



Geographic Information System

Spatial Statistics I Lab Practice

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Outline

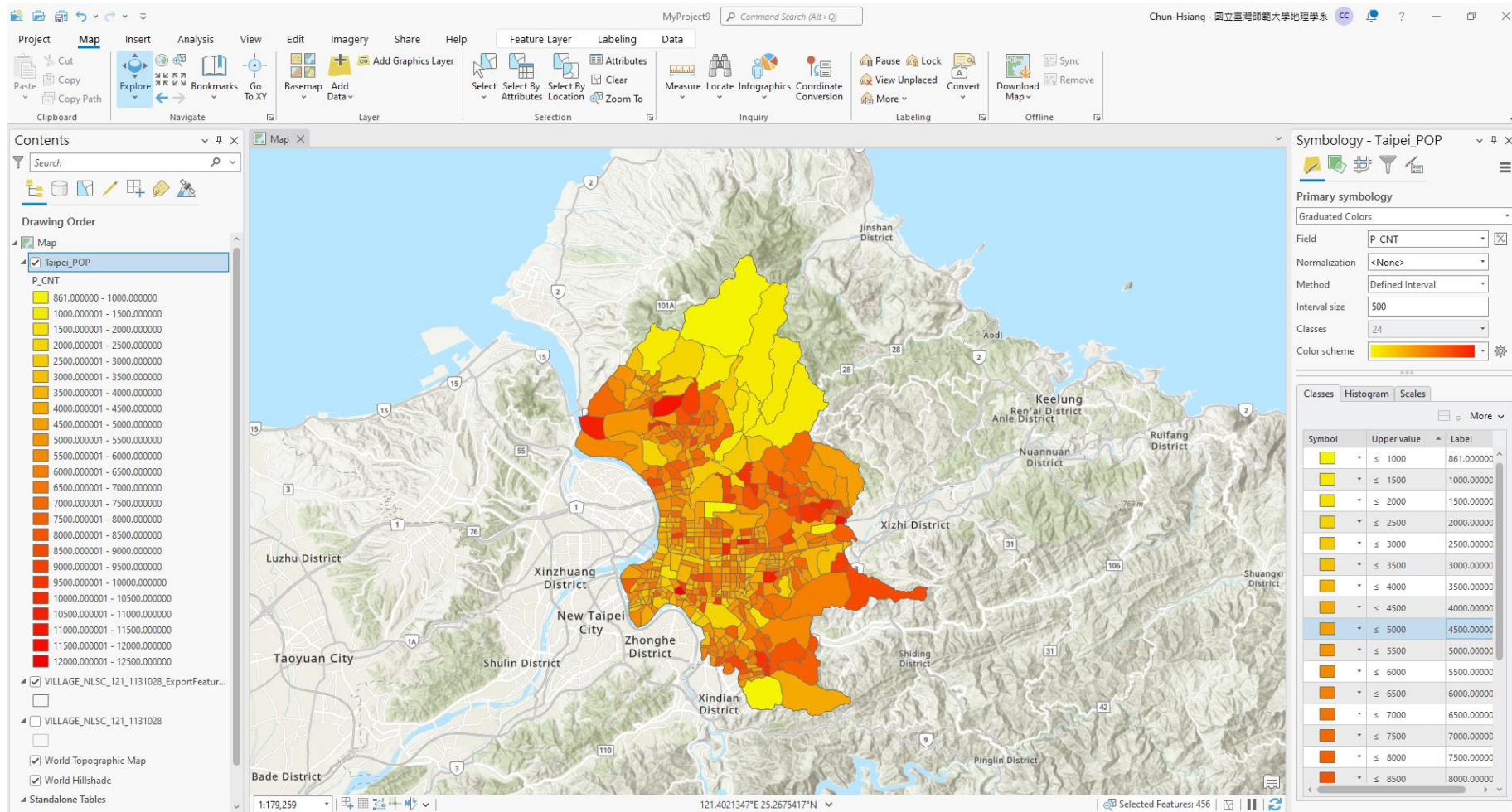
- **Observe the central tendency of Taipei traffic accident data between January and July**
- **Observe the average nearest neighbor of Taipei traffic accident data between January and July**
- **Observe the spatial pattern of Taipei population data**



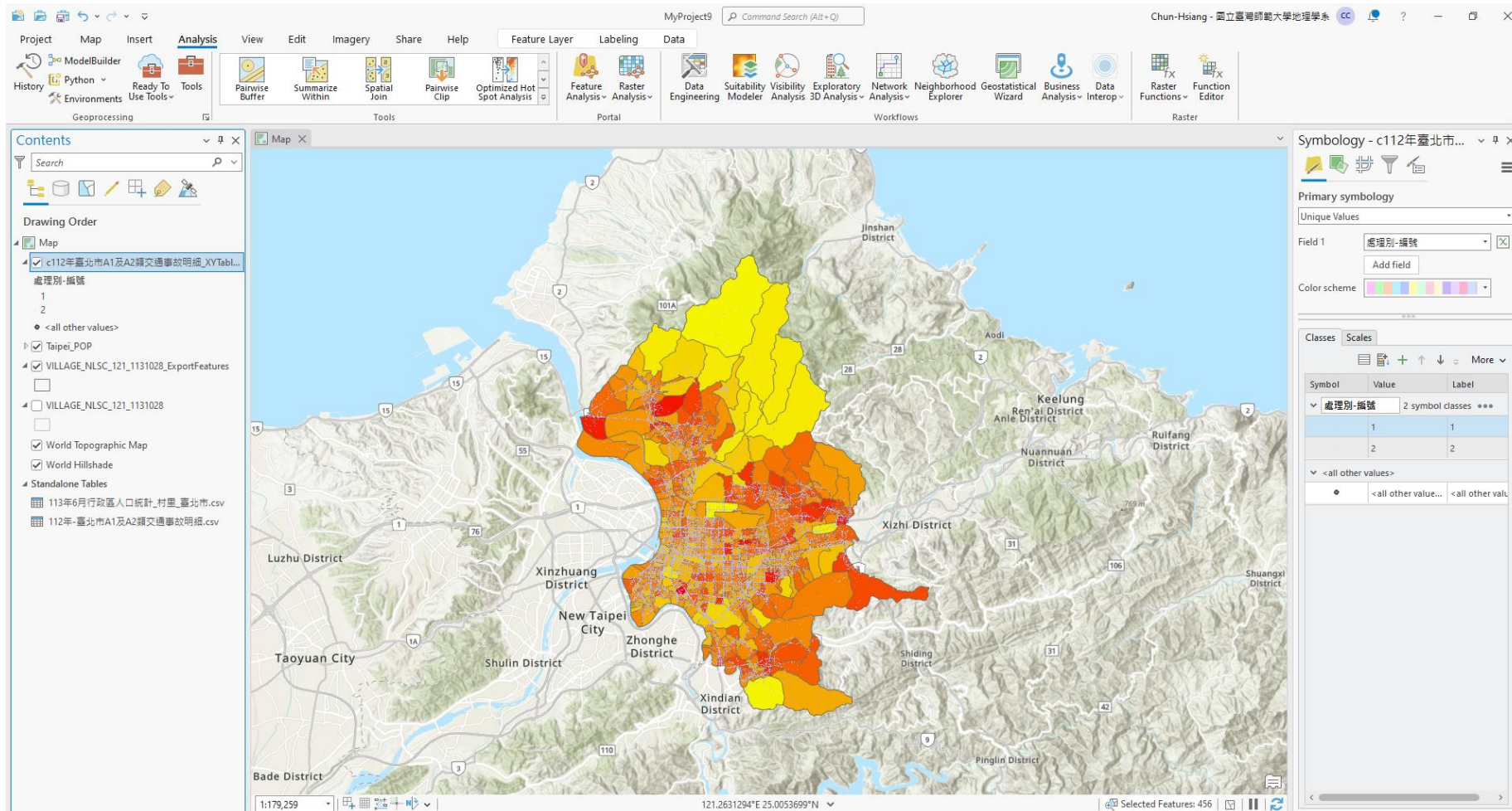
Initial Settings (...)

- 1) Set up the CRS of the map
- 2) Load Taipei Population Data, Taipei Traffic Accident Data, and Taiwan Village Data
- 3) Select all Taipei villages from the Taiwan village data and export as a new feature data named “Taipei_POP”
- 4) Join Taipei population into Taipei_POP
- 5) Use XY Table To Point to convert Taipei traffic accident data into Point data
- 6) Select 112/01 and 112/07 Taipei traffic accident and export as a new feature data, respectively, named “TrafficAccident_11201” and “TrafficAccident_11207”
- 7) Spatial Join Taipei traffic accident into Taipei_POP

