MapInfo Pro Advanced Technical Workshop

Contents

MapInfo Advanced Technical Workshop Introduction

The aim of this workshop is to familiarize MapInfo users with MapInfo Pro Advanced capabilities, let them use supplied data and workspaces to explore Raster toolset. It is assumed that MapInfo Pro 17.0.3 (or later) in installed and user has Advanced license.

Exercise 1 – Opening Raster Data

Data can be found at …\Workshop\Ex-01

1) Navigate to the Workshop directory. Go to **Home** > **Open Table** and select Raster Image from **Files of Type**.
2) Select the file called **GB OST50 UK** and click Open.

3) Use the pan and zoom tools to navigate around the map. Take note of the performance while zooming and panning.
4) Navigate to **Raster** > **Raster Info** on the ribbon. Note the raster size, this information will give you an idea of how many pixels are in the grid and give you rough ideas about performance for certain queries and operations. The greater the size the longer some operations will take.
5) Try to turn On/Off **Hill Shading**.
6) Zoom in until you have a window width of about 5km (3 miles). You can check what window with you are viewing by clicking in the status bar in the bottom left hand corner of the MapInfo interface and changing **Cursor Location** to **Zoom (Window Width)**.
7) Once zoomed in to around 5km window width, navigate to the **Raster** tab in the MapInfo ribbon and select Raster **Quality** > **Cubic Spline (Global)**. Note the significant increase in quality that can be achieved using this option.
8) Right click the mouse and select **View Entire Layer** > **All Layers**. Leave the map open ready for exercise 2.

Exercise 2 – Clipping Raster Data

Data can be found at …\Workshop\Ex-02 (GB OST50 UK.mrr from Ex-01 is required if it has been closed down).

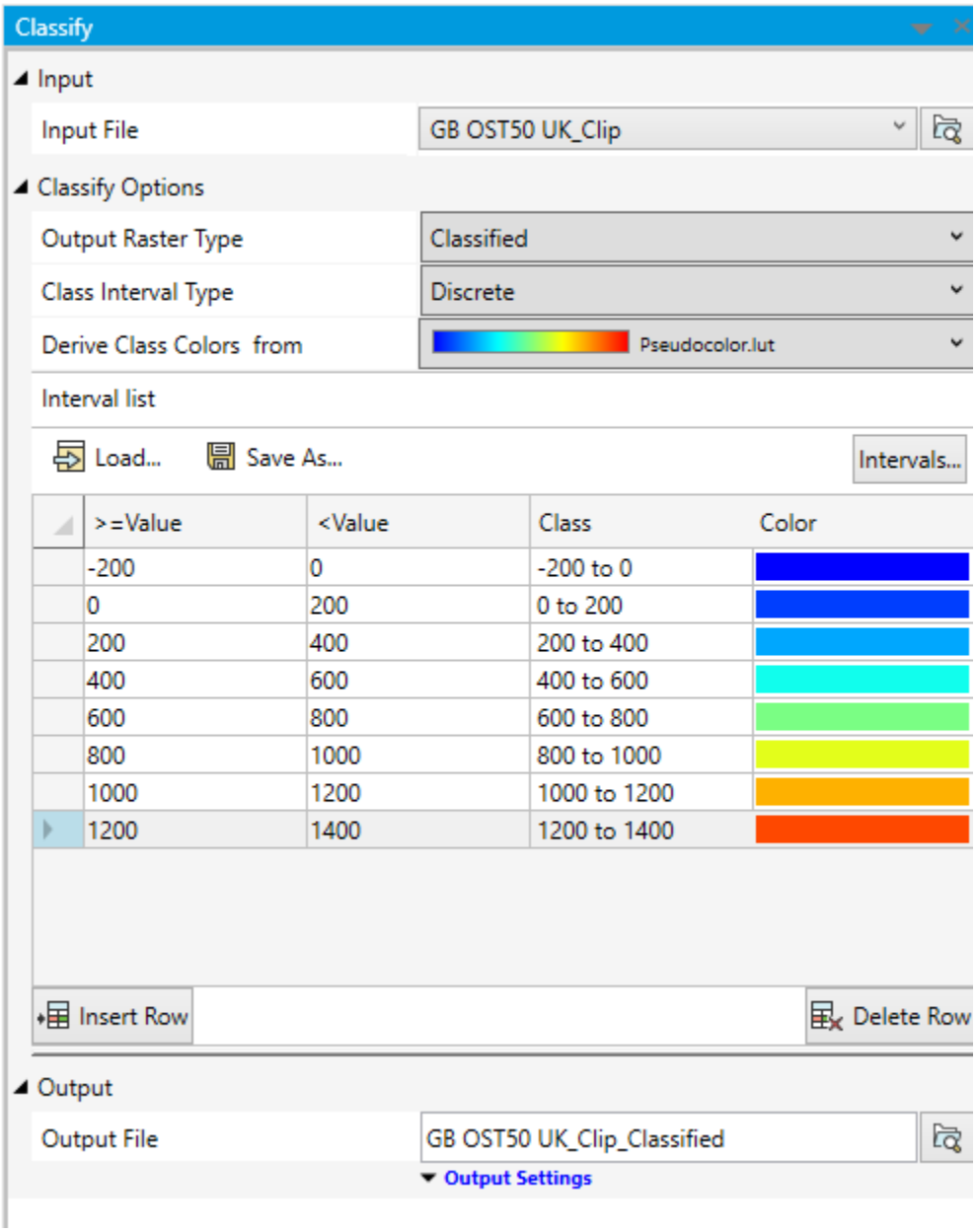
1) Navigate to …\Workshop\Ex-02 and ensure the file of type drop down is set to .tab.
2) Select **UK Boundary** and click **Open**.
3) Navigate to **Raster** > **Raster Operations** > **Clip**.
4) Ensure that the settings in Clip details pane on the right hand side of the MapInfo interface are set to **Retain Inside** and **Region(Polygon)**. Polygon will be set to UK Boundary.
5) In Output File option, select the file explorer button and navigate to the Ex-03 folder. Save the file as **GB OST50 UK CLIP**. Click **Process**. (This may take 1-2 minutes).
6) Close the original grid file **GB OST50 UK** and leave **GB OST50 UK CLIP** open. Leave this file open for exercise 3.

