PS Methods in Spatial Analysis Assignment #2 | Spatial Analysis

Paris-Lodron-Universität Salzburg

Department of Geoinformatics

Objective

The objective is to use spatial analysis techniques to analyze Salzburg and its terrain using ArcGIS Online and ArcGIS Pro methods.

Data:

1. DEM of Salzburg: dgm5m.asc
2. Catchments_Salzburg
   Source
   (https://zgis.maps.arcgis.com/home/item.html?id=3dfdaf154803453795c632a98c26da3e)

   Study Area:
   A river's Catchment area is identified using the attribute code HZB_CODE that is 82721 46 as shown in the screenshot below.

ClipedCatchment_salzburgNN

FID	Shape *	HZB_CODE	AREA_KM	Shape_Are	Shape_Len
0	Polygon	2 8272146 1 0 0 0 0	1.977376	4300507.26351	9157.575123
1	Polygon	2 8272146 2 0 0 0 0	4.380733	9531971.86153	12607.207102
2	Polygon	2 8272146 3 0 0 0 0	0.052458	114099.984948	2156.461361
3	Polygon	2 8272146 3 0 0 0 0	1.45695	3168708.55593	7055.155065
4	Polygon	2 8272146 5 0 0 0 0	5.531292	12028265.5255	16058.297106
5	Polygon	2 8272146 4 0 0 0 0	4.316031	9392688.13124	13319.250124

Task 1 > grade 4:
The selected catchment area is the area of interest for the following tasks:

1. Create a hill shade for the selected area
2. Create a map showing the color-coded elevation of the area

Create a hill shade for the selected area
Hill shade, Slope, Aspect for the area of interest is processed by using Geo-processing tool>Hillshade, Slope, Aspect.

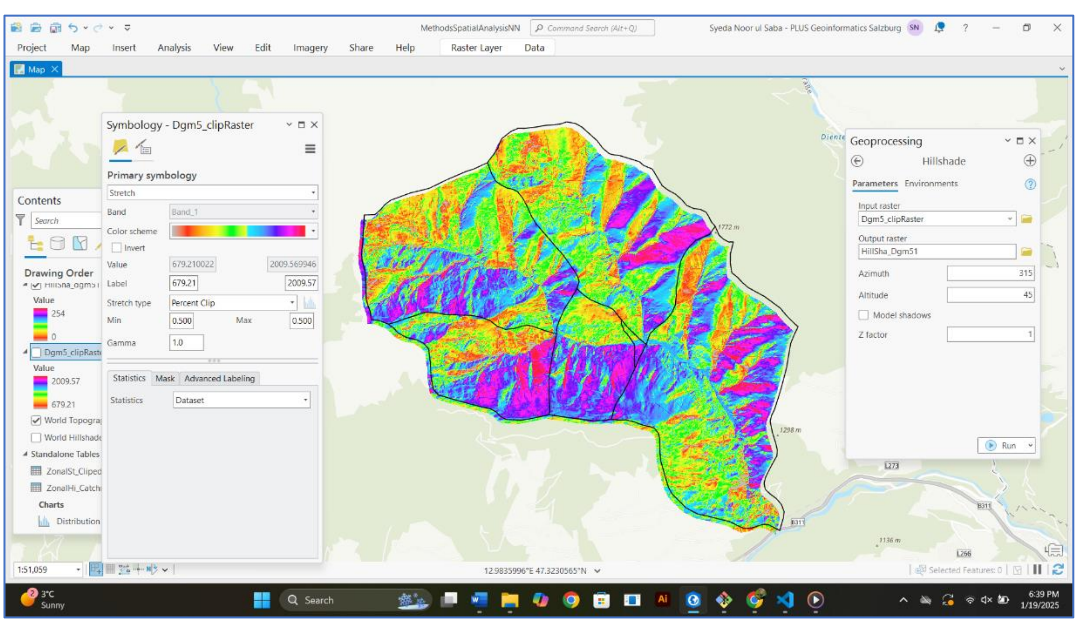

Figure 1. Hillshade

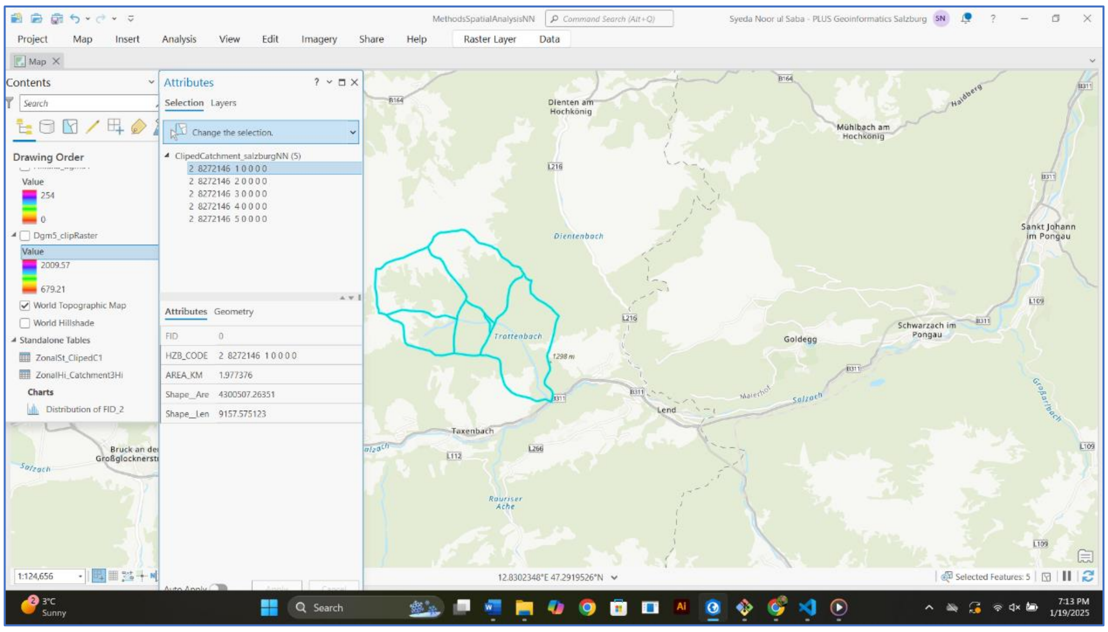

Figure 2. Attributes of the Area

Task 2 > grade 3:

Calculate a map showing slope and aspect. Calculate average slope and provide a slope histogram. Please explain the histogram accordingly.