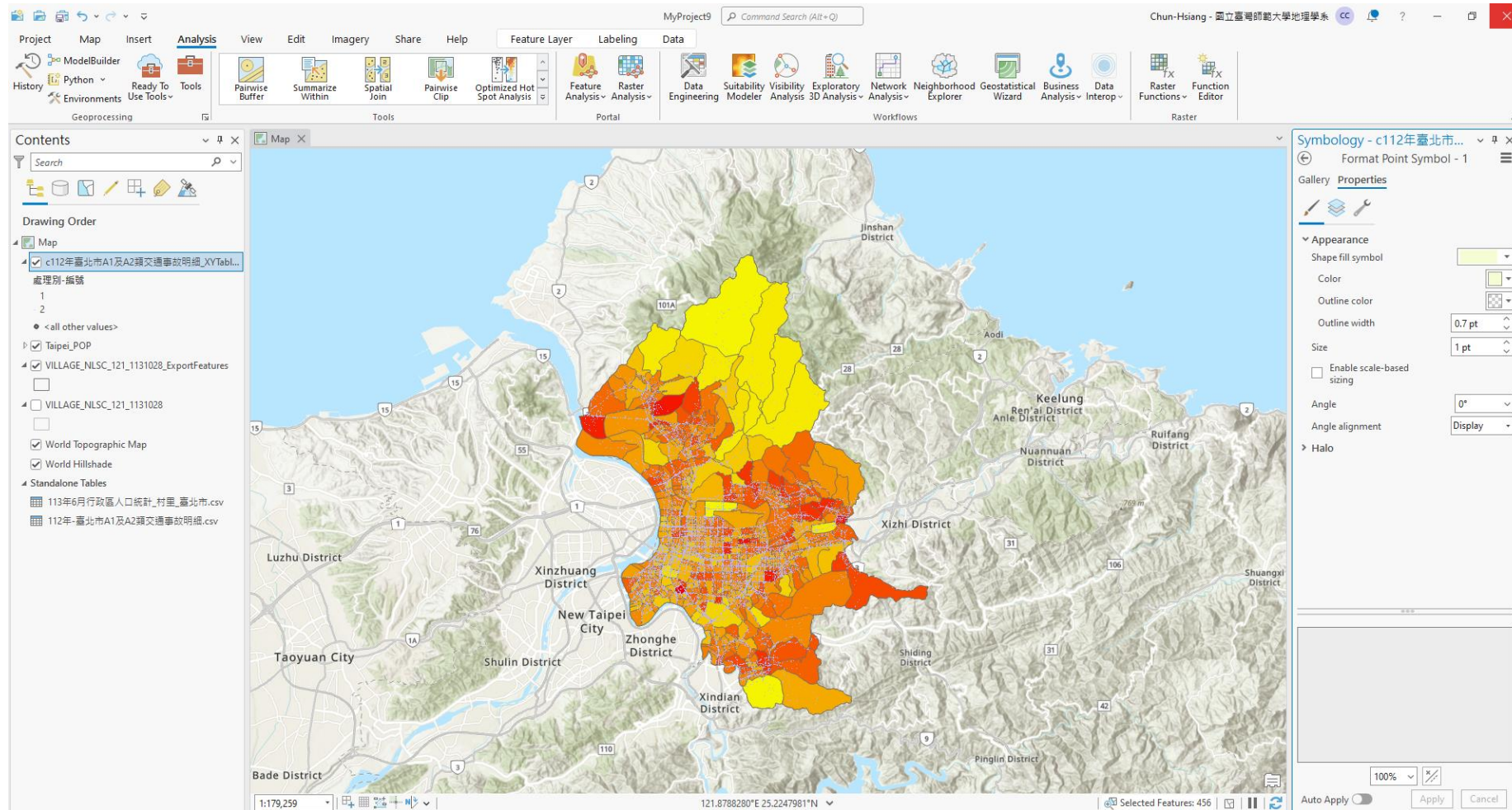
Taipei Population Data



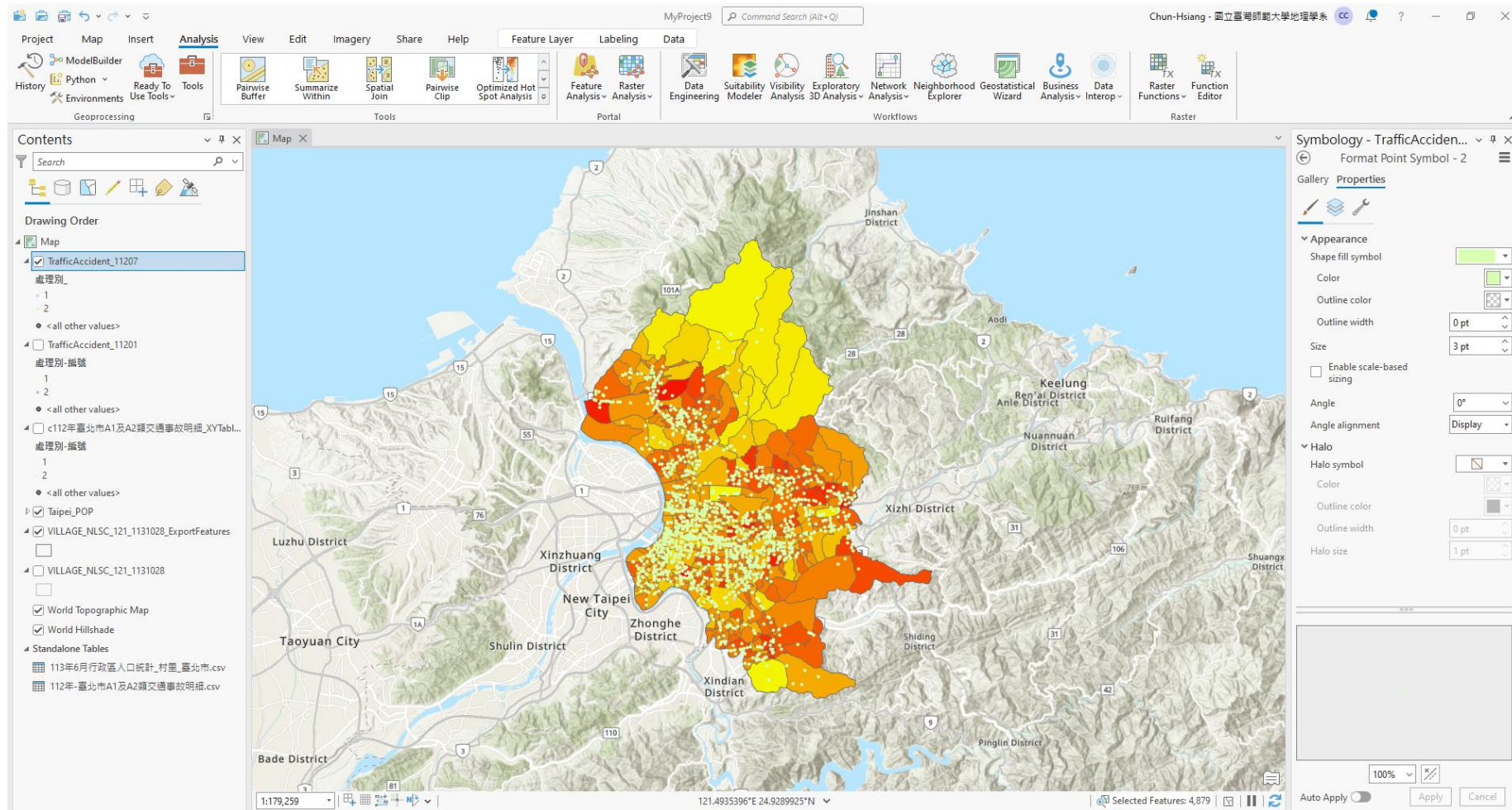
Overlay with Traffic Accident Data



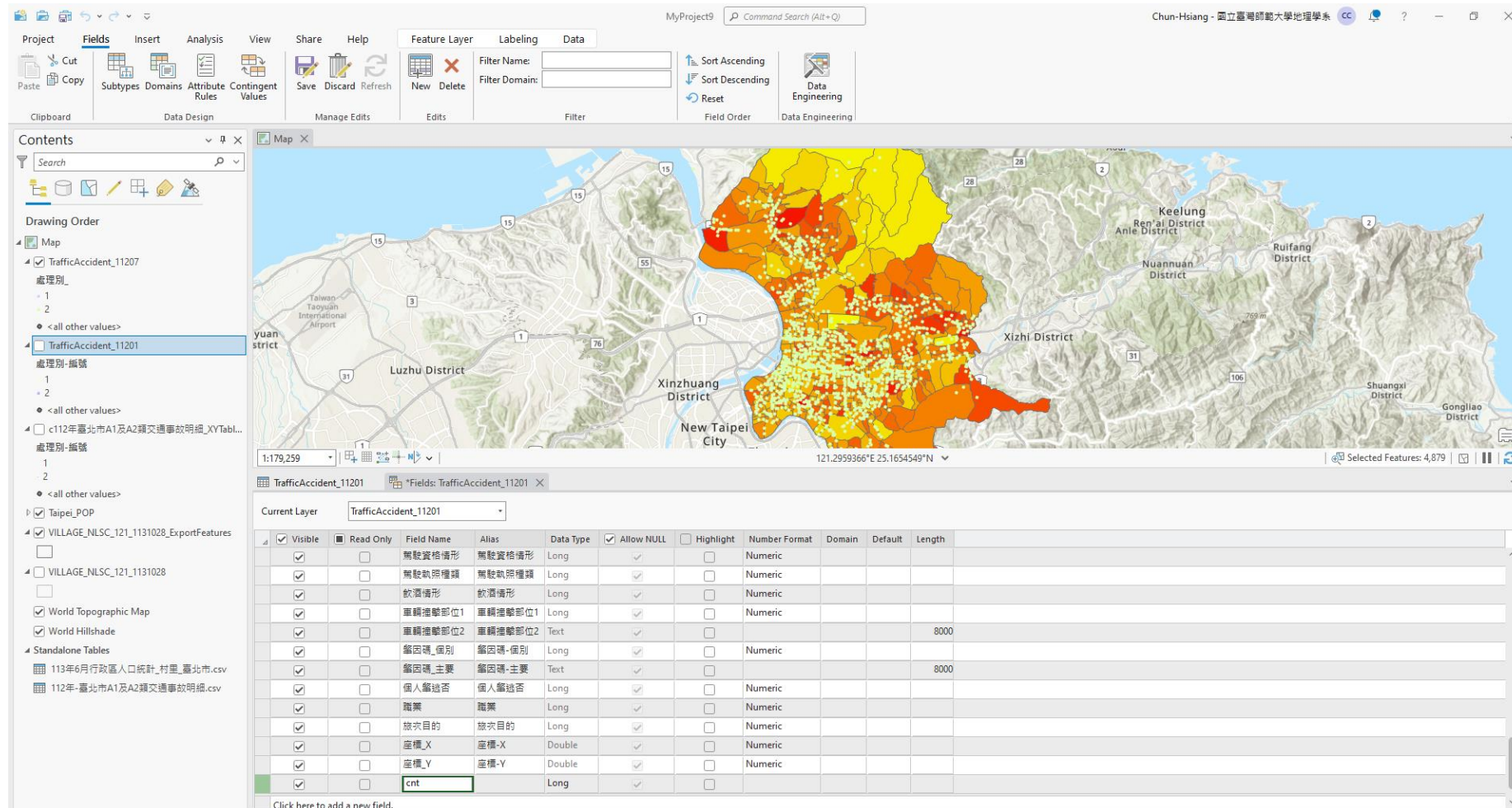
Overlay with Traffic Accident Data



Overlay with Traffic Accident Data



Add a New Field "cnt" to both 11201 & 11207



The screenshot shows the QGIS 3.22.0 interface with the 'TrafficAccident_11201' layer selected in the 'Fields' tab. The 'cnt' field is being added to the layer's attribute table. The map view shows a heatmap of traffic accidents in the New Taipei City area, with a high concentration of accidents in the central urban area.

Contents Panel:

- Map
- TrafficAccident_11207
 - 處理別_編號
 - 1
 - 2
 - <all other values>
- TrafficAccident_11201
 - 處理別_編號
 - 1
 - 2
 - <all other values>
- c112年臺北市A1及A2類交通事故明細_XYTabl...
 - 處理別_編號
 - 1
 - 2
 - <all other values>
- Taipei_POP
- VILLAGE_NLSC_121_1131028_ExportFeatures
- VILLAGE_NLSC_121_1131028
- World Topographic Map
- World Hillshade
- Standalone Tables
 - 113年6月行政區人口統計_村里_臺北市.csv
 - 112年-臺北市A1及A2類交通事故明細.csv

Fields Panel:

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Domain	Default	Length
☒	☐	駕駛資格情形	駕駛資格情形	Long	☒	☐	Numeric			
☒	☐	駕駛執照種類	駕駛執照種類	Long	☒	☐	Numeric			
☒	☐	飲酒情形	飲酒情形	Long	☒	☐	Numeric			
☒	☐	車輛撞擊部位1	車輛撞擊部位1	Long	☒	☐	Numeric			
☒	☐	車輛撞擊部位2	車輛撞擊部位2	Text	☒	☐				8000
☒	☐	肇因碼_個別	肇因碼_個別	Long	☒	☐	Numeric			
☒	☐	肇因碼_主要	肇因碼_主要	Text	☒	☐				8000
☒	☐	個人肇逃否	個人肇逃否	Long	☒	☐	Numeric			
☒	☐	職業	職業	Long	☒	☐	Numeric			
☒	☐	旅次目的	旅次目的	Long	☒	☐	Numeric			
☒	☐	座標_X	座標_X	Double	☒	☐	Numeric			
☒	☐	座標_Y	座標_Y	Double	☒	☐	Numeric			
☒	☐	cnt		Long	☒	☐				

Click here to add a new field.