Exercise 3 – Classify Raster Data

Data can be found at …\Workshop\Ex-03

1) Ensure that **GB OST50 UK CLIP** is open in the map window.
2) Navigate to **Statistics**. Note the minimum and maximum height values in the details pane on the right hand side. Based on the details decide upon some suitable height intervals to use for the classification for example height intervals or 200m.
3) Navigate to **Raster** > **Raster Operations** > **Classify**.
4) Under Classify Options choose a Pseudocolor.lut style from the **Derive Class Colors From** drop down.
5) Select the **Intervals** button, select **Method** and choose **Interval Spacing**.

6) Set the **Value** to **200** and click **OK**.



7) Navigate to the Output File Explorer and choose the …\Ex-04. Name the file **UK Classified Elevation**. Close all tables.

Note: Although this output may not be visually appealing, it does precisely visualize the highest elevations in the UK. In many cases when raster data is used for analytics the aim will be to identify particular areas or hotspots in a dataset. Classifications and color stretches are key to identifying areas of interest.

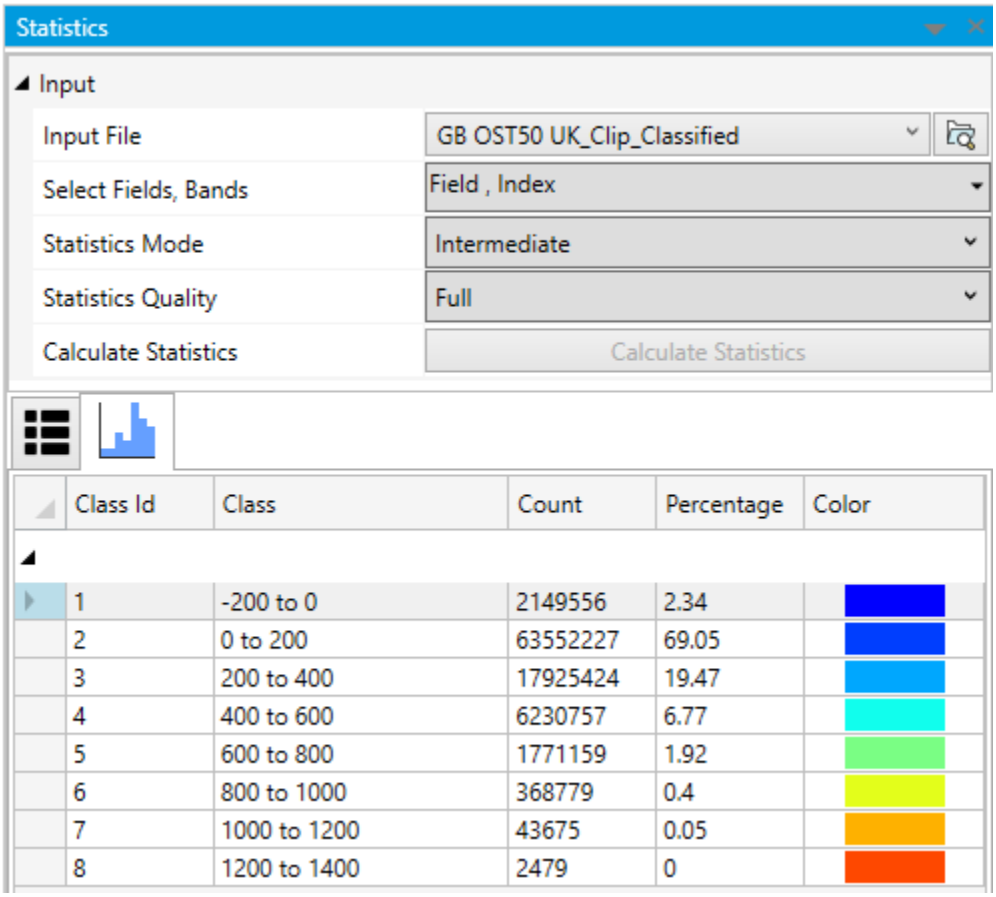
Exercise 4 – Raster Data Statistics

…\Workshop\Ex-04.

1) Open table **UK Classified Elevation** from …\Workshop\Ex-04.
2) Navigate to the **Raster** tab and select **Cell Value** > **Full**. Now click in the map window. Notice that the values being returned are a group or class value for example 200-400 meters above sea level. This type of grid differs from a continuous grid where all vales are individual.

Raster statistics can be found very easily in MapInfo Advanced. In this case we need to find what percentage of the UK land area is between 0 and 200m above sea level.

3) Navigate to the **Raster** tab and select **Statistics.** Note the values returned in the detail pane on the right hand side of the MapInfo Advanced user interface.



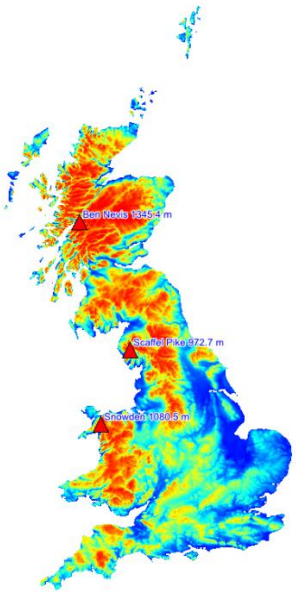
Class Id	Class	Count	Percentage	Color
1	-200 to 0	2149556	2.34	
2	0 to 200	63552227	69.05	
3	200 to 400	17925424	19.47	
4	400 to 600	6230757	6.77	
5	600 to 800	1771159	1.92	
6	800 to 1000	368779	0.4	
7	1000 to 1200	43675	0.05	
8	1200 to 1400	2479	0	

4) Click **Save As** and name the output csv file **UK Elevation Statistics.csv** and save to the Working directory. This illustrates how quickly important statistics can be generated. More complex questions can be asked using the Calculator.