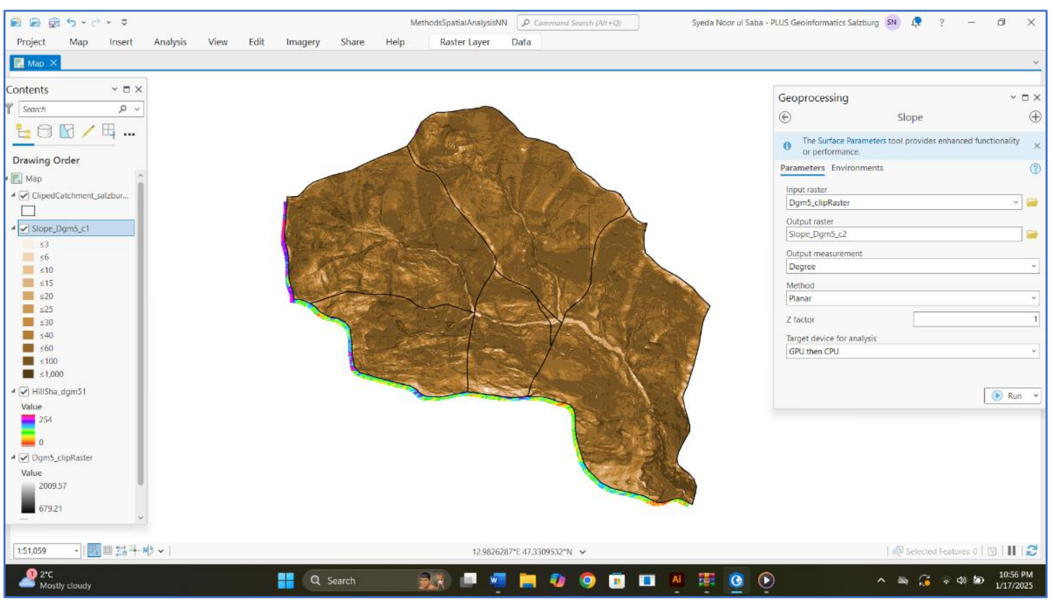

Figure 3. Slope

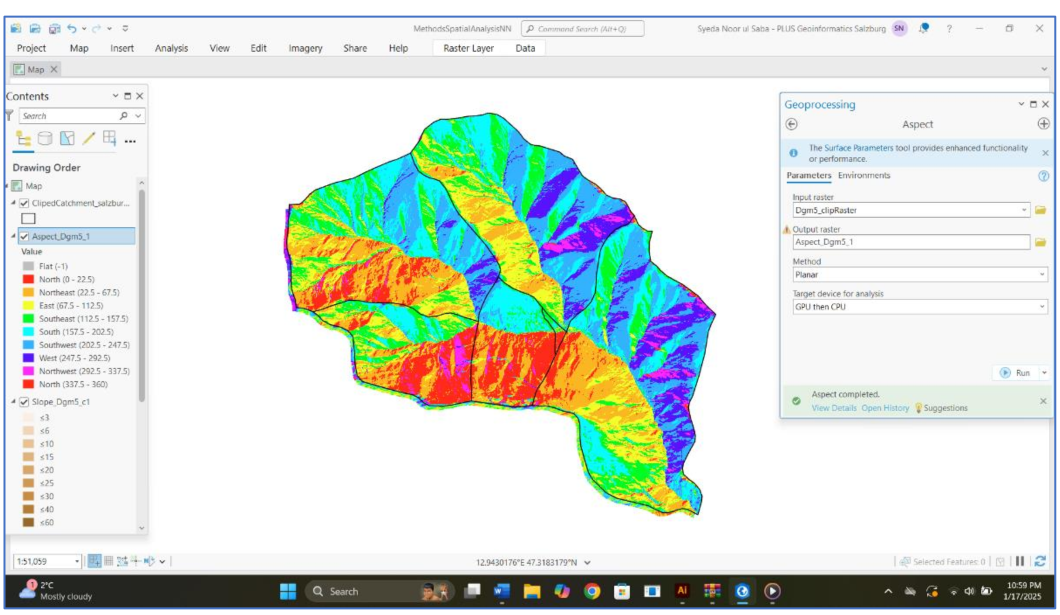

Figure 4. Aspect

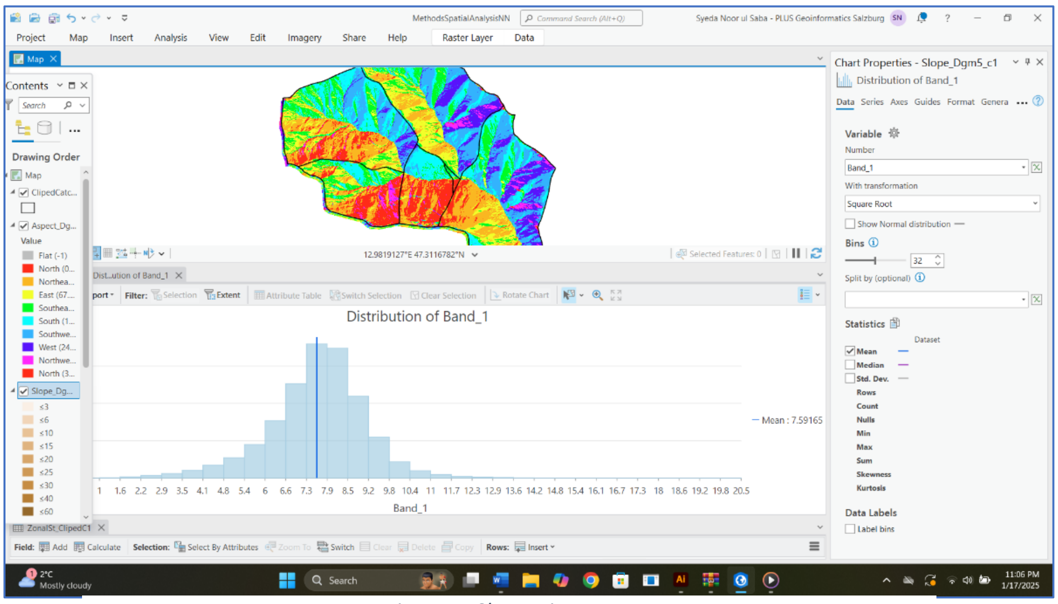

Figure 5. Slope Histogram

The histogram showing the distribution of slope values (in degrees) for a study area, with the slope values represented in the raster dataset. X-Axis Represents the slope values, measured in degrees. The range of values spans approximately from **1.6 to 20.5 degrees**, divided into intervals. Each interval aggregates a subset of the slope values within the defined range whereas Y-Axis represents the frequency (or count) of pixels in the raster that fall within each slope value range.

The distribution shows a slightly right-skewed pattern, with most slope values concentrated around the central range of approximately 6 to 10 degrees, as seen from the higher bars in the middle. Fewer pixels have very low (<5) or very high (>15) slope values.

Mean slope value: Approximately 7.59 degrees. The histogram reflects the natural variation in slope across the terrain, likely highlighting areas with moderate slopes as the most common.

Task 3 > grade 2:

Calculate the average slope for each elevation zone (you can choose between 200m/500m elevation intervals) and provide a slope histogram for each elevation zone. (Hint: use the tool "contour" to generate the elevation interval polygons – use contour type "contour polygon").