Fill 1 into “cnt” Field to both 11201 & 11207

The screenshot displays the ArcGIS Desktop interface. The main map area shows a geographic view of New Taipei City with a heatmap overlay. The left pane (Contents) lists the following layers:

- Map
- TrafficAccident_11207
 - 處理別
 - 1
 - 2
 - <all other values>
- TrafficAccident_11201
 - 處理別-編號
 - 1
 - 2
 - <all other values>
- c112年臺北市A1及A2類交通事故明細_XYTabl...
 - 處理別-編號
 - 1
 - 2
 - <all other values>
- Taipei_POP
- VILLAGE_NLSC_121_1131028
- World Topographic Map
- World Hillshade
- Standalone Tables
 - 113年6月行政區人口統計_村里_臺北市.csv
 - 112年-臺北市A1及A2類交通事故明細.csv

The bottom pane shows a data table with the following columns:

Field	Add	Calculate	Selection	Select By Attributes	Zoom To	Switch	Clear	Delete	Copy										
分組2	車禍劃分分組3	事故類型及型態	性別	年齡	受傷程度	主要傷處	保護裝置	行動電話	車輛用途	肇事者行動狀態	駕駛資格情形	駕駛執照種類	飲酒情形	車輛撞擊部位1	車輛撞擊部位2	肇因碼-個別	肇因碼-主要	cnt	
1	5	2	9	1	34	2	9	1	7	9	1	10	2	14	<Null>	23	<Null>	<Null>	
2	5	2	9	1	24	3	10	4	5	8	16	8	20	10	16	<Null>	60	<Null>	<Null>
3	5	2	12	1	48	3	10	1	1	7	7	1	8	1	2	<Null>	7	<Null>	<Null>
4	5	2	12	1	22	2	7	1	1	7	7	1	10	1	14	<Null>	7	<Null>	<Null>
5	5	2	12	2	22	2	8	4	5	7	21	8	20	10	15	<Null>	67	<Null>	<Null>
6	4	2	17	2	27	2	9	3	4	7	9	1	10	2	12	<Null>	42	<Null>	<Null>
7	4	2	17	1	63	4	11	3	4	7	10	7	19	11	15	<Null>	7	<Null>	<Null>
8	5	2	11	1	22	2	9	1	1	7	9	1	10	2	11	<Null>	44	<Null>	<Null>
9	5	2	11	1	64	3	10	1	1	7	5	1	4	2	6	<Null>	25	<Null>	<Null>
10	5	1	12	1	52	3	10	1	1	7	6	1	4	2	5	<Null>	6	<Null>	<Null>
11	5	1	12	2	56	2	9	1	1	7	9	8	20	2	16	<Null>	44	<Null>	<Null>
12	5	2	12	1	33	2	9	1	1	7	9	1	10	2	12	<Null>	44	<Null>	<Null>
13	5	2	12	1	49	3	10	1	1	7	5	1	8	2	4	<Null>	44	<Null>	<Null>

A context menu is open over the 'cnt' field, showing the following options:

- Sort Ascending
- Sort Descending
- Custom Sort (Ctrl+Shift+S)
- Fields
- Hide Field
- Freeze/Unfreeze Field
- Calculate Field
- Calculate Geometry
- Explore Statistics
- Visualize Statistics
- Summarize
- Delete

The 'Calculate Field' option is highlighted, and a tooltip is visible: "Set the values of this field by specifying a calculation expression. If any of the rows in the table are currently selected, only the values of the selected rows will be calculated."

Fill 1 into “cnt” Field to both 11201 & 11207

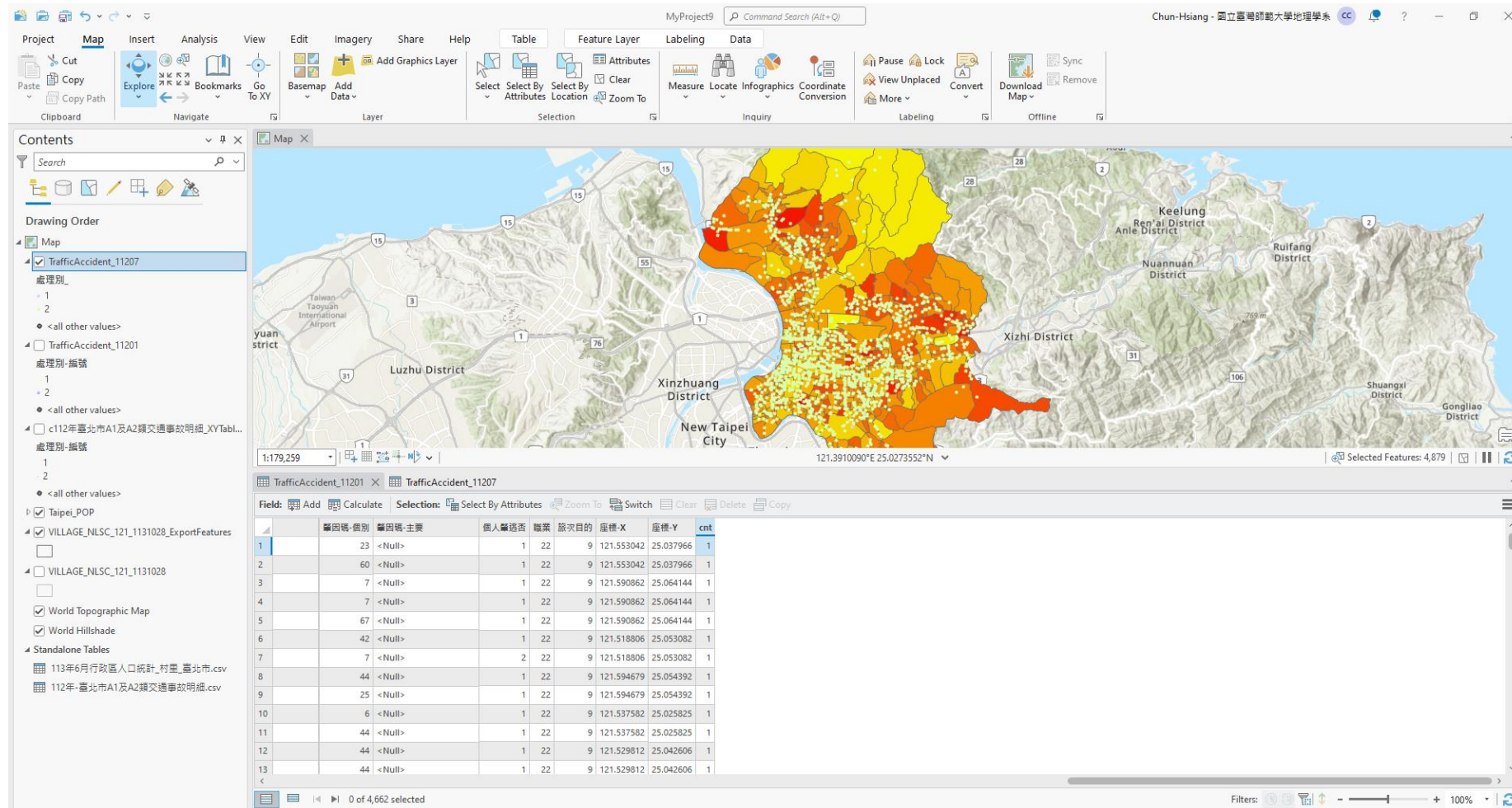
The screenshot displays the QGIS desktop environment. The 'Calculate Field' dialog box is open, showing the following configuration:

- Input Table:** TrafficAccident_11201
- Field Name (Existing or New):** cnt
- Expression Type:** Python
- Expression:** 1

The background map shows a topographic view of Keelung and surrounding districts (Ren'ai, Nuannuan, Ruifang, Xizhi, Shuangxi, Gongliao). A data table is visible at the bottom right, showing attributes for traffic accidents, including location, date, and count (cnt).

車禍地點部位1	車禍地點部位2	肇因碼:個別	肇因碼:主要	個人肇因否	職業	旅次目的	座標-X	座標-Y	cnt
14	<Null>	23	<Null>	1	22	9	121.553042	25.037966	<Null>
16	<Null>	60	<Null>	1	22	9	121.553042	25.037966	<Null>
2	<Null>	7	<Null>	1	22	9	121.590862	25.064144	<Null>
14	<Null>	7	<Null>	1	22	9	121.590862	25.064144	<Null>
15	<Null>	67	<Null>	1	22	9	121.590862	25.064144	<Null>
12	<Null>	42	<Null>	1	22	9	121.518806	25.053082	<Null>
15	<Null>	7	<Null>	2	22	9	121.518806	25.053082	<Null>
11	<Null>	44	<Null>	1	22	9	121.594679	25.054392	<Null>
6	<Null>	25	<Null>	1	22	9	121.594679	25.054392	<Null>
5	<Null>	6	<Null>	1	22	9	121.537582	25.025825	<Null>
16	<Null>	44	<Null>	1	22	9	121.537582	25.025825	<Null>
12	<Null>	44	<Null>	1	22	9	121.529812	25.042606	<Null>
4	<Null>	44	<Null>	1	22	9	121.529812	25.042606	<Null>