Exercise 5 – Assigning Values from a Raster to a Vector file

1) Open table **GB OST50 UK CLIP** from …\Workshop\Ex-03 if it has been closed down.
2) Open table **Highest Elevation Points UK** from …\Workshop\Ex-05.

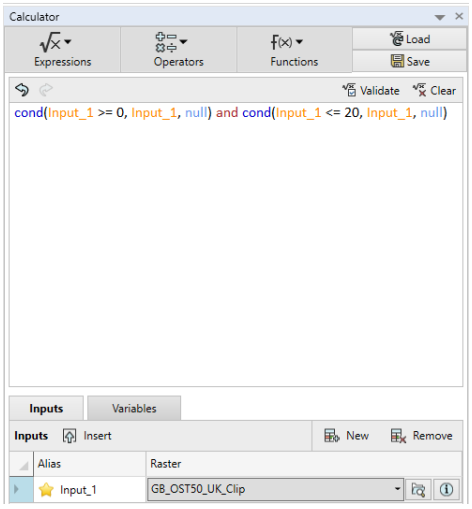
3) MapInfo Raster's Point Inspection tool will be used to assign the value from the open source Ordnance Survey elevation grid to the points in the map.
4) Navigate to the **Raster** tab in the MapInfo ribbon. **Select Raster Tools** > **Point Inspection**, set the GB OST50 UK Clip file as the **Input File**. Set Highest Elevation Points UK as the **Select Point Layer**. Set **Output Mode** as **Edit input tab file** and select output column **Elevation**.
5) Click **Process**.
6) Set an expression in the labels settings to show the name and elevation of the highest points in the UK.

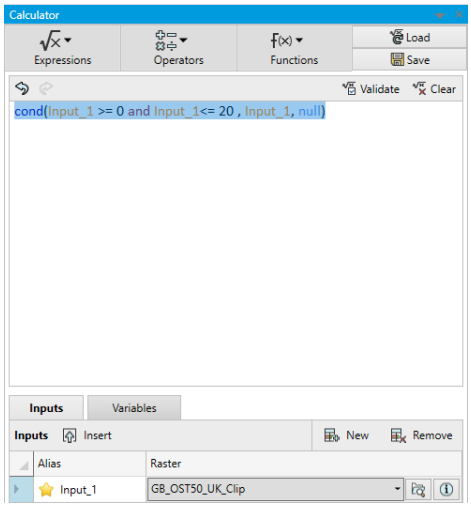


Exercise 6 – Raster Queries

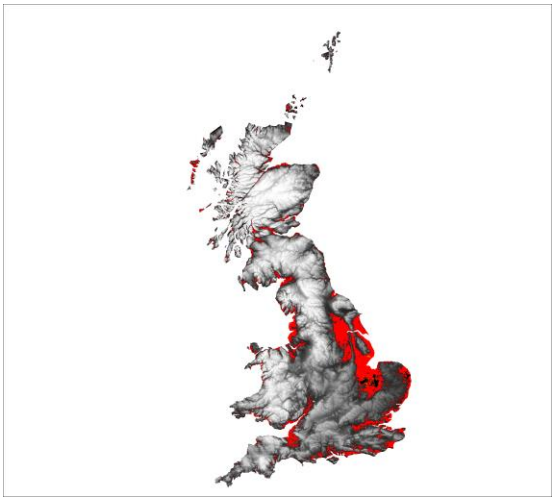
In order to define all of the lowland areas in the UK a query can be used. In this case all areas need to be defined between 0 and 10 meters above mean sea level.

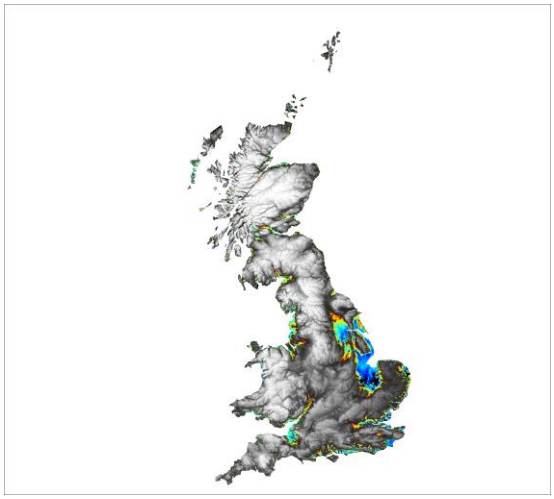
1) Open table **GB OST50 UK CLIP** from …\Workshop\Ex-03 if it has been closed down.
2) Change style override for the raster layer to be
3) Navigate to the **Raster** tab. Go to **Raster Tools** > **Calculator.**
4) Select the **Expressions** drop down, there are number of predefined expressions created for use. In this case the query needs to find all values from 0 to 20 meters. Consider if you want the result to have values including 0 and 20 or including 0 and 20.
5) Example Expressions:
    a. [Predefined Expression Used = Keep if >= or =<]
        i. `cond(Input_1 >= 0, Input_1, null) and cond(Input_1 <= 20, Input_1, null)`
    b. [Keep Between Two Variables]
        i. `cond(Input_1 >= 0 and Input_1<= 20 , Input_1, null)`





6) Define an Expression as above. Use can use Variables or use 0 and 20 values right in the expression.
7) Click **Compute**. This process should take less than 30 seconds. The new grid will be opened into the map window. Run the second variable option. Note the differences in results. One grid has the original values and one has been classified.
8)





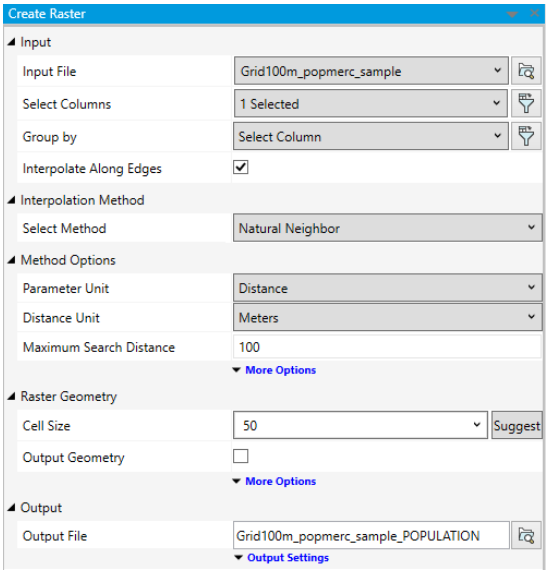
Exercise 7 – Interpolation (population density)

