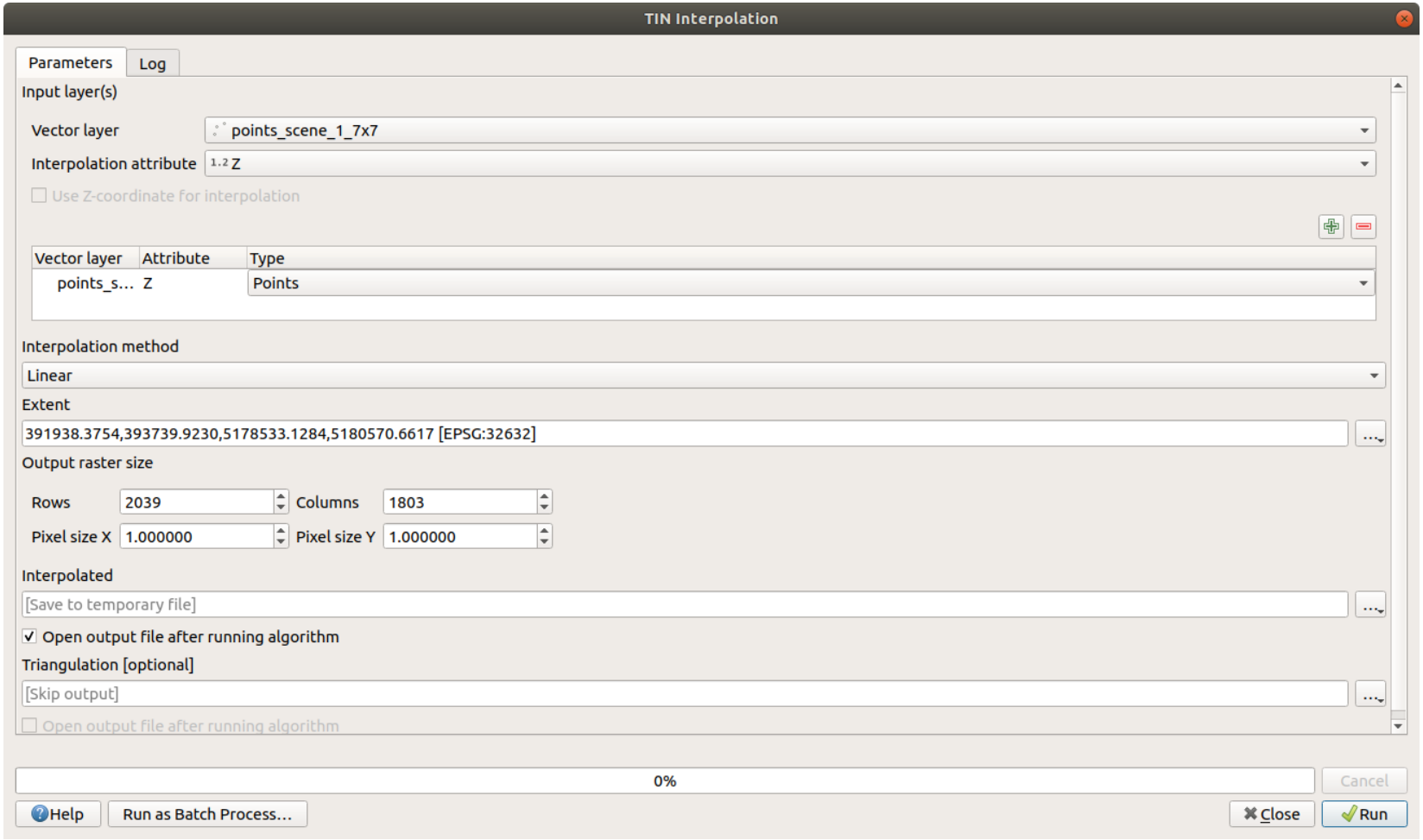


Interpolation

- Use the following settings:
  - “Vector layer” should be the points layer
  - Interpolation attribute: Z
  - Click the “+” symbol just below
  - Calculate extent from points layer itself
  - Pixel size X/Y: 1.0
  - Save to temporary file (automatic)
  - Click on Run, then Close

- This will interpolate the point cloud using a regular grid with a 1 m GSD. The two rasters are not yet aligned.

Interpolation



Interpolation

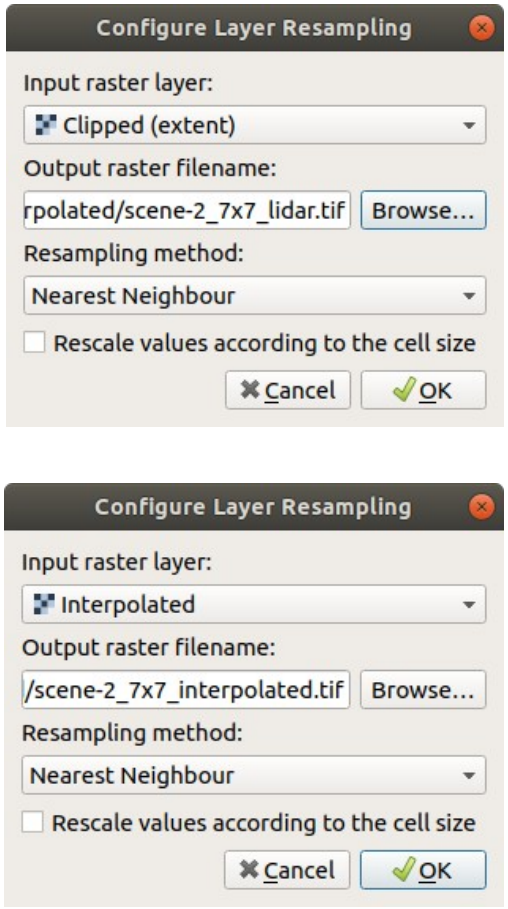
- Create a folder called “interpolated” under L1W4