Fill 1 into “cnt” Field to both 11201 & 11207

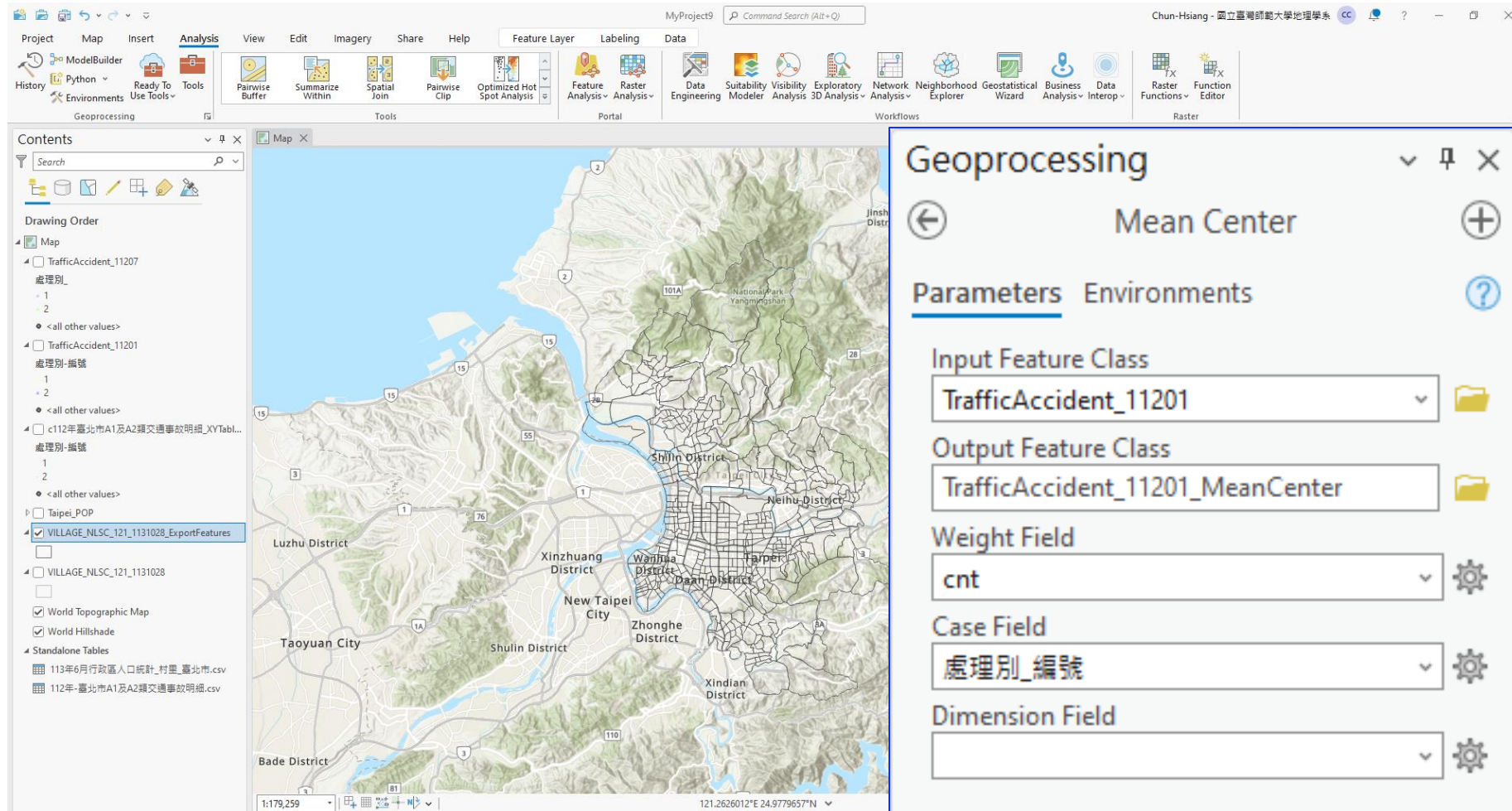


Central Tendency Analysis

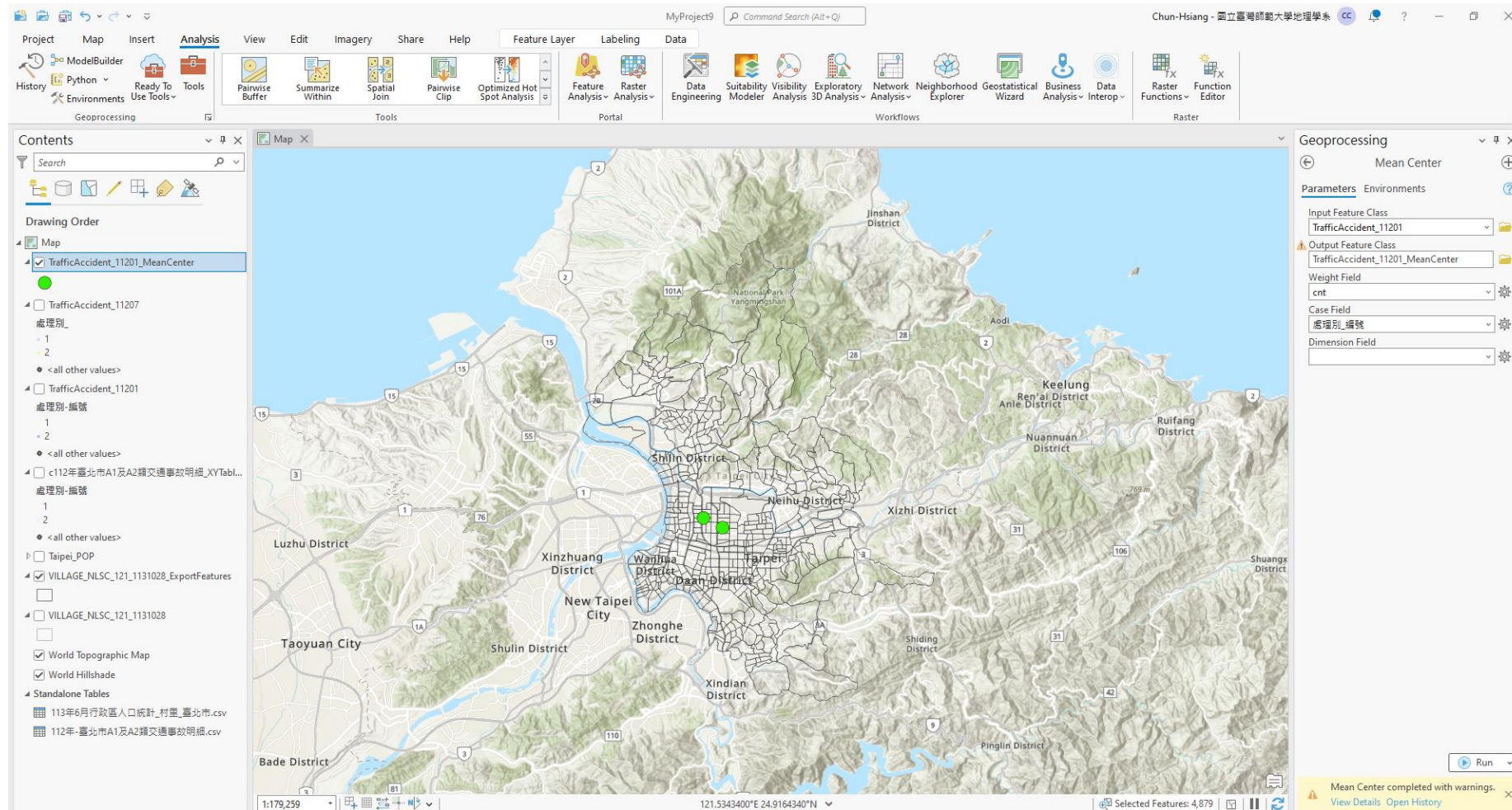
Compute the following functions with both TrafficAccident_11201 and TrafficAccident_11207

- 1) Mean Center
- 2) Median Center
- 3) Standard Distance
- 4) Central Feature
- 5) Directional Distribution