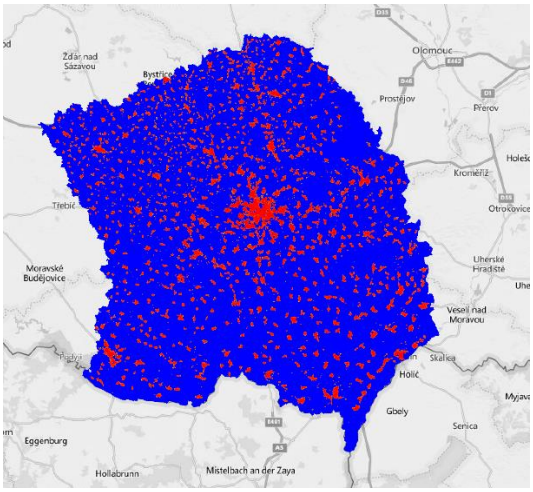
Interpolation algorithms are used to create continuous surfaces that fill in the gaps between data points. These are models of the real world, they don't always represent the facts but try get as close as possible to the geographic reality as is possible. A typical example would be creating a Digital Terrain Model from a series of surveyed elevation points covering an area or LIDAR collected data. These algorithms can also be used for analysis such as distance and density, for example a visual hotspot map can give a

viewer the idea of the most populated areas of a county or the areas where the most incidents of crime occur very quickly.

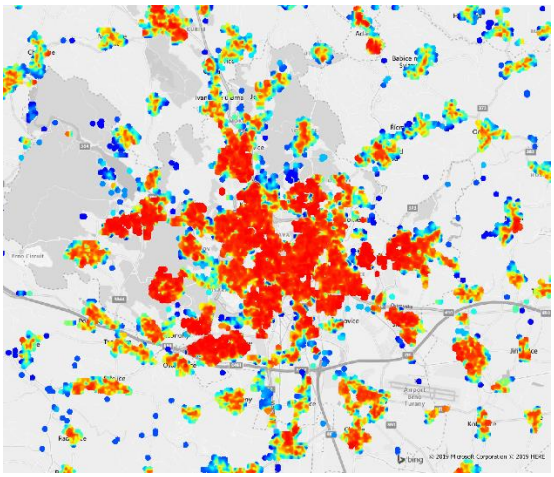
In this example territory of city Brno is divided into 100m by 100m squares and for each square population is defined. Different interpolation methods will be used to create population density grid.

1) Open workspace **BrnoPopulation.wor** from …\Workshop\Ex-07
2) Navigate to the **Raster** tab, click on Create **Raster** > **Nearest Neighbor**. Set the parameters as below.



3) Select **Population** column in **Select Columns**
4) Save the **Output File** as **Grid100m_popmerc_sample_POPULATION**. Click **Process**. This process will take a few seconds, it can be tested with different parameters, these will give slightly different results and take more or less time.
5) 

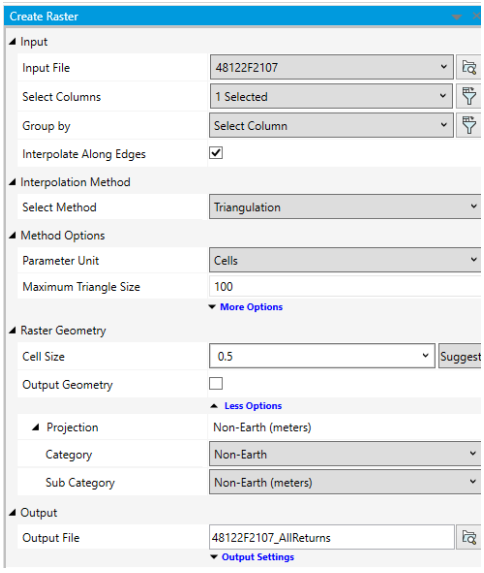
6) Resulting grid has a lot of blue cells that correspond to zero population value. It is possible to ignore zero input values during gridding process. This can be done by clicking on **Data Conditioning Options** button (next to **Select Columns** dropdown). Select **Specify Invalid Data** option, click on **Insert Row** and leave zero as an invalid data value. Click **Ok** and click **Process** to repeat gridding operation.

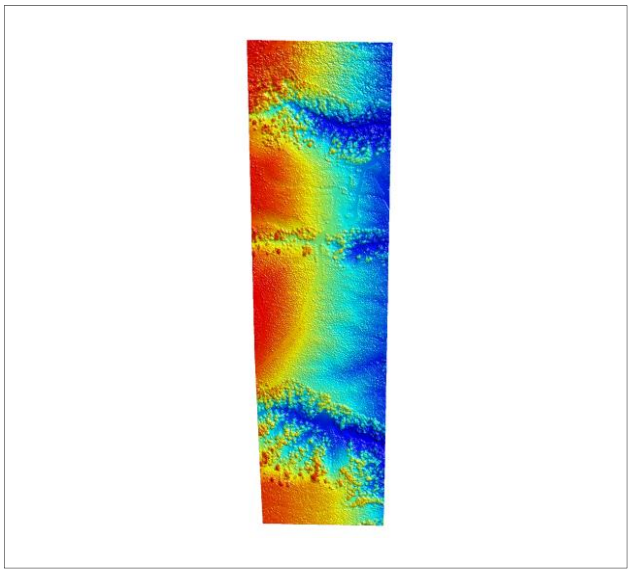


7)
8) Try increasing **Maximum Search Distance** to 200 meters, changing **Smoothing Method** to **Gaussian**, increase smoothing level. Try to turn on **Hill Shading**.