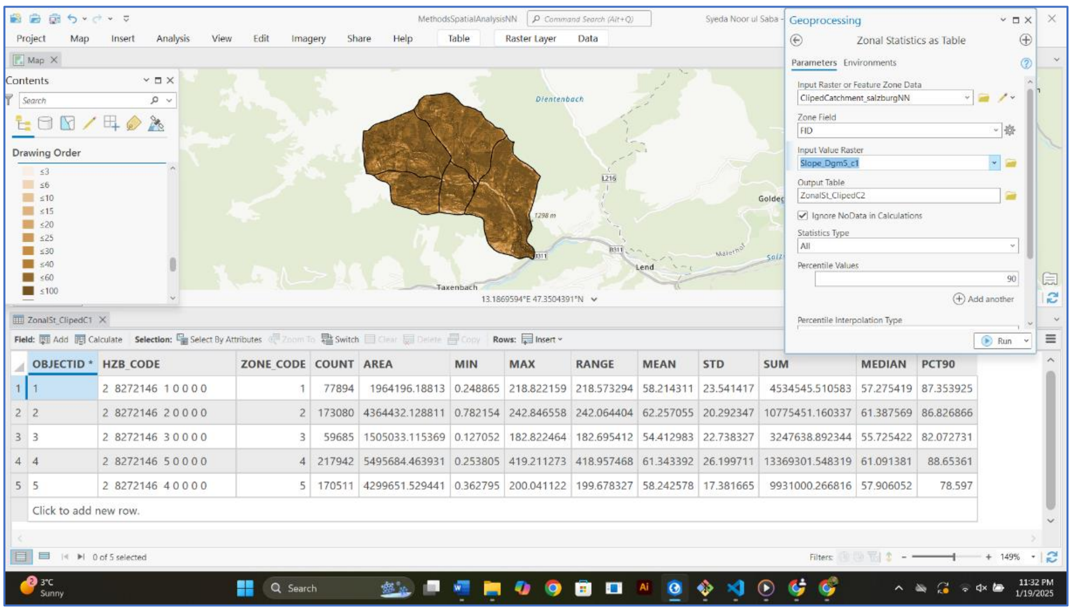

Figure 6. Zonal Statistics as Table

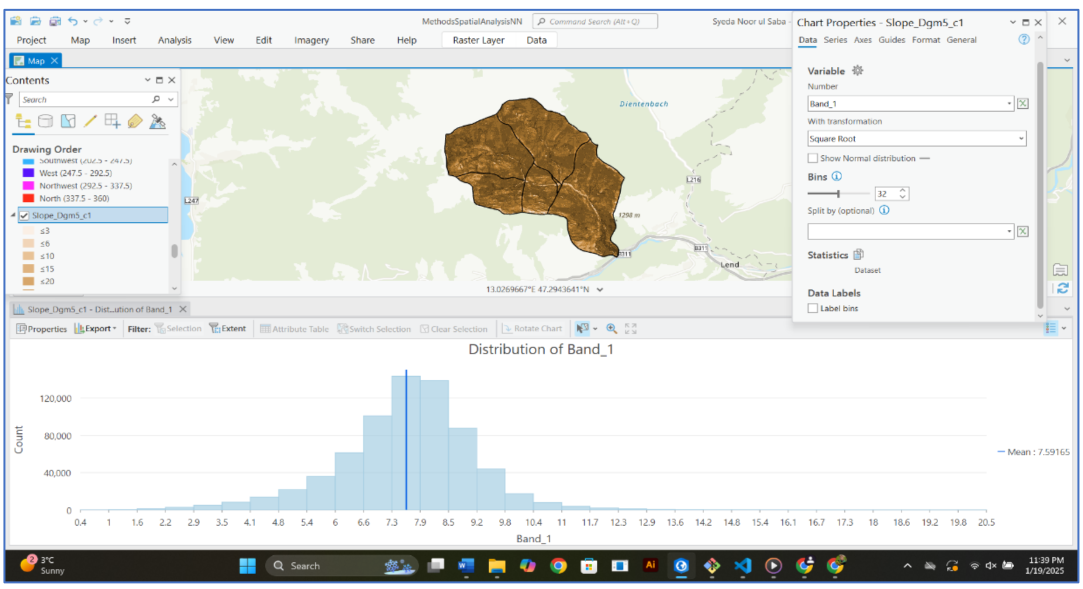

Figure 7. Distribution of Band-1

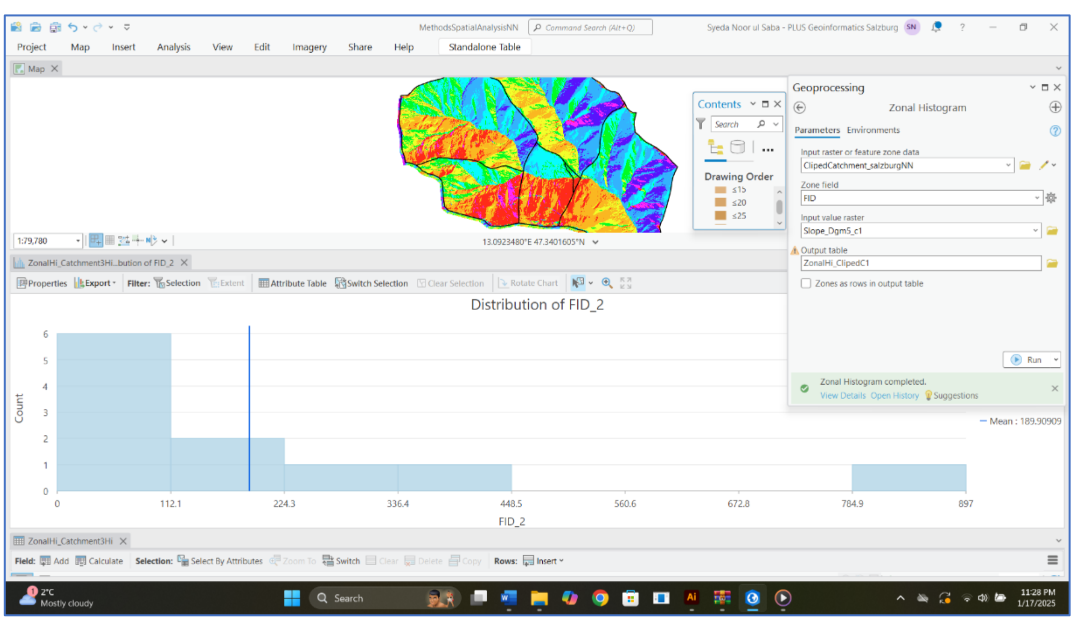

Figure 8. Distribution FID 2

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Task 3 > grade 2:
Calculate the average slope for each elevation zone (you can choose between 200m/500m elevation intervals), and provide a slope histogram for each elevation zone. (Hint: use the tool “contour” to generate the elevation interval polygons – use contour type “contour polygon”).