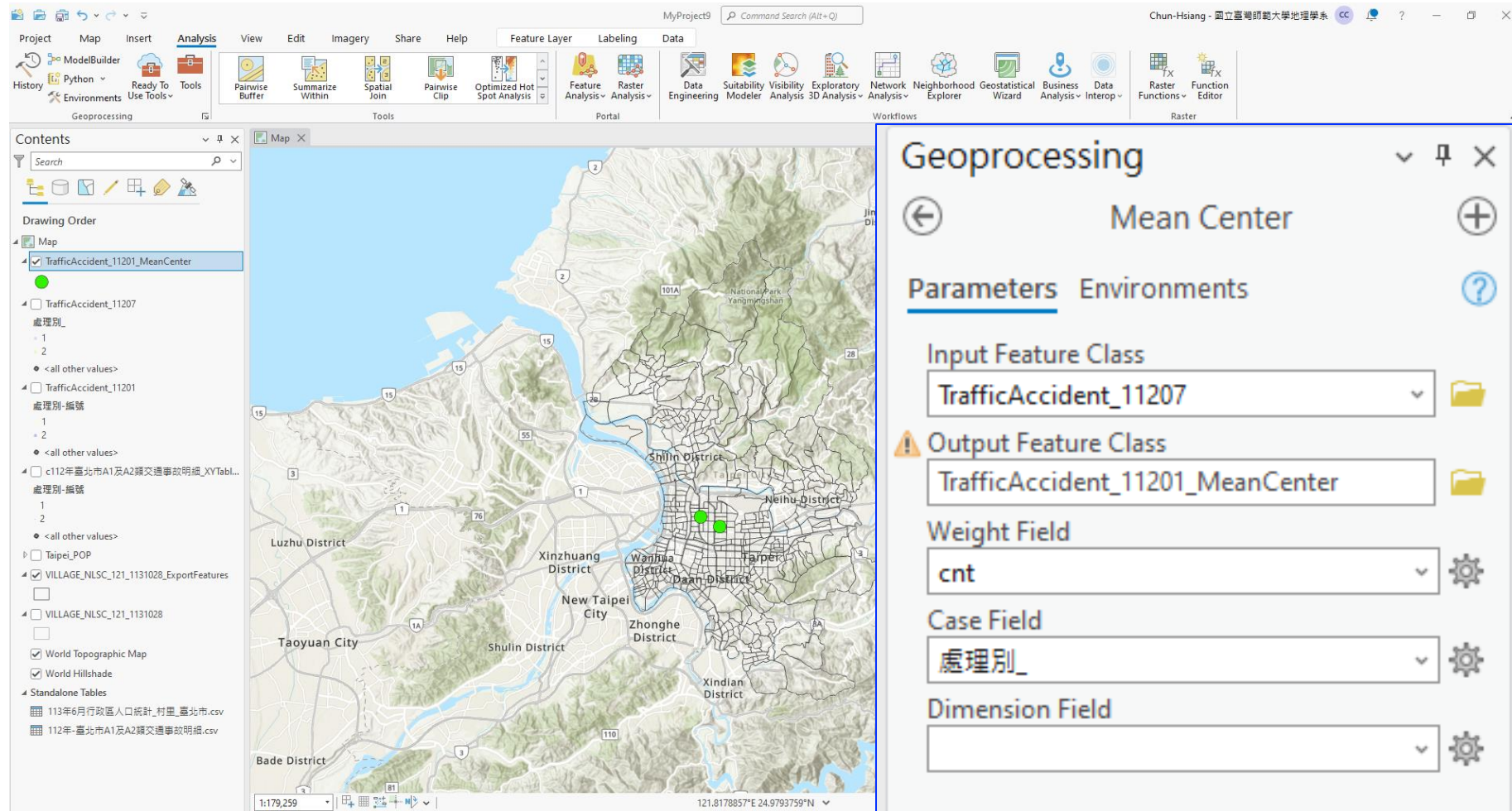
Mean Center



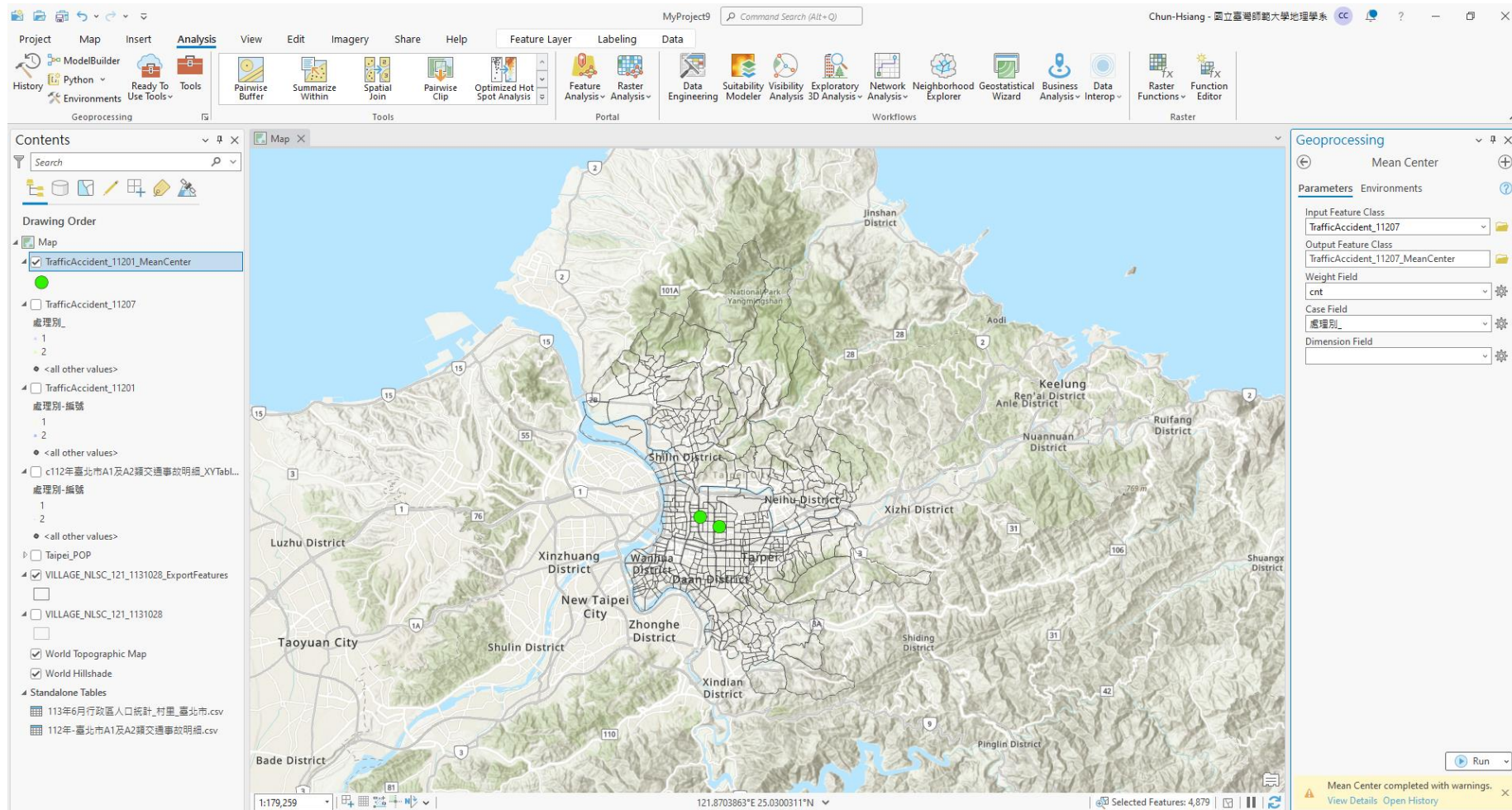
Mean Center



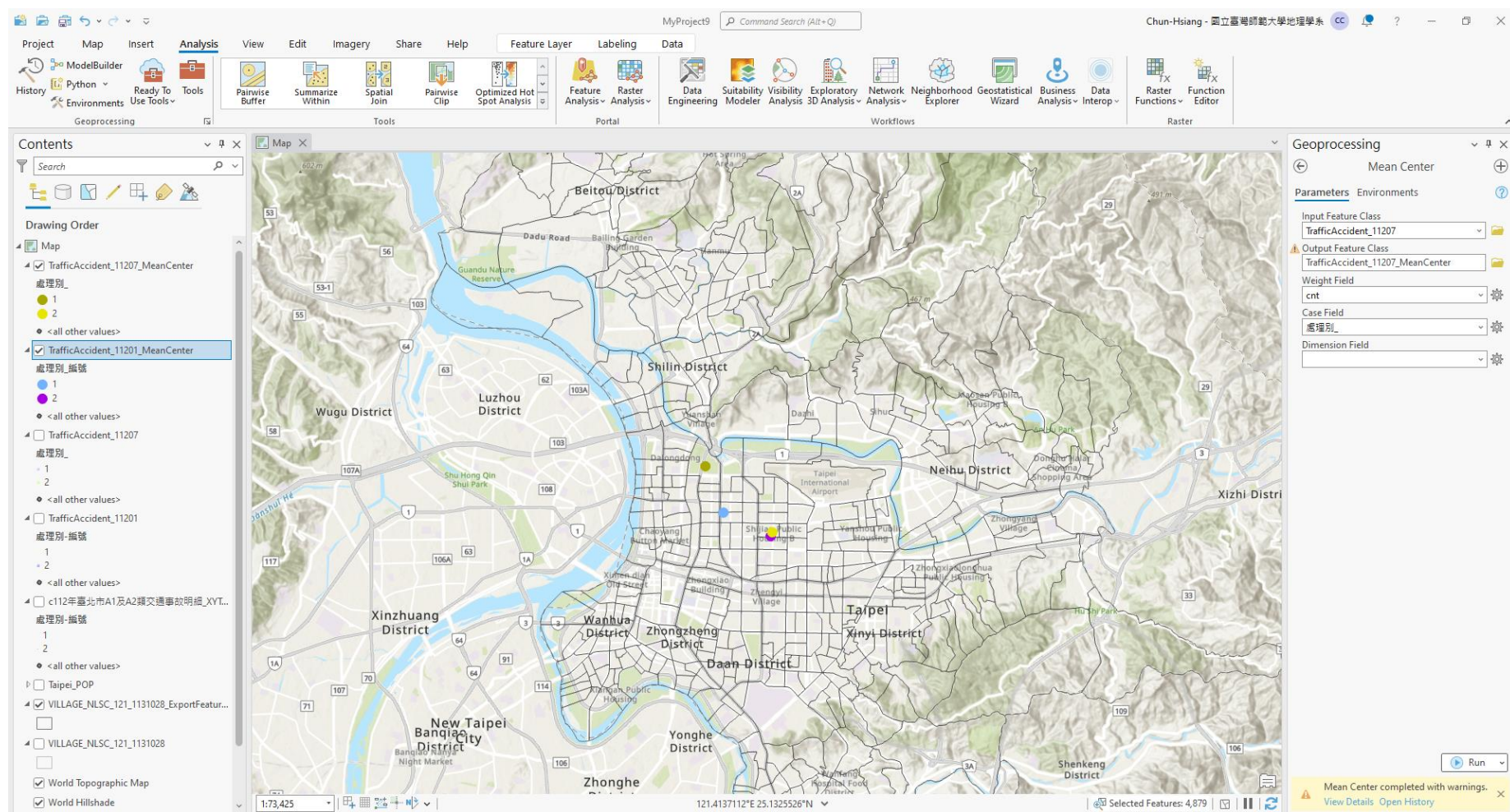
Mean Center



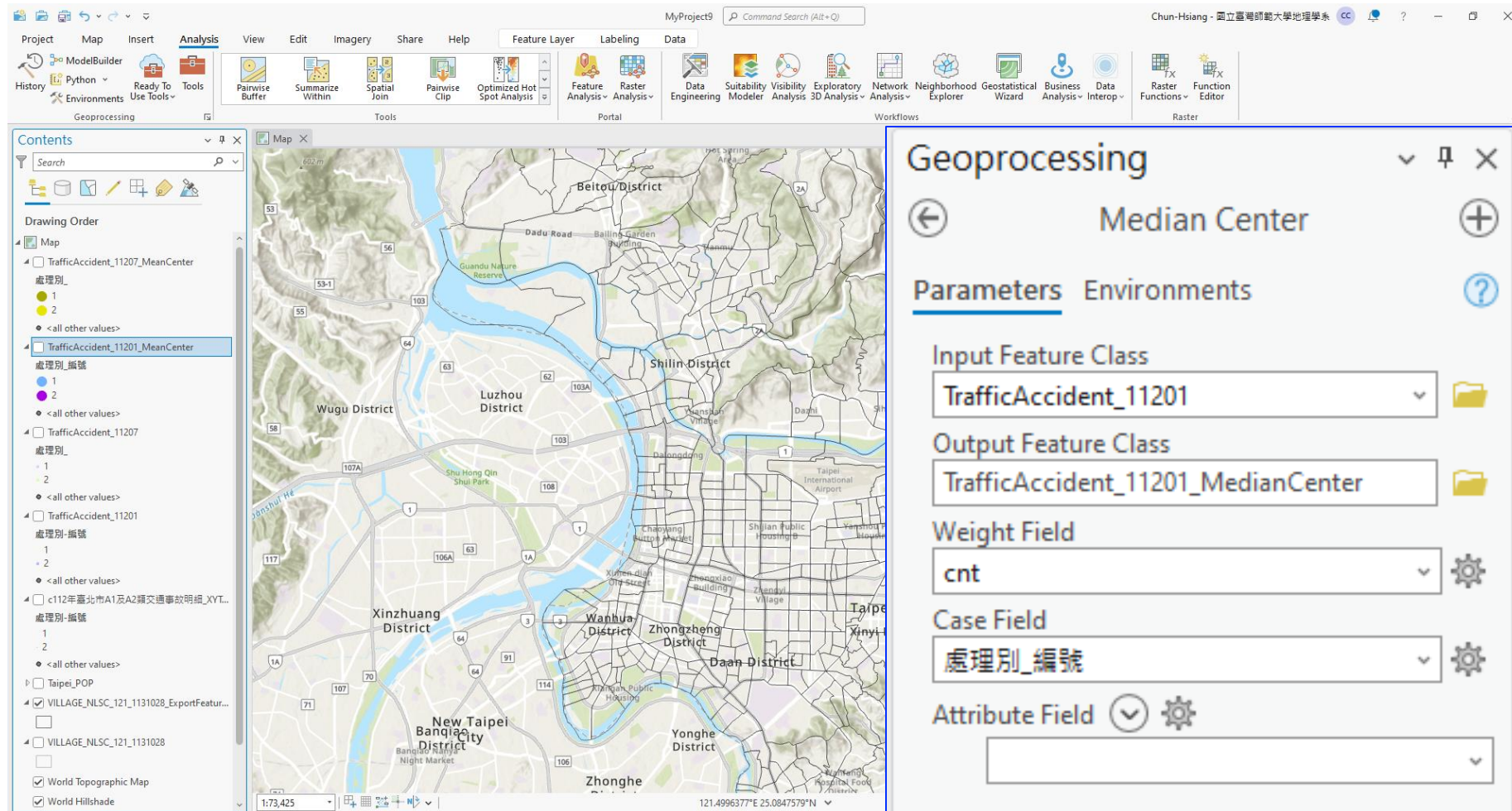
Mean Center