Exercise 8 – Interpolation (LIDAR data)

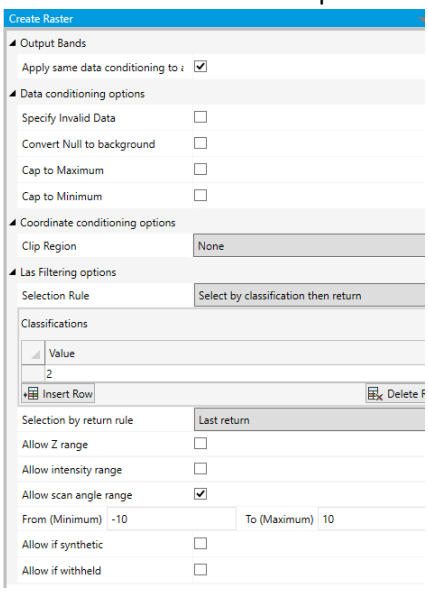
1) Go to **Raster>Create Raster** and select **Triangulation** method. This method usually works best for LIDAR data. Click on **Browse File** button and change file type for LAS/LAZ files. Open 48122F2107.laz file from …\Workshop\Ex-07 folder.
2) Select Z column for gridding, use Non-Earth meters coordinate system. In real situation you need to provide correct projection for the LIDAR dataset. Use following parameters and get the elevation grid that looks like this:

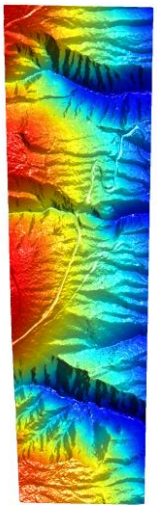




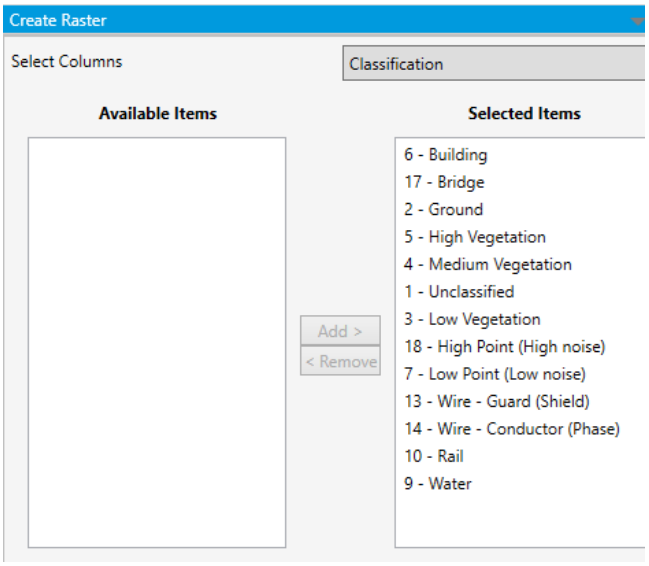
3)

4) Resulting grid is clearly an elevation grid, but it contains a lot of noise. Pro Advanced can be used to filter the input LIDAR data by classification, returns and angle.
5) Click **Data conditioning Options** button and expand **LAS Filtering options**. Every time the laser beam goes down, it gets multiple returns, they are numbered and you can select by data by return, you can select by the intensity of the return. Depending on what the laser hit, different intensity signal will come back to the measuring equipment. More useful option is to select by classification and then by return or select by classification and then by intensity. When the client gets the LIDAR data from the surveyor, the surveyor would have done some kind of classification operation on the data and he would label all of the returns depending on what they are: so, if it is a building or is the ground or perhaps a tree or it's a surface of a road or is a deck of the bridge or it's a power line or other things. All of these are standard classifications and the surveyor will provide all that information. So, we can select returns by classification. We know that 2 corresponds to ground. Select ground and select last return. And there are other options available for selecting a return. We can also do some restrictions based on the scanning angle. The laser is moving from left to right and there is an angle from the vertical that is called scan angle and if the angle is high, then you are looking right after the side of the measuring platform and can get more distortion. So, let's just restrict it to something smaller, let's say ten degrees on either side. This is how parameters would look:

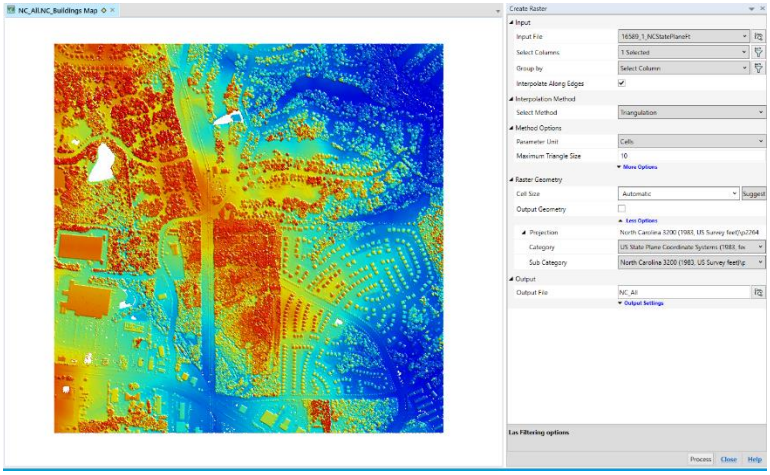




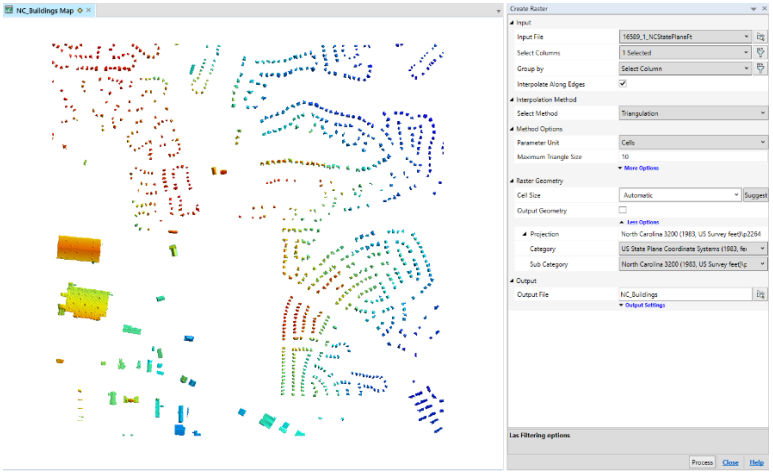
6)
7) Click Ok, name it **48122F2107_Ground.** Resulting grid really represents a terrain and can be used for analysis. You can clearly see roads compared to the first iteration.
8) Close all and open another LIDAR dataset **16589_1_NCStatePlaneFt.las** file and select Z column for gridding. Click on Grouping Options button and select Classification column:

9) 

10) Without any filtering and with the following parameters you will get the following grid:

11) 

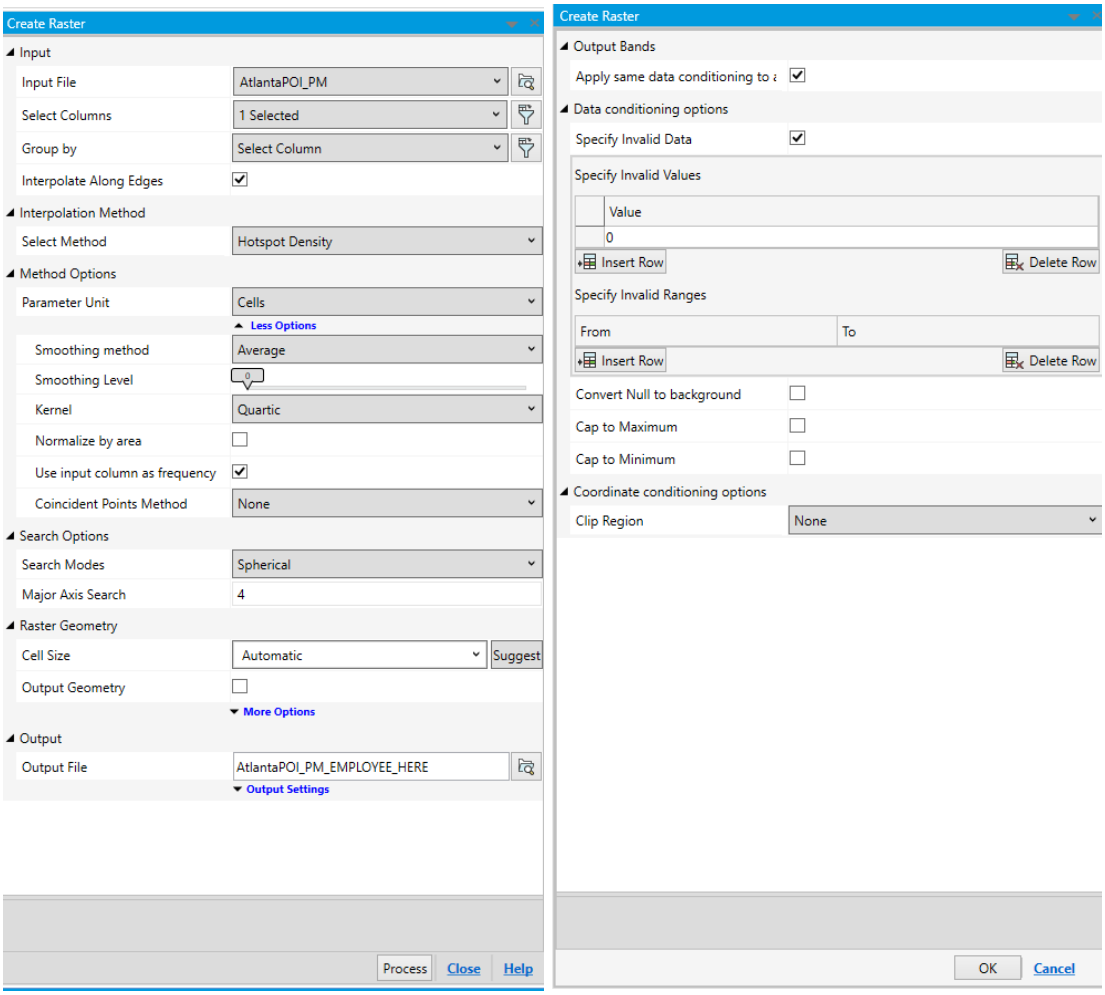
12) If you select only Buildings classification (number 6), you will get a grid with just buildings

13) 

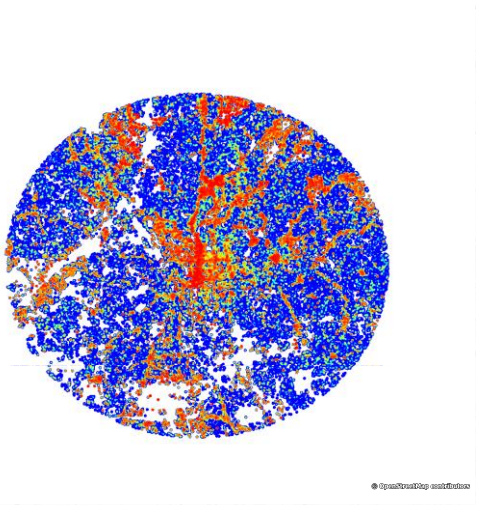
Exercise 9 - Heat Map

In this exercise we will create a Heat Map for distribution of employees of different industries across Atlanta metropolitan area.

1) Open workspace **AtlantaPOI.wor** from …\Workshop\Ex-09 folder.
2) **AtlantaPOI_PM** table is derived from Pitney Bowes Points of Interest dataset and it corresponds to locations of different employers across Atlanta metro area and has information about trade division it belongs and it also has number of employees for each location.
3) Go to **Create Raster** and select **Hotspot Density.**
4) **Select Column** for gridding to be EMPLOYEE_HERE and specify **Data Conditioning** to ignore zero values.