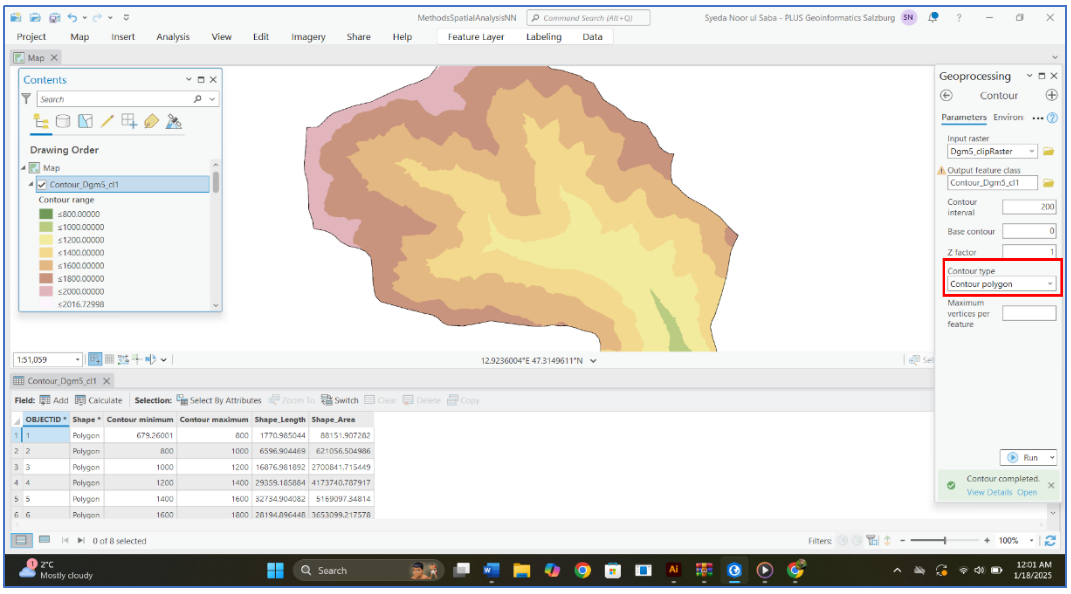

Figure 9. Contour Polygon

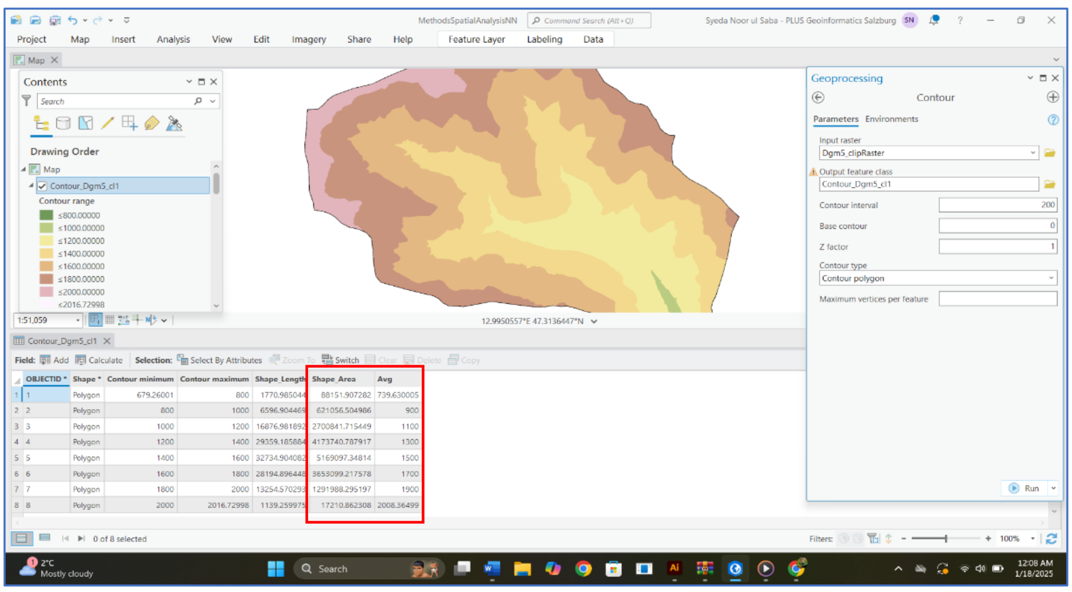

Figure 10. Contour Polygon with Shape Area and Average

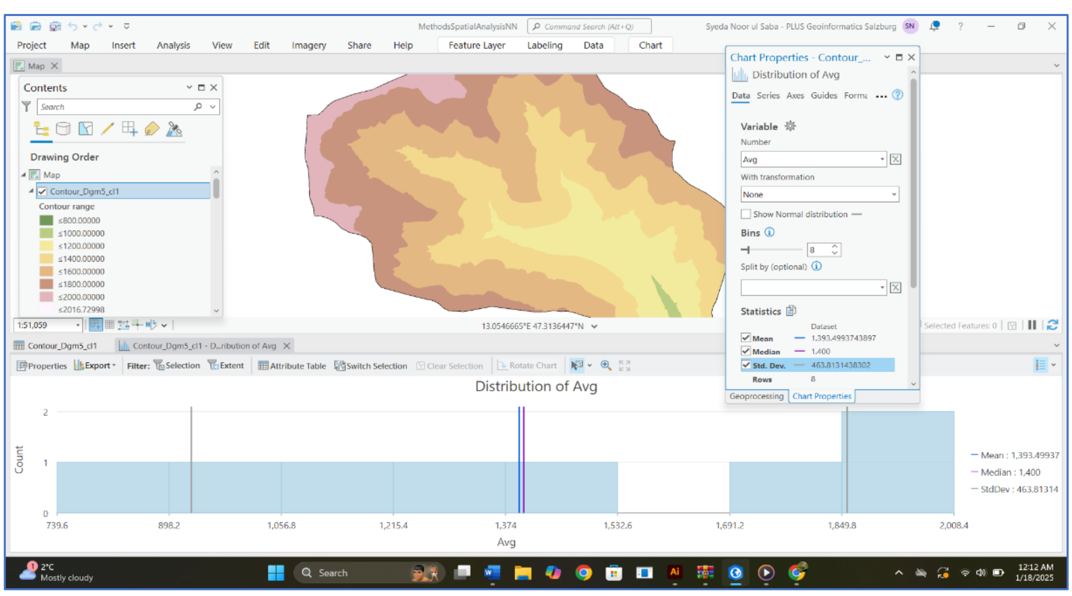

Figure 11. Distribution of Avg Histogram

Task 4 > grade 1:
Evaluate the average slope per elevation zone for different elevation raster resolution (5m – 10m – 100m). Please provide the average slope for each elevation zone and a histogram. Please explain your results accordingly!