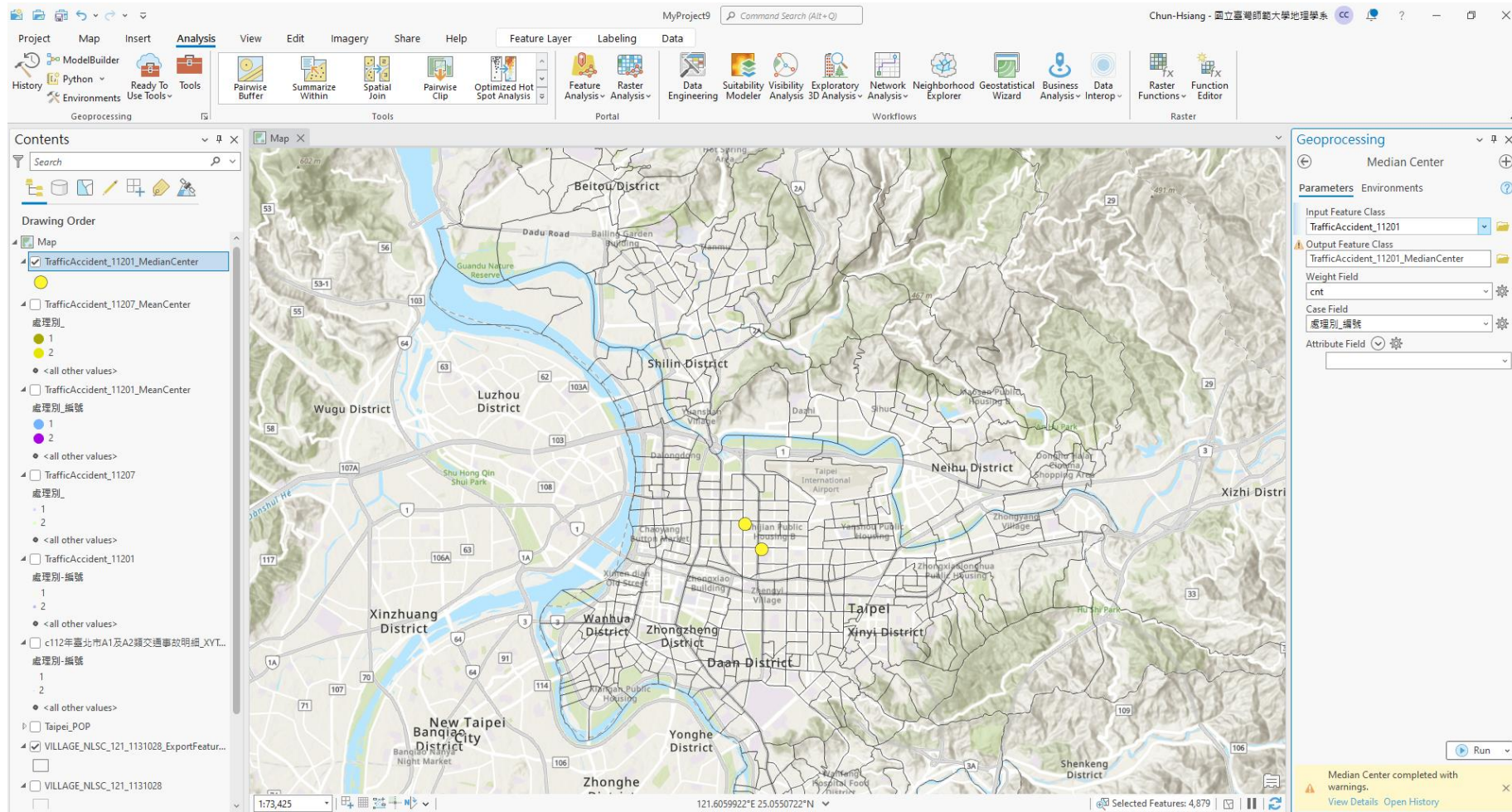
Mean Center :: Symbology



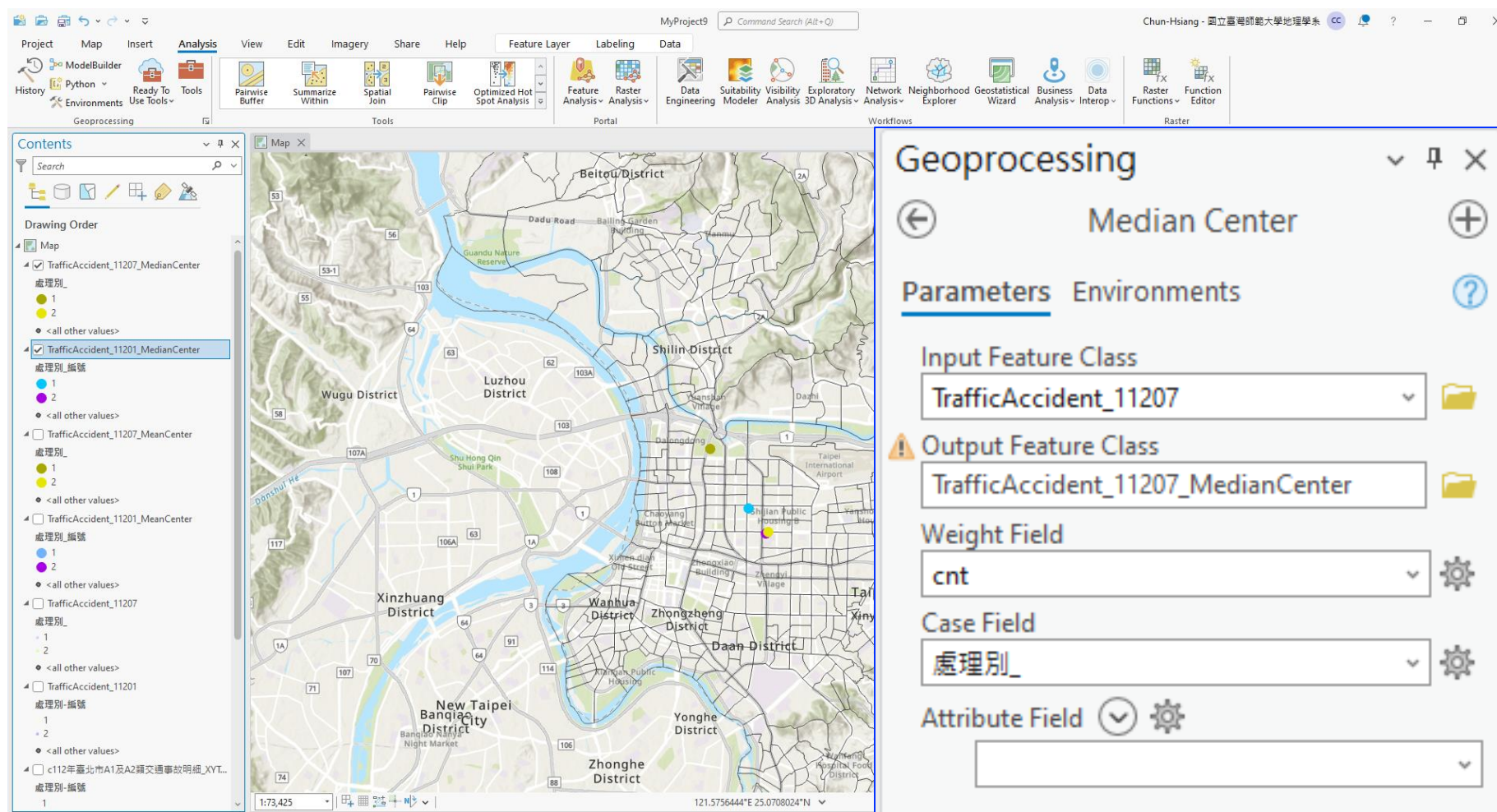
Median Center



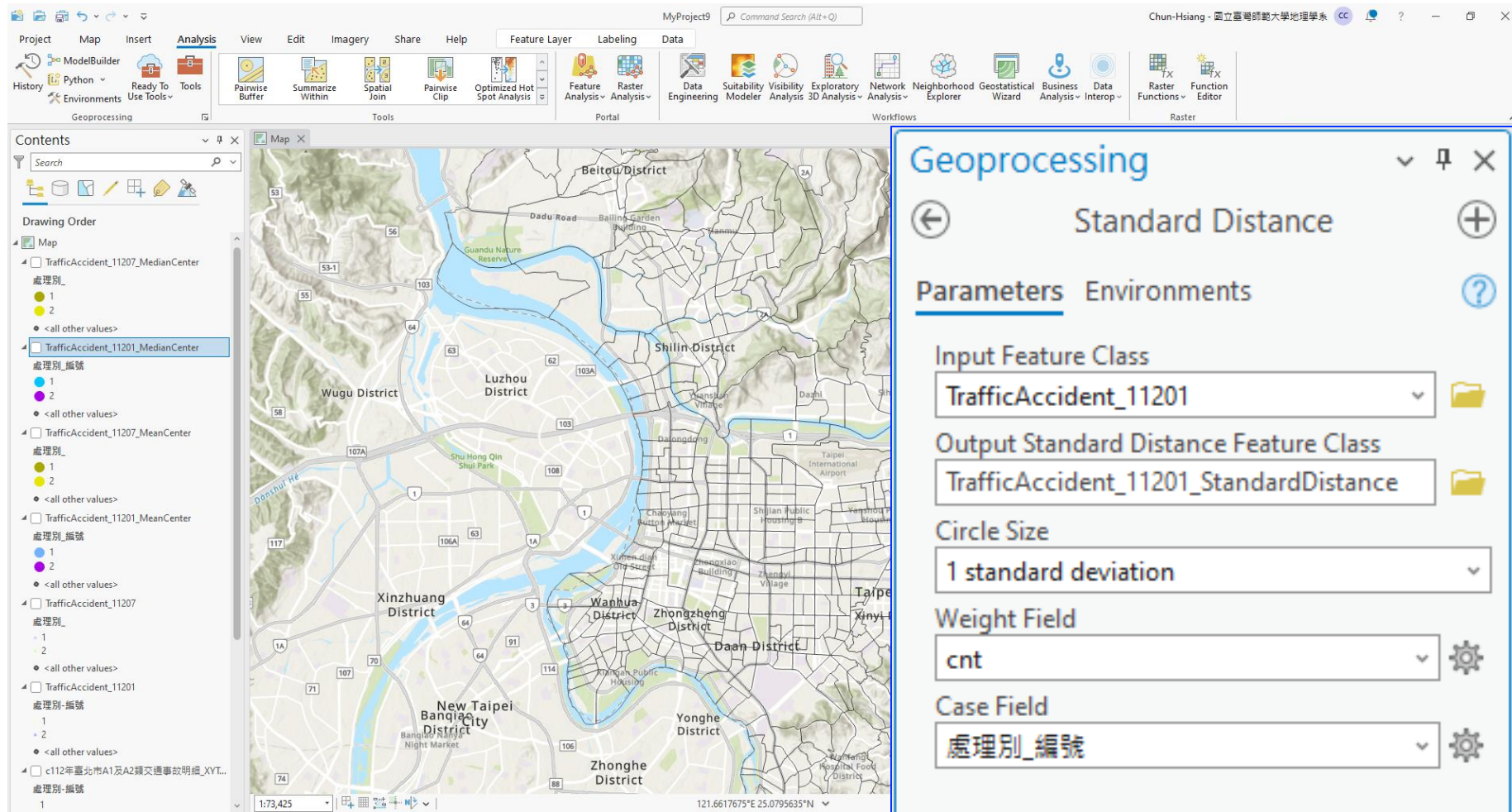
Median Center



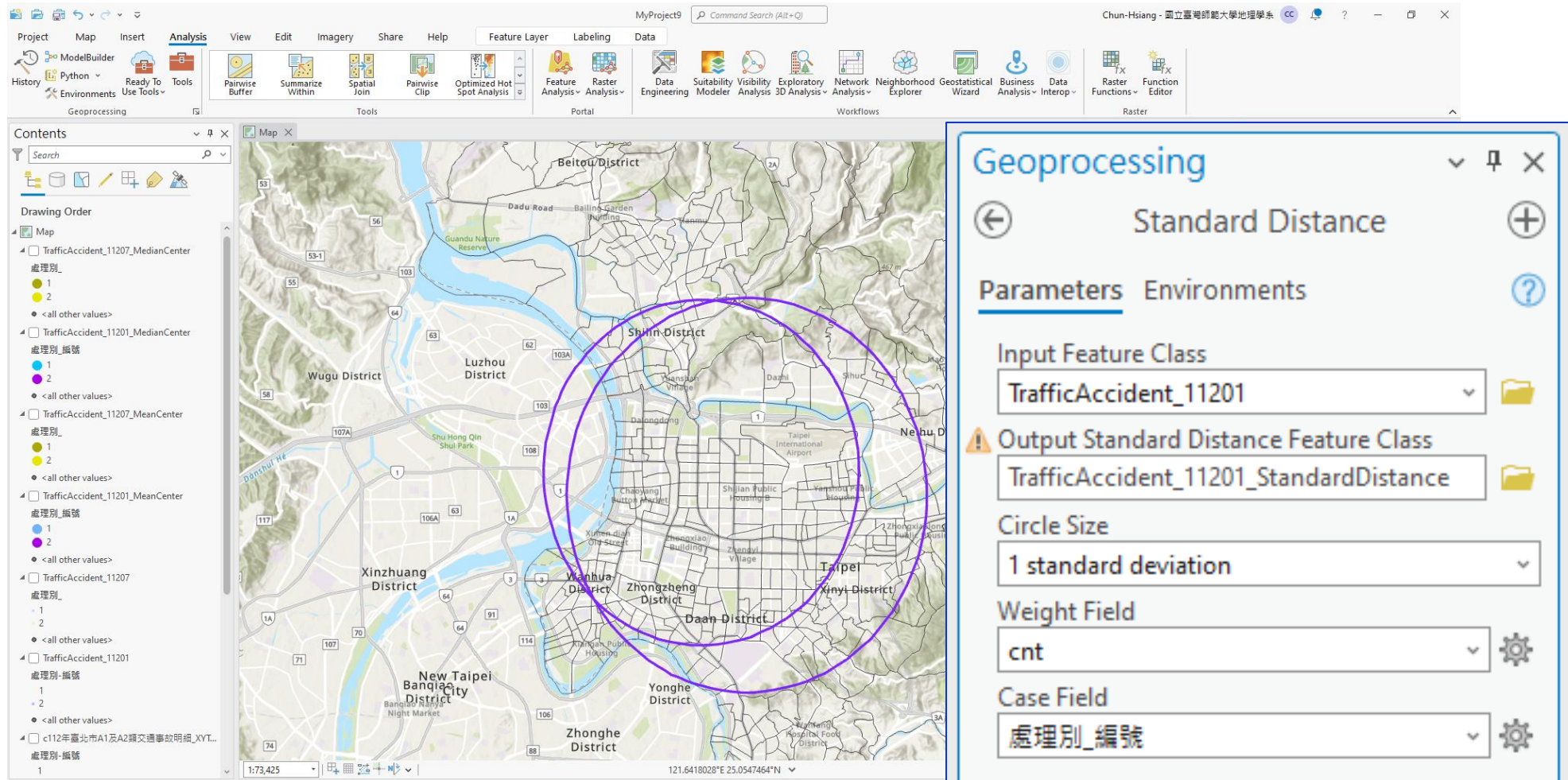