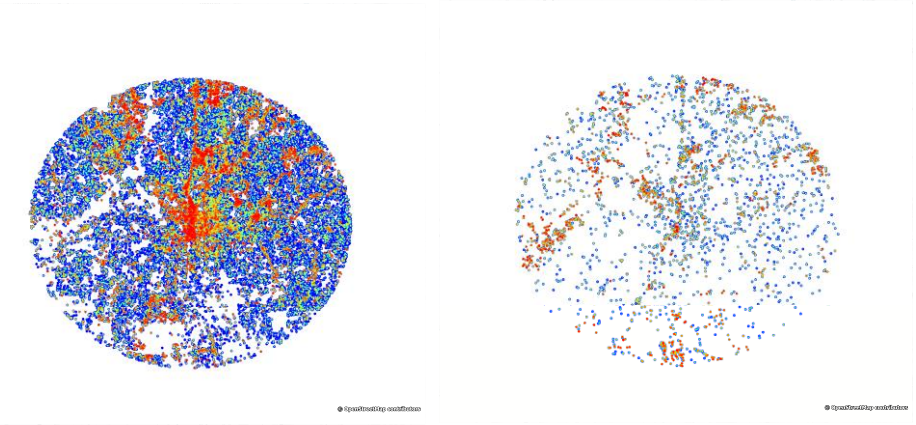


5)
6) Make sure to select Quatric Kernel (works well for Heat maps) and check **Use input column as frequency**. Click process and heat map will be created and will show distribution of overall employes across the area.



7)

8) Next step is to use new **Group by** capability. Click on **Group by** button and select **TRADE_DIVISION** column. Dialog will display all possible Trade division values, leave them as they are and click **OK** button. Click Process button to recalculate the grid. In this case resulting Raster will contain multiple fields and one can change which field is display by selecting TRADE_DIVISION through Field button. Below are grids for Services (left) and wholesale (right). You can see that services clearly has a big presence in downtown Atlanta and wholesale has pockets of large concentration further away from the city centre.

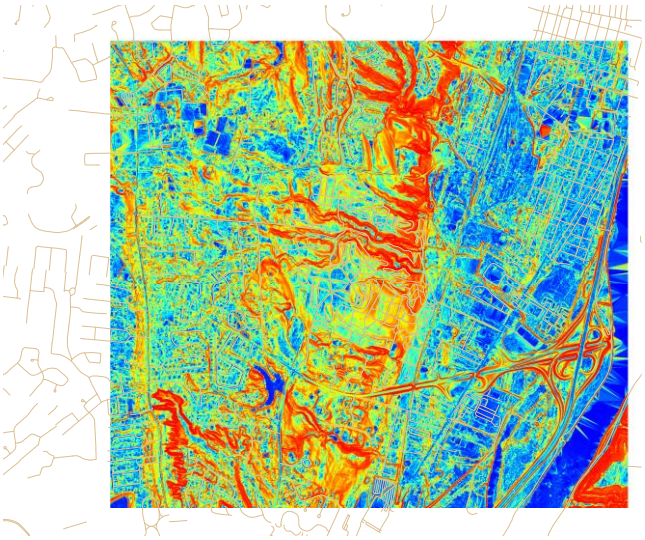


9)

Exercise 10 – Surface Tool and Calculator

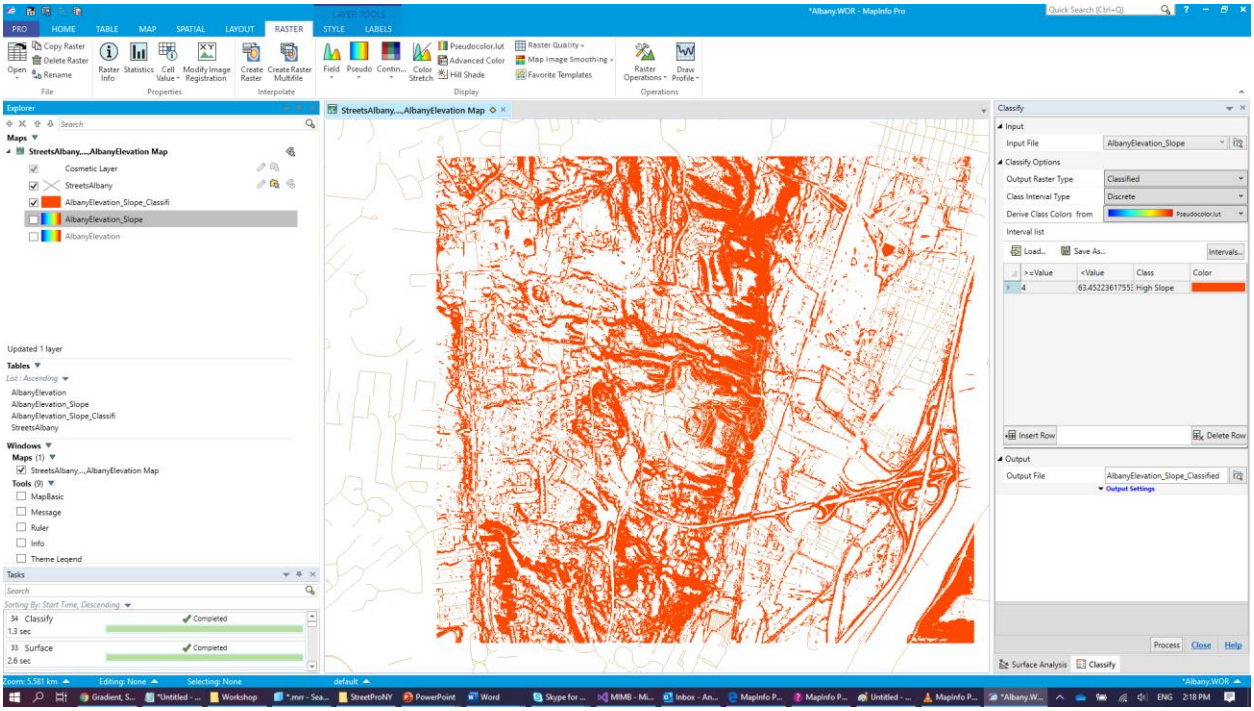
This demo will utilize both raster and vector data to find areas of Albany neighbourhood that have high slope (> 4 degrees) and identify streets that might need to be treated first in case of ice storm. Note that 4-degree slope corresponds to 7% grade. You will be using Albany elevation dataset and street network vector dataset.