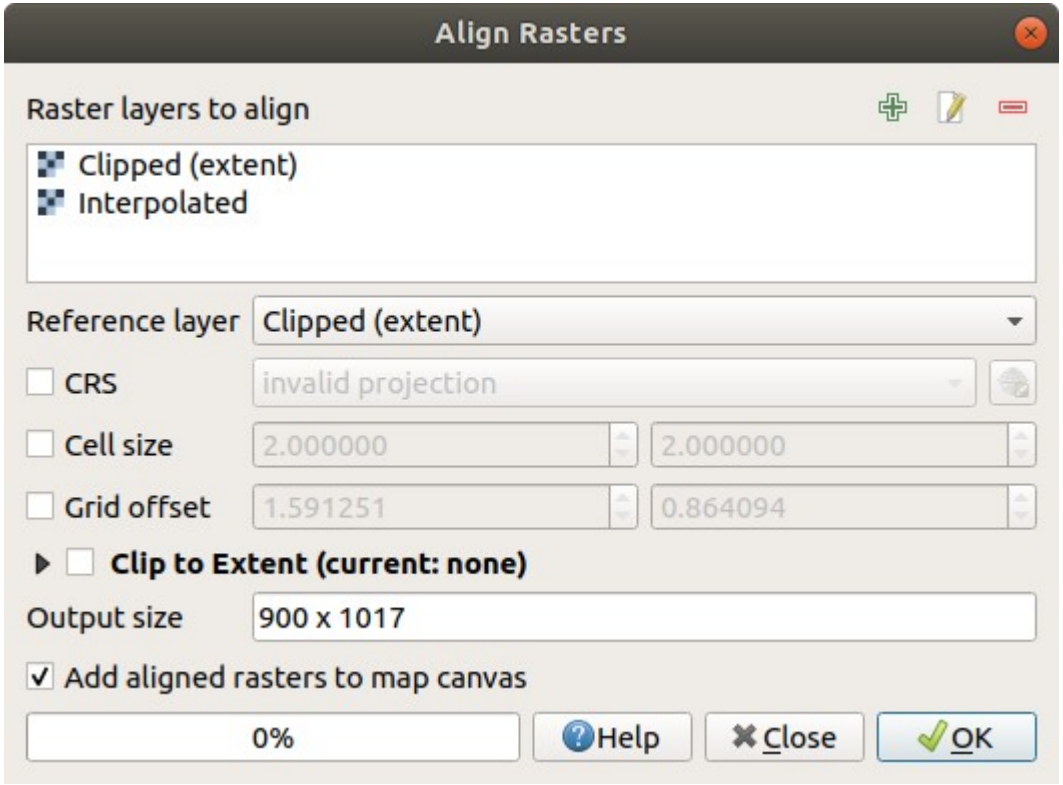
- Click on Raster/Align Rasters. Using the green “+” button, add:
    - Clipped (extent)
        - Output: interpolated/scene-1_7x7_lidar.tif
    - Interpolated
        - Output: interpolated/scene-1_7x7_interpolated.tif

- Make sure the “Clipped (extent)” layer is selected as reference layer

- Click on OK, then Close.

Interpolation





Interpolation

- Once all steps are performed, two outputs with aligned rasters are produced. The expected file names are:
  - ./interpolated/scene-1_7x7_interpolated.tif
  - ./interpolated/scene-1_7x7_lidar.tif

- After repeating for all four scenarios (scene 1 or 2, patch size 7x7 or 15x15), 8 files should have been produced.

Quality Control

- You can now calculate **residual** statistics based on the generated files. The statistics to be calculated are:
    - Minimum
    - Maximum
    - Mean
    - Standard deviation
    - Median
    - MAD (median absolute deviation from median)
    - Mode

- Complete the missing parts of the code in *L1W4_2_compute_metrics.**

- Note that pixels with no data contain the value -9999. Information on how to deal with this is in the code.

Quality Control

- Plot all the residuals using the same scale. For this you will have to calculate the global minimum and maximum considering the four cases, then use those values for scaling in *plt.imshow()*.

- Generate a document (delivered in PDF) that contains, for each case, three images in a single line:
  - The Wallis filtered image 1
  - The normalized crosscorrelation image from L1W3
    - Note: these can be generated again from the *matches_*.npz* files if necessary.
  - The residuals image

Deliverables

- One PDF file containing the 12 images described in slide 16.
- One (or four) text files containing the metrics described in slide 15 for each of the four cases.
- The code that was used to calculate the metrics, i.e. *L1W2_2_**.

- Answer quiz on Moodle.

- Deadline for submission and quiz: April 5th 15:45