Median Center :: Symbology



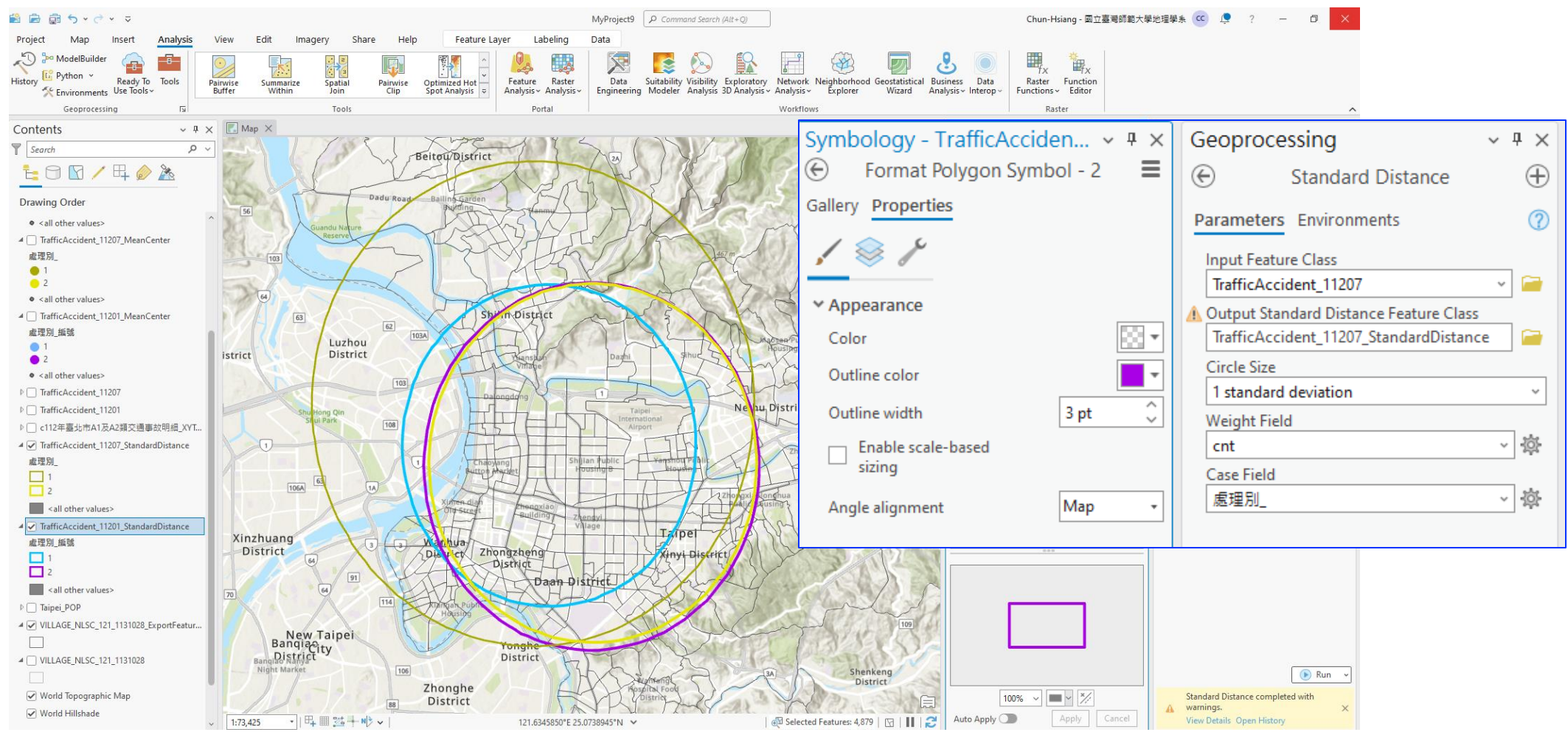
Standard Distance



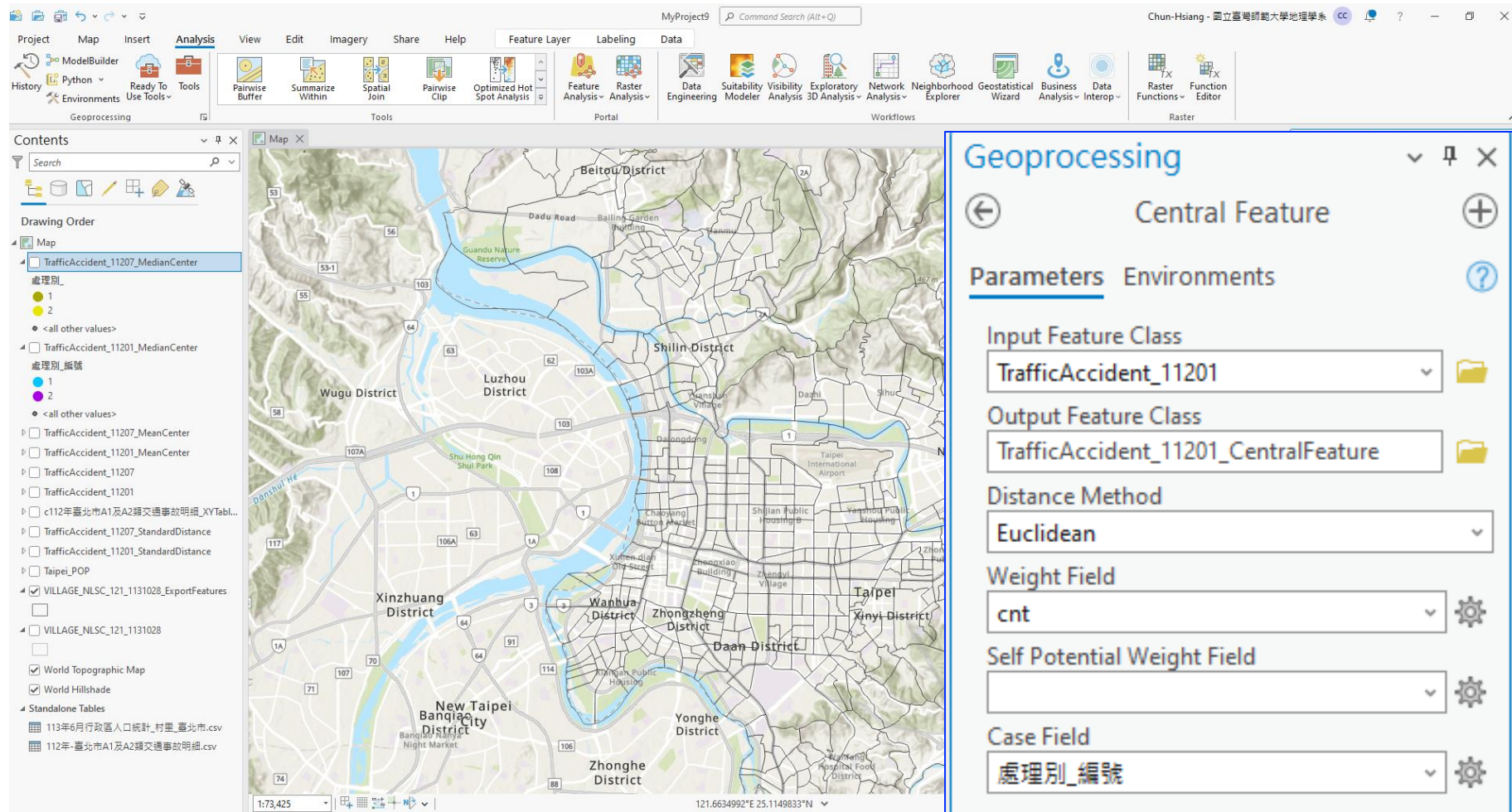
Standard Distance



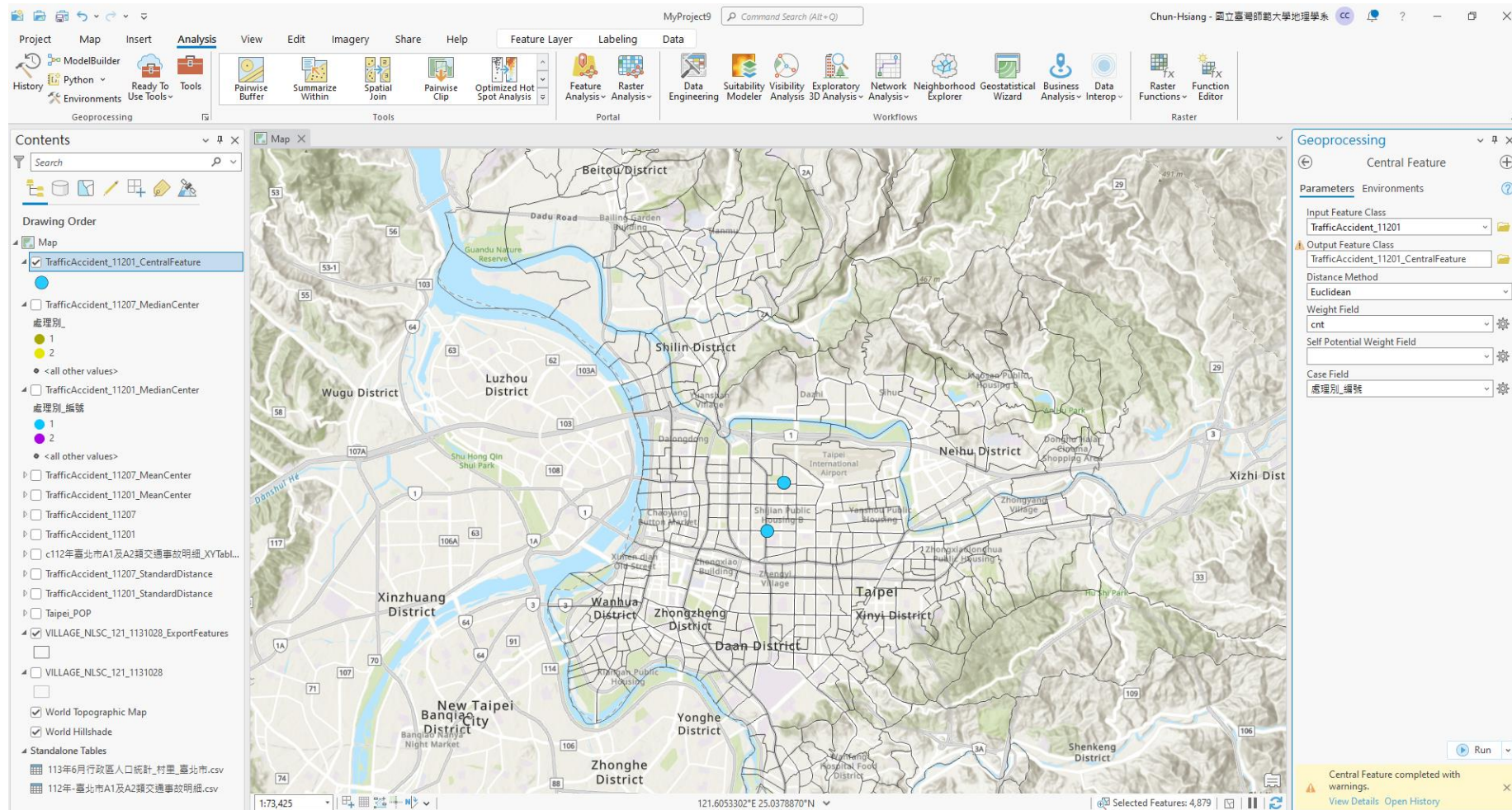