1) Open workspace **Albany.wor** from …\Workshop\Ex-10 folder. This workspace have two tables: first one (**AlbanyElevation**) is subset of Albany elevation data and second one (**StreetsAlbany**) represent Albany streets.
2) First step is to calculate slope grid using **Raster Surface** tool. Select **Surface** button from **Raster Operations** gallery. Use all default values to calculate the slope grid. Resulting grid should look like this:



3)

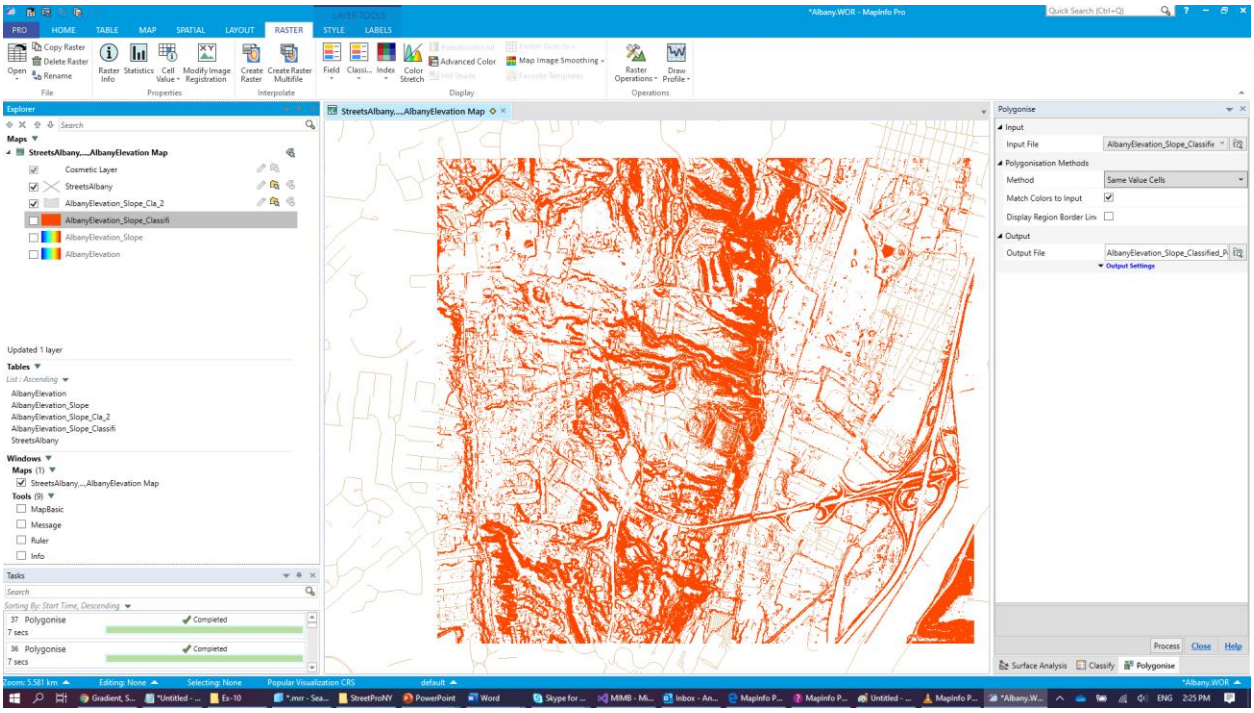
4) Next step is to find all areas that have a slope higher than 4 degree. We will use Classify tool to create classify grid with only one class “High Slope” that would include all areas with a slope 4 degrees or high. You can use the same values for classification as shown below:



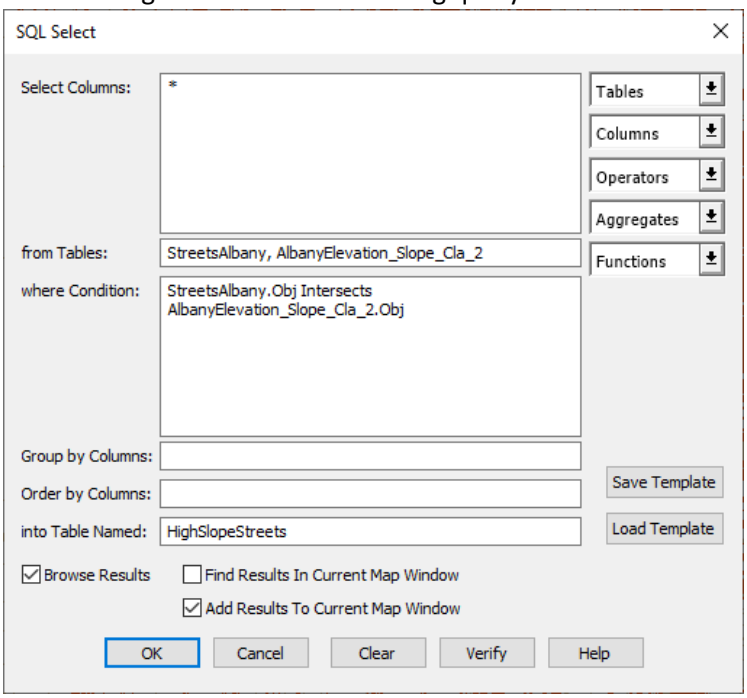
5)

6) Next step is to convert classified Raster into polygons. This could be done by running **Polygonise** tool on **AlbanyElevation_Slope_Classified** raster:

7)



8) Next step is to run a SQL query to select all roads that intersect high slope areas. Open **SQL Select** dialog and select the following query:



9)

10) **HighSlopeStreets** table will be added to the map. Uncheck visibility of polygon map and this is how result should look:

11)