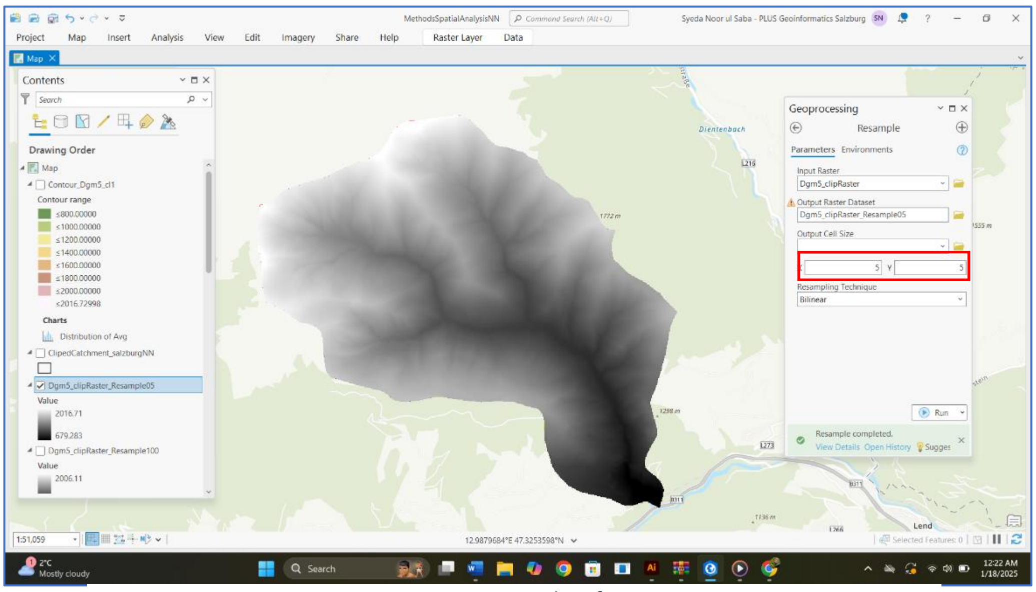

Figure 12. Resampling for 5m

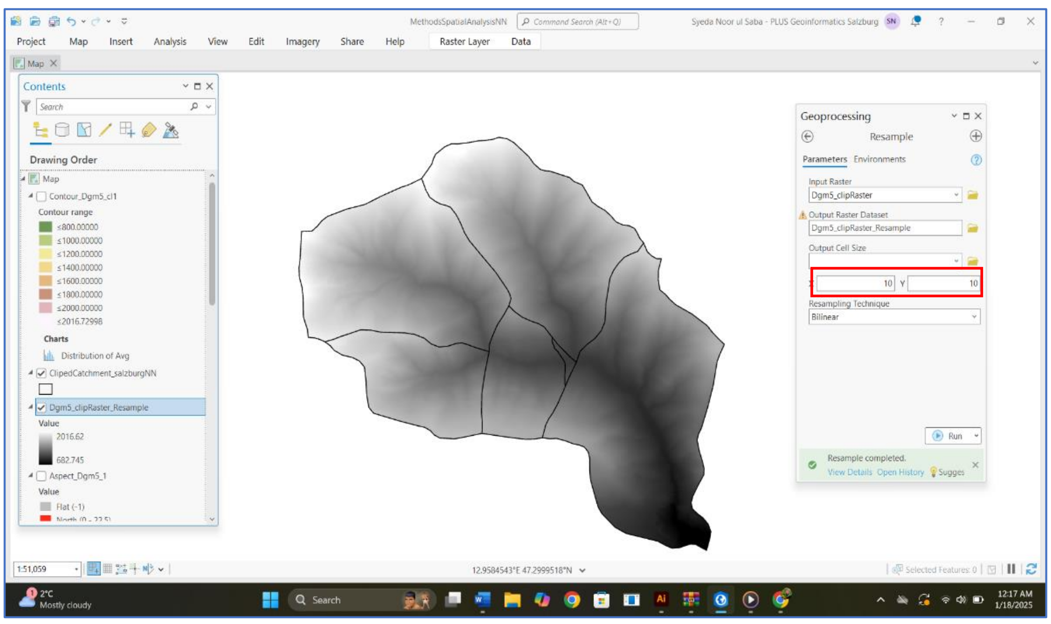

Figure 13. Resampling for 10m

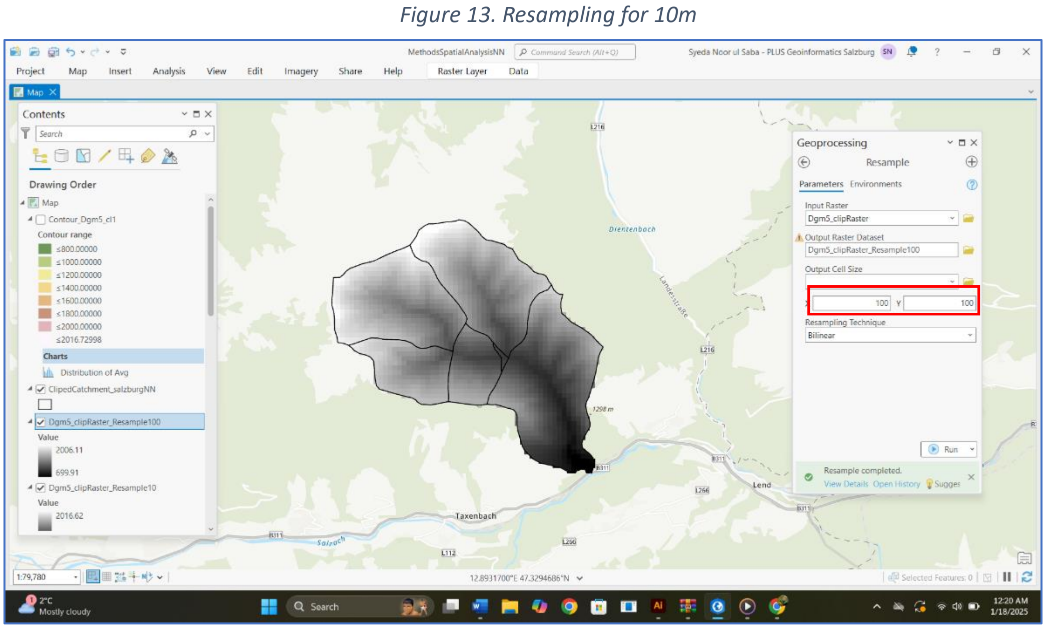

Figure 14. Resampling for 100m

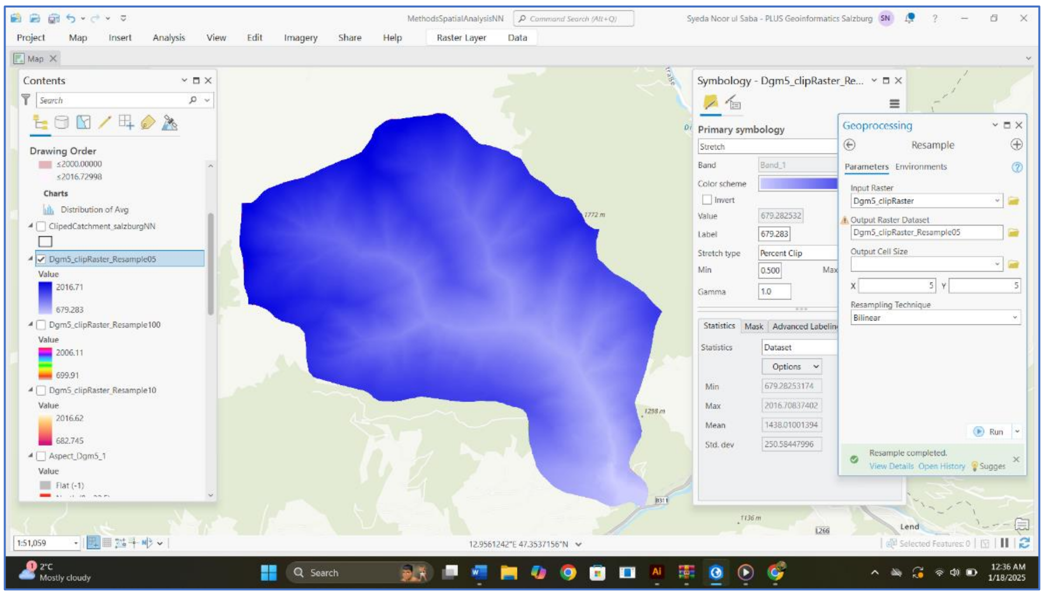

Figure 15. 5m Resolution

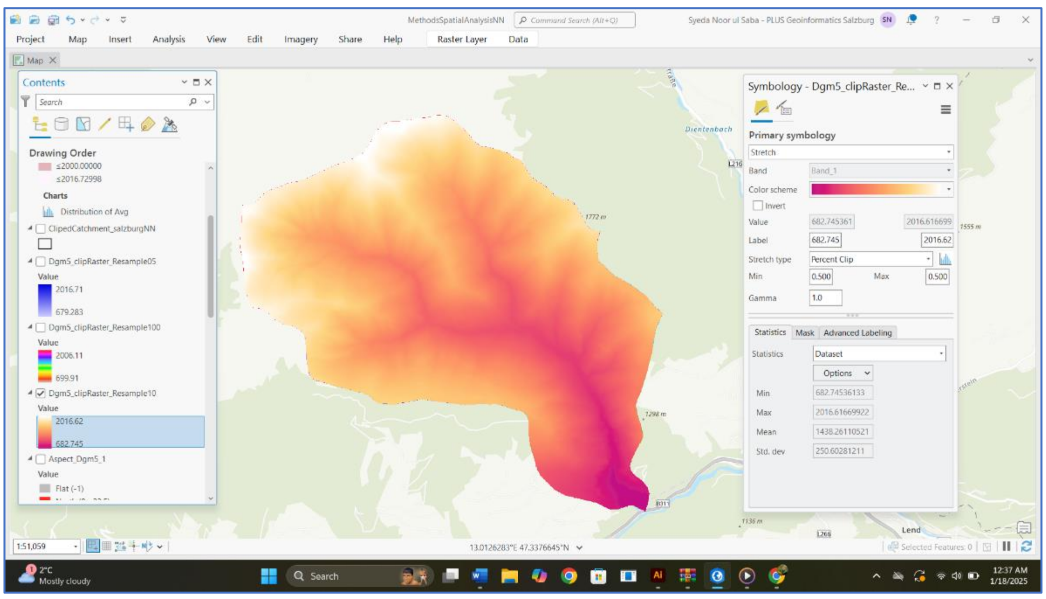

Figure 16. 10m Resolution

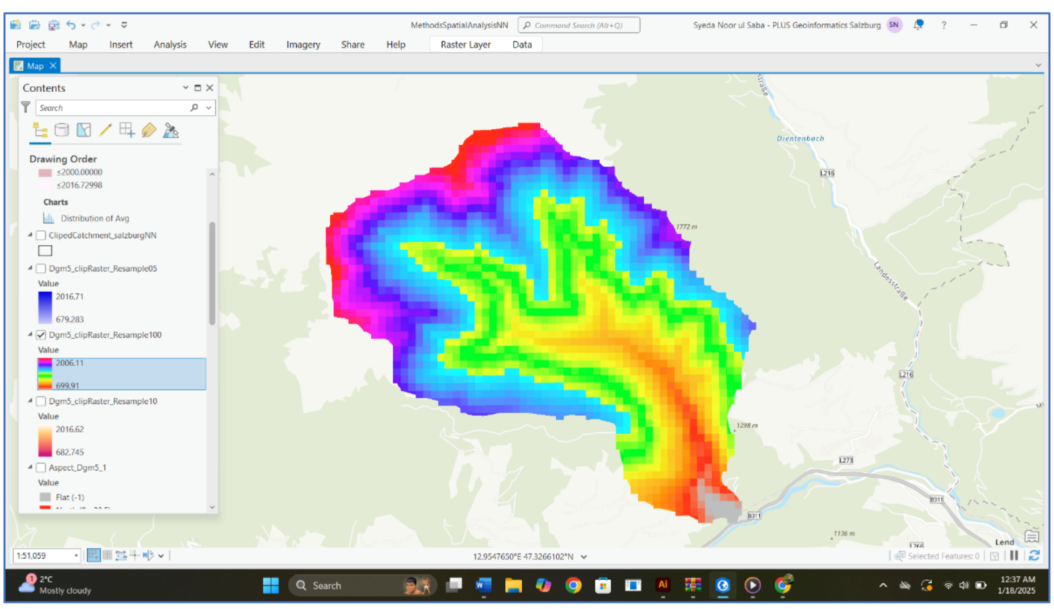

Figure 17. 100m Resolution

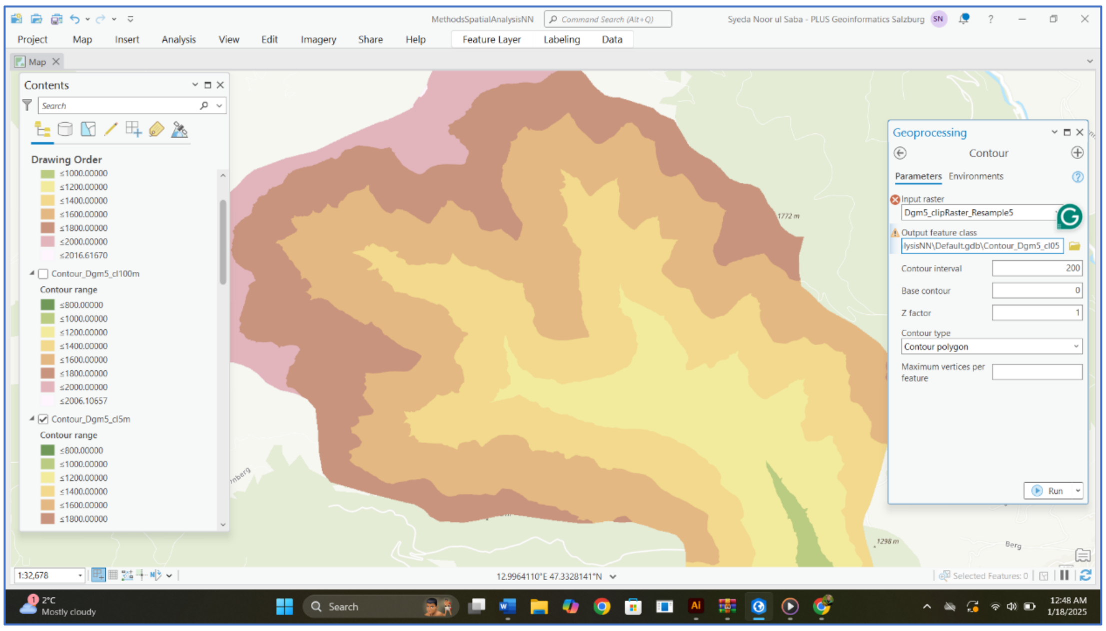

Figure 18. Raster Contour Resample

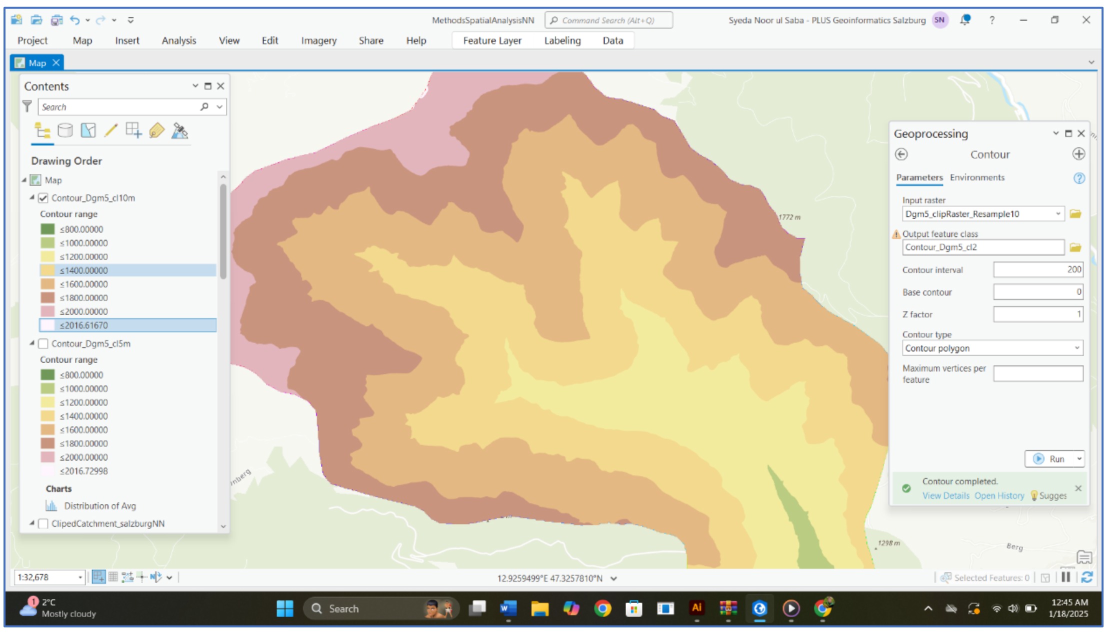

Figure 19. 10m Raster Contour Resample

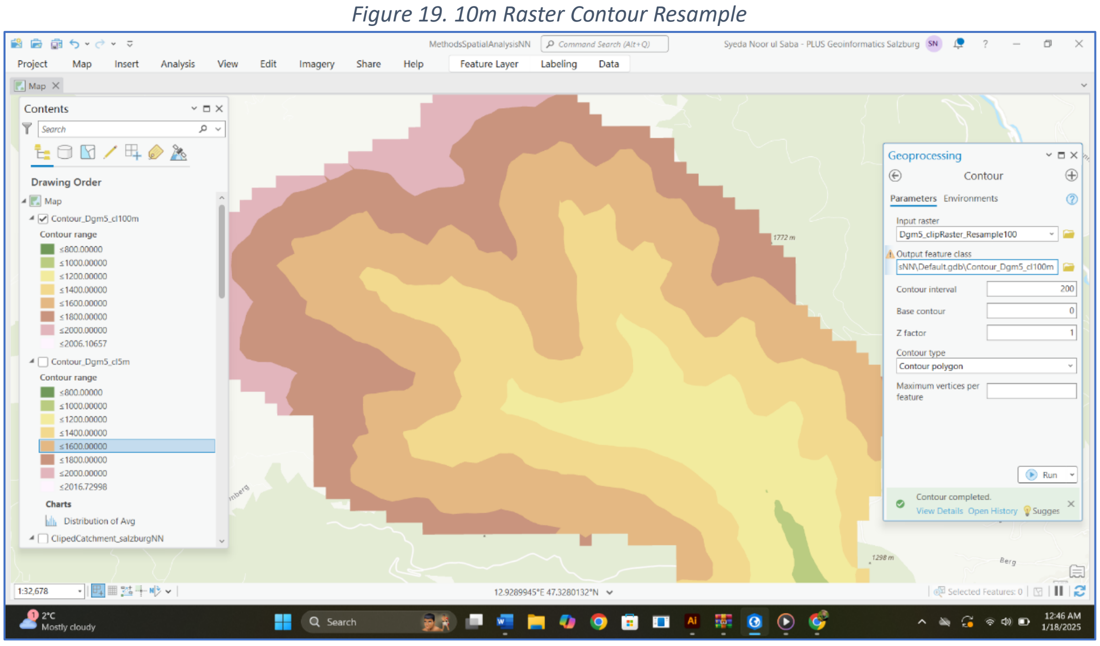

Figure 20. 100m Raster Resample Contour

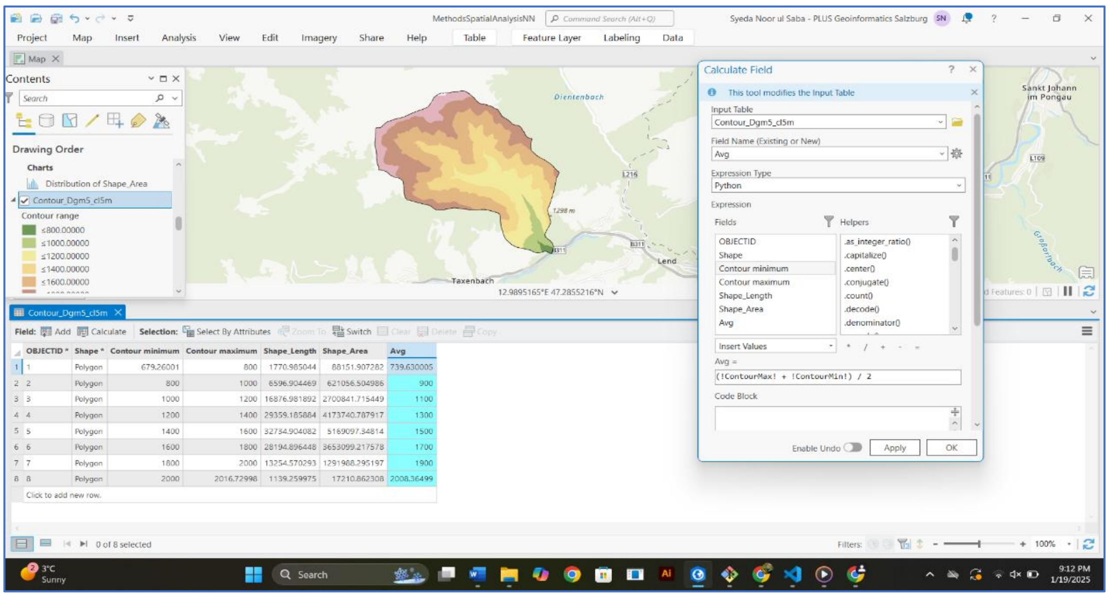

Figure 21. 5m Average Slope