Standard Distance :: Symbology



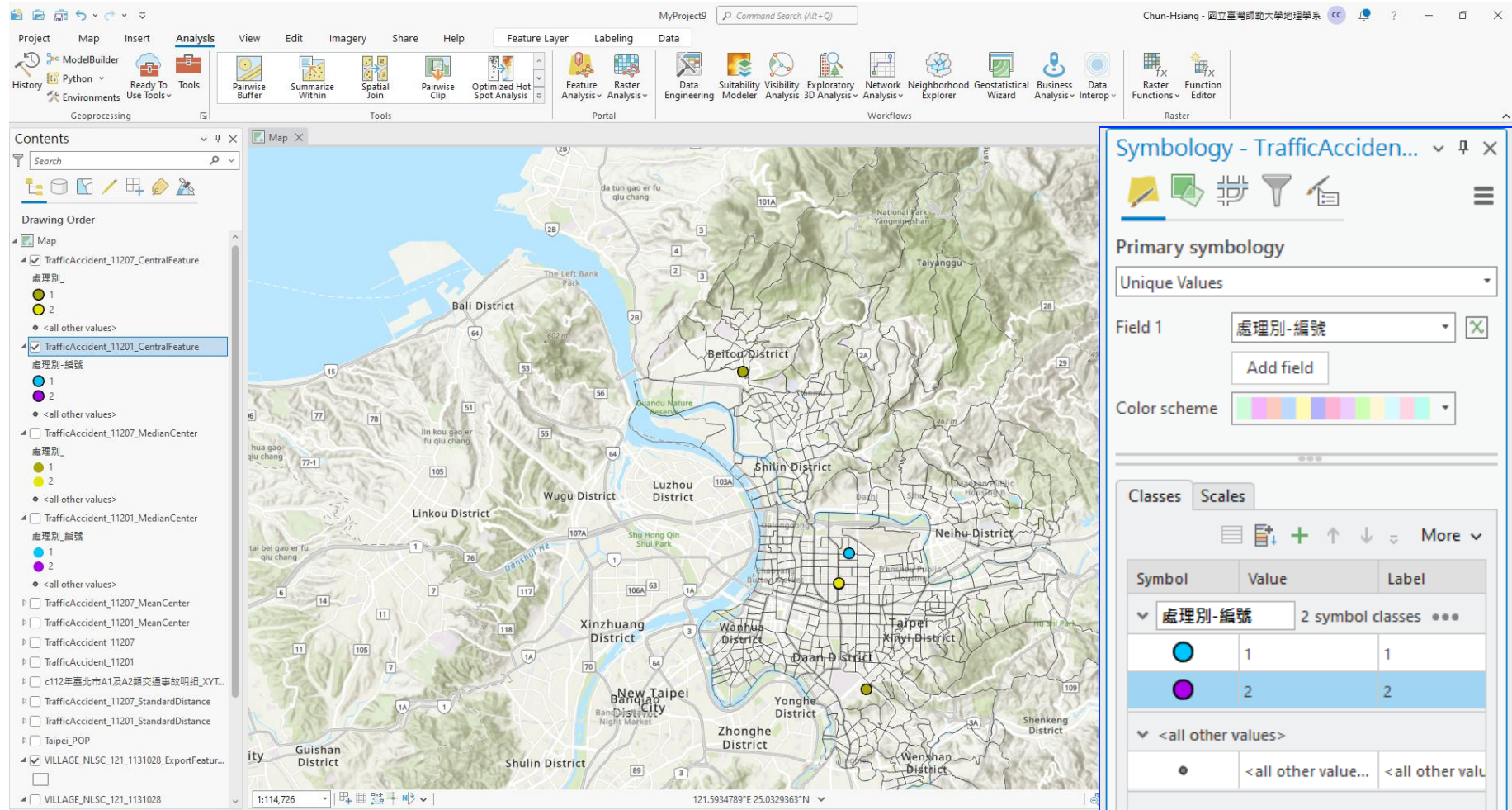
Central Feature



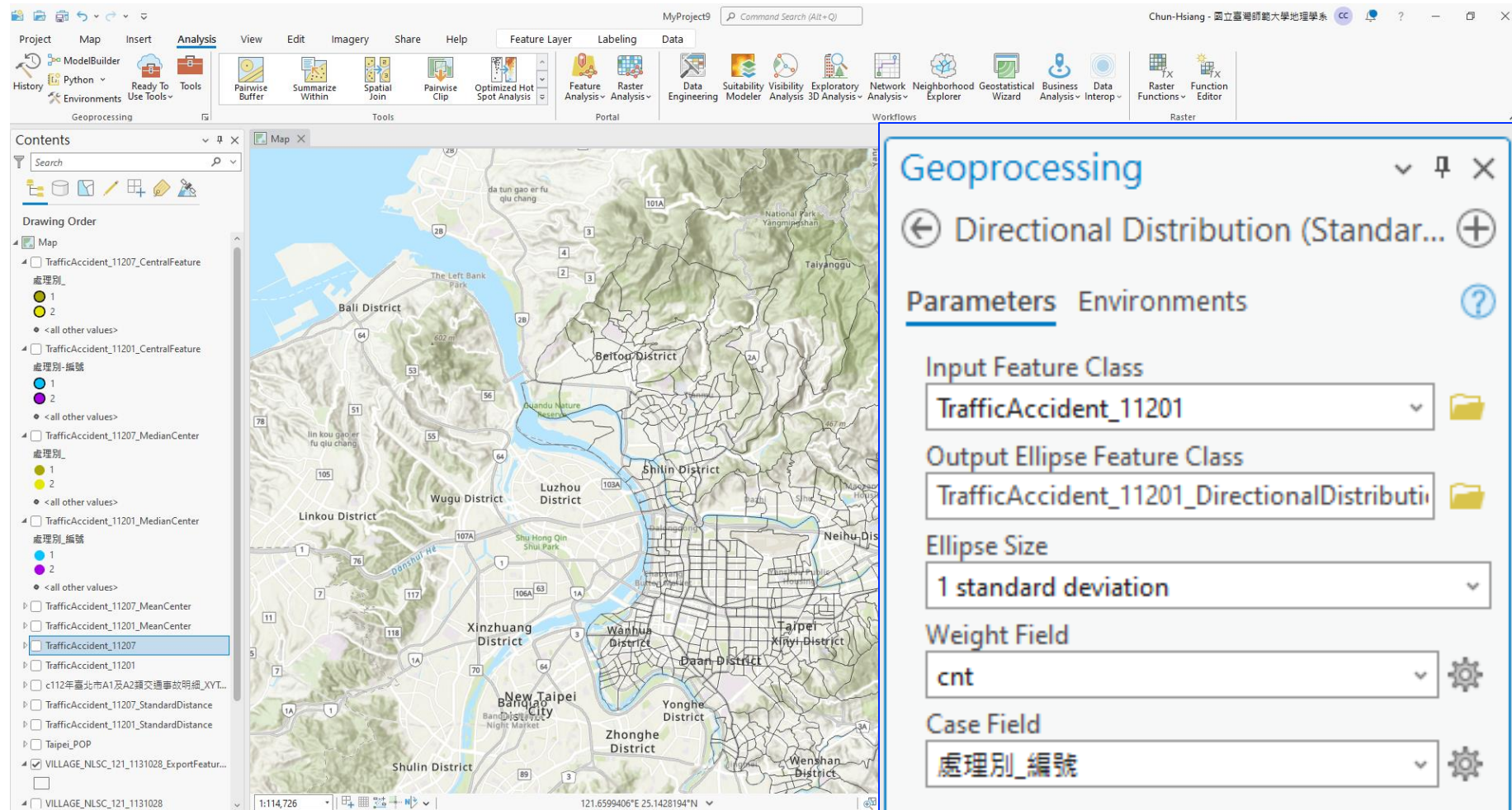
Central Feature



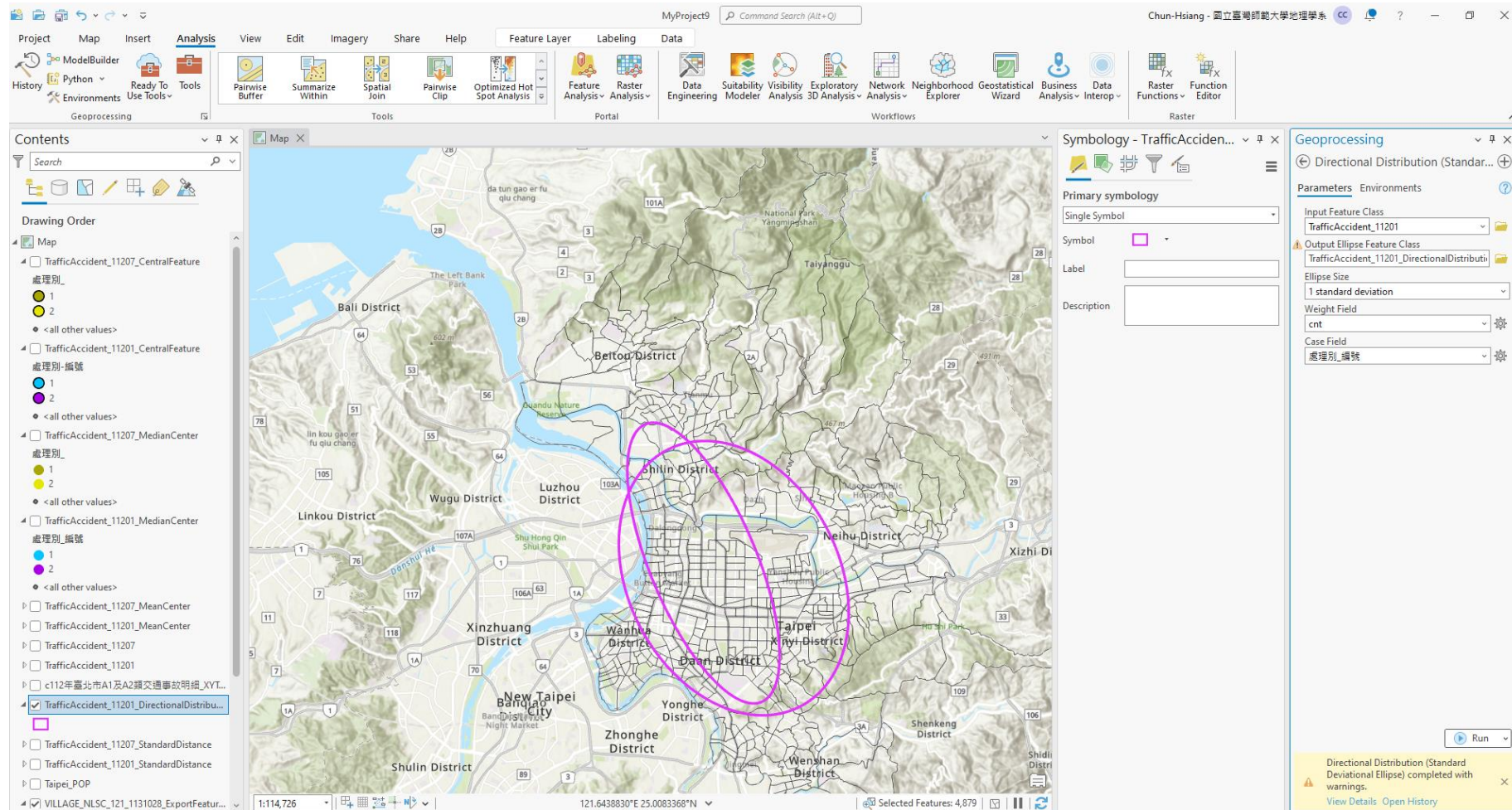
Central Feature :: Symbology