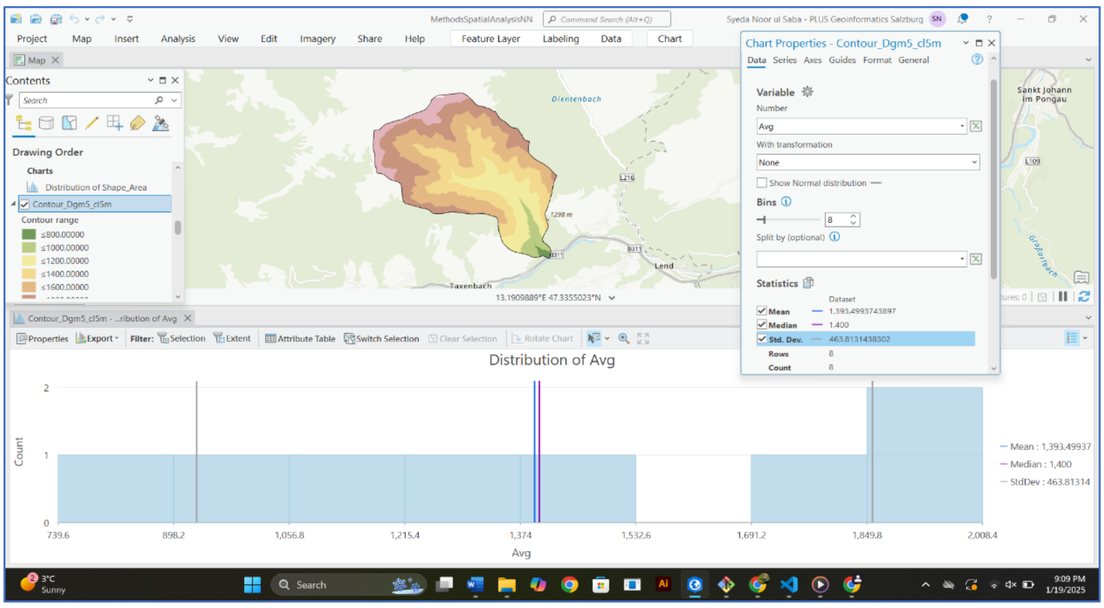

Figure 22. Histogram: 5m Average Slope

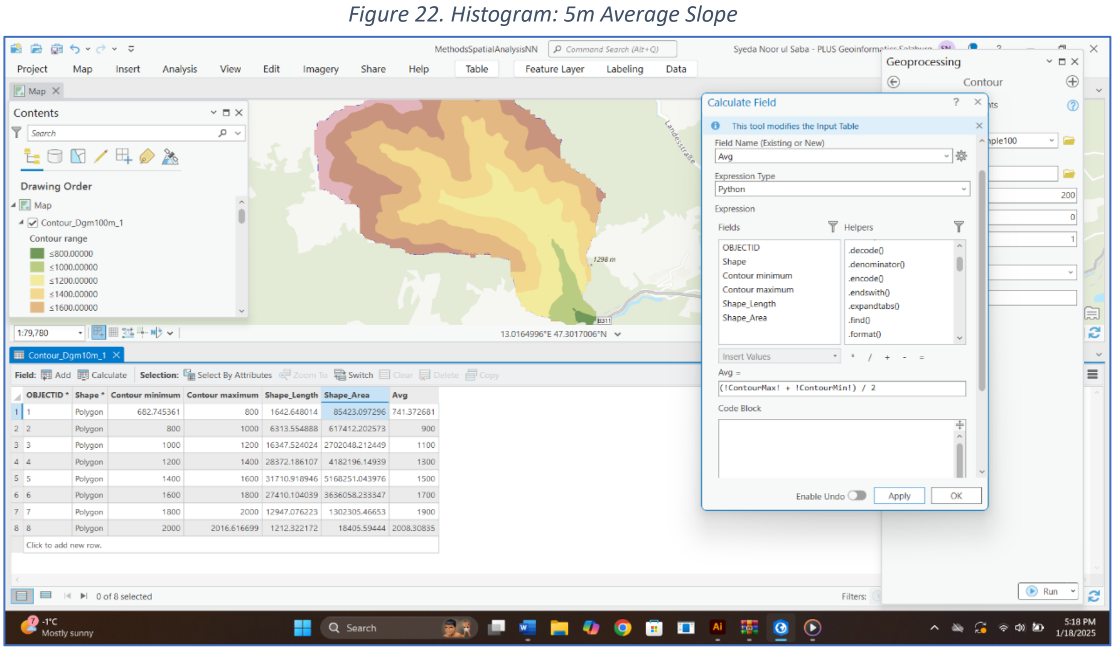

Figure 23. 10m Slope Average

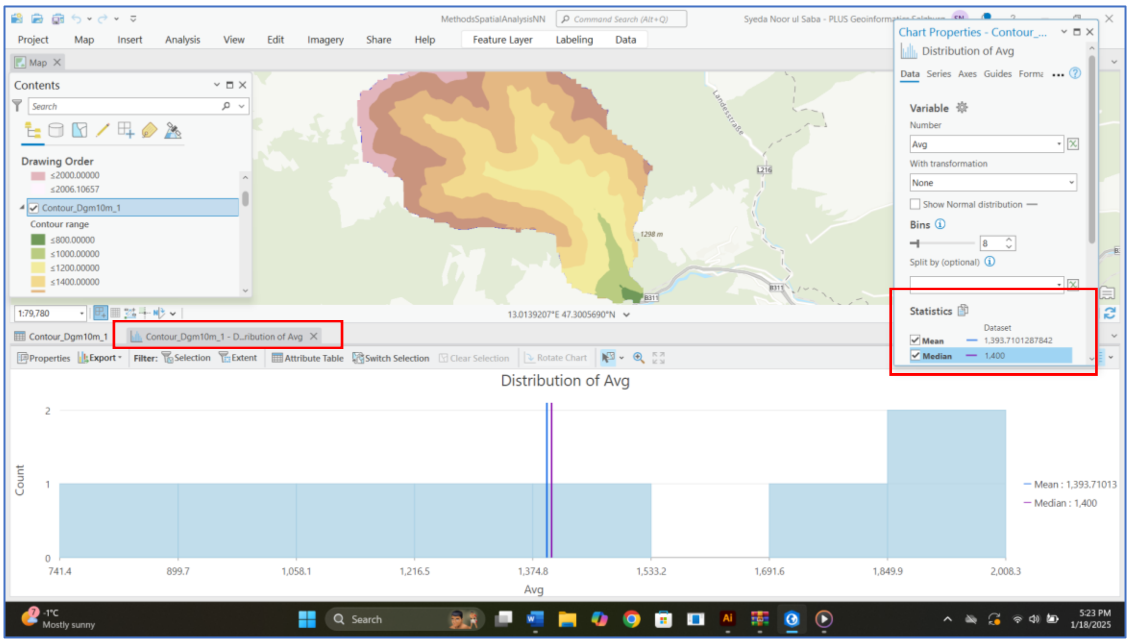

Figure 24. Histogram: Distribution of Average Slope 10m

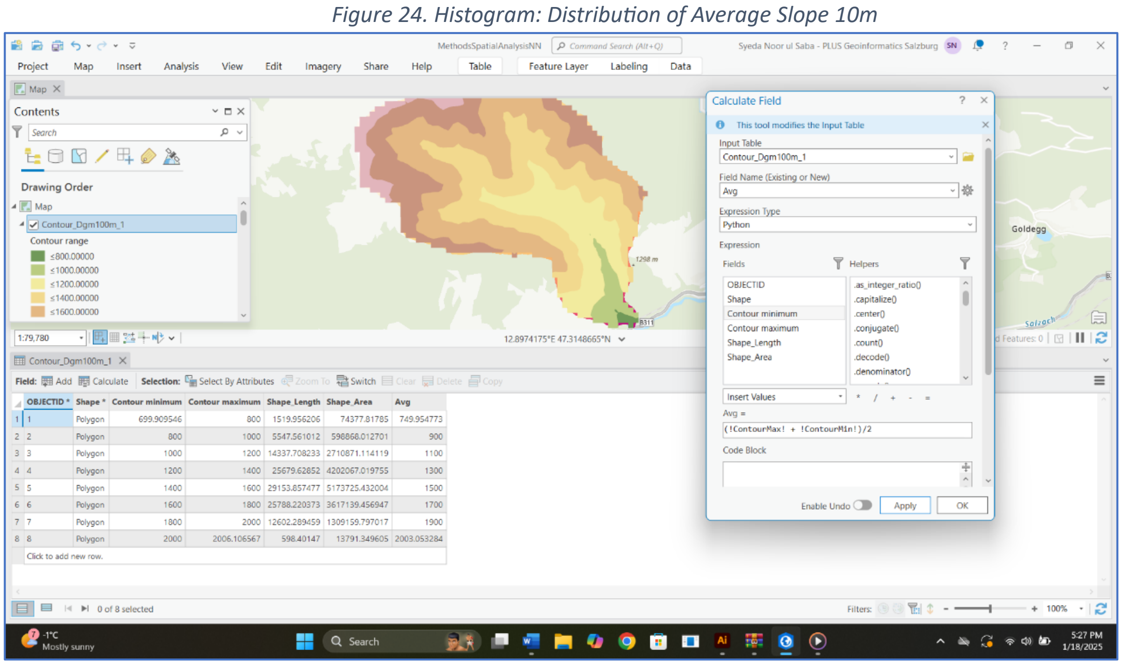

Figure 25. 100m Slope Average

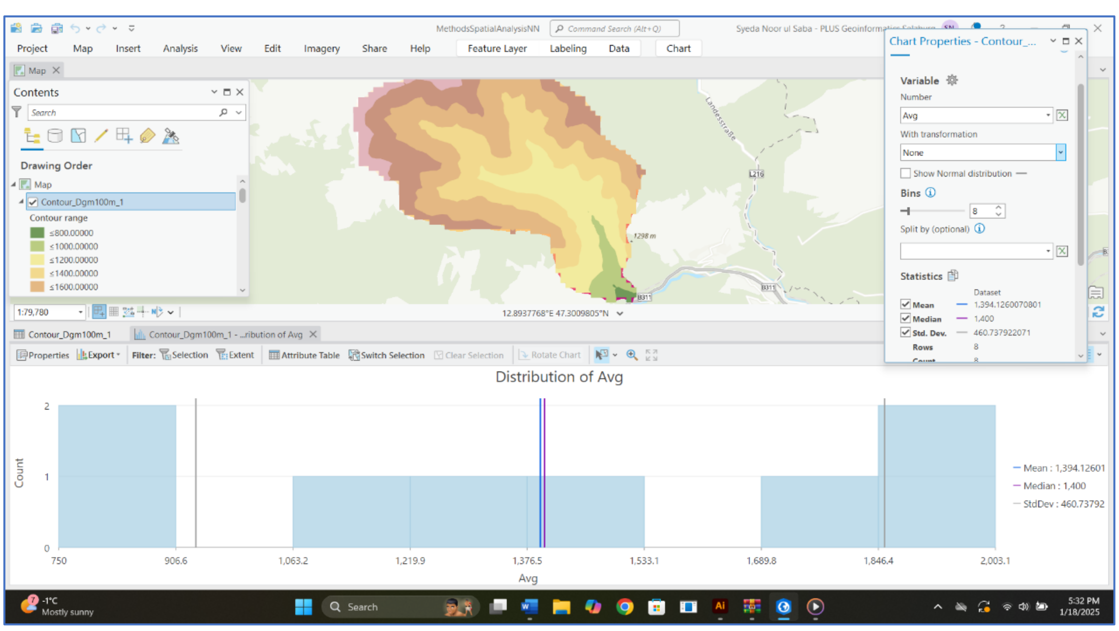

Figure 26. Histogram: Distribution of Average Slope 100m

Avg 5m	Avg 10m	Avg 100m

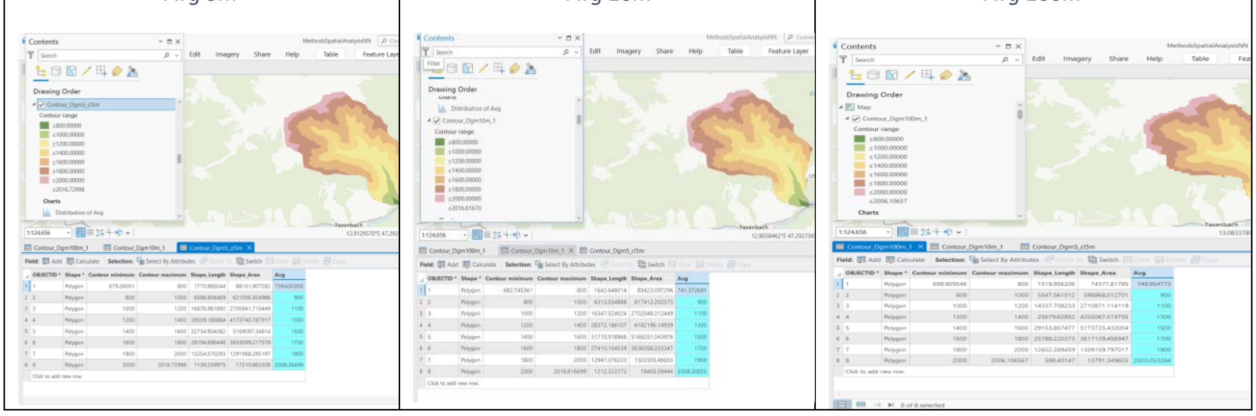

Figure 27. All Slope Averages

Discussion:

Raster Resolution

- During the evalution of Average Slope per elevation across different Raster Resolution such as 5,10 and 100m, it has been noticed that resolution significantly impact terrain representation.
- 5m resolution showed highly detailed representation of terrain and captured variations in elevation and slope etc clearly.
- In 10m resolution, it defined moderate detailed representation of the features.
- In 100m resolution, it has been observed that representation of train is very coarse, shows only broad elevation trends.

Average Slope Calculation

The average is calculated using the formula:
<u>Avg = (!Contour Maximum!+!Contour Minimum!)</u>
/2

Results:

5m Resolution/Histogram

In the attribute table of 5m slope, precise contour ranges can be seen, and slope averages are quite visible due to detailed terrain representation.
In the Histogram of 5m slightly wider value ranges can be seen that reflects variabilities in the terrain. And the mean and median values are close enough (1393 and 1400) that indicated symmetrical distribution.

10m Resolution/Histogram

The average slope that is calculated per zone is smoothing out slightly that indicates reduction of visibility.
The histogram indicated the narrower distribution as compared to 5m resolution. The mean and median are observed to be the same but changes in variability of slope can be observed that is decreasing slightly.

100m Resolution/Histogram

In 100m resolution, a noticeable roughness can be seen, and average slopes are largely smoothing out that is reducing visibility and undermining steep slopes, but it is noticed that mean and median is not changing significantly.
It is also noticed that all slope averages are approximately remained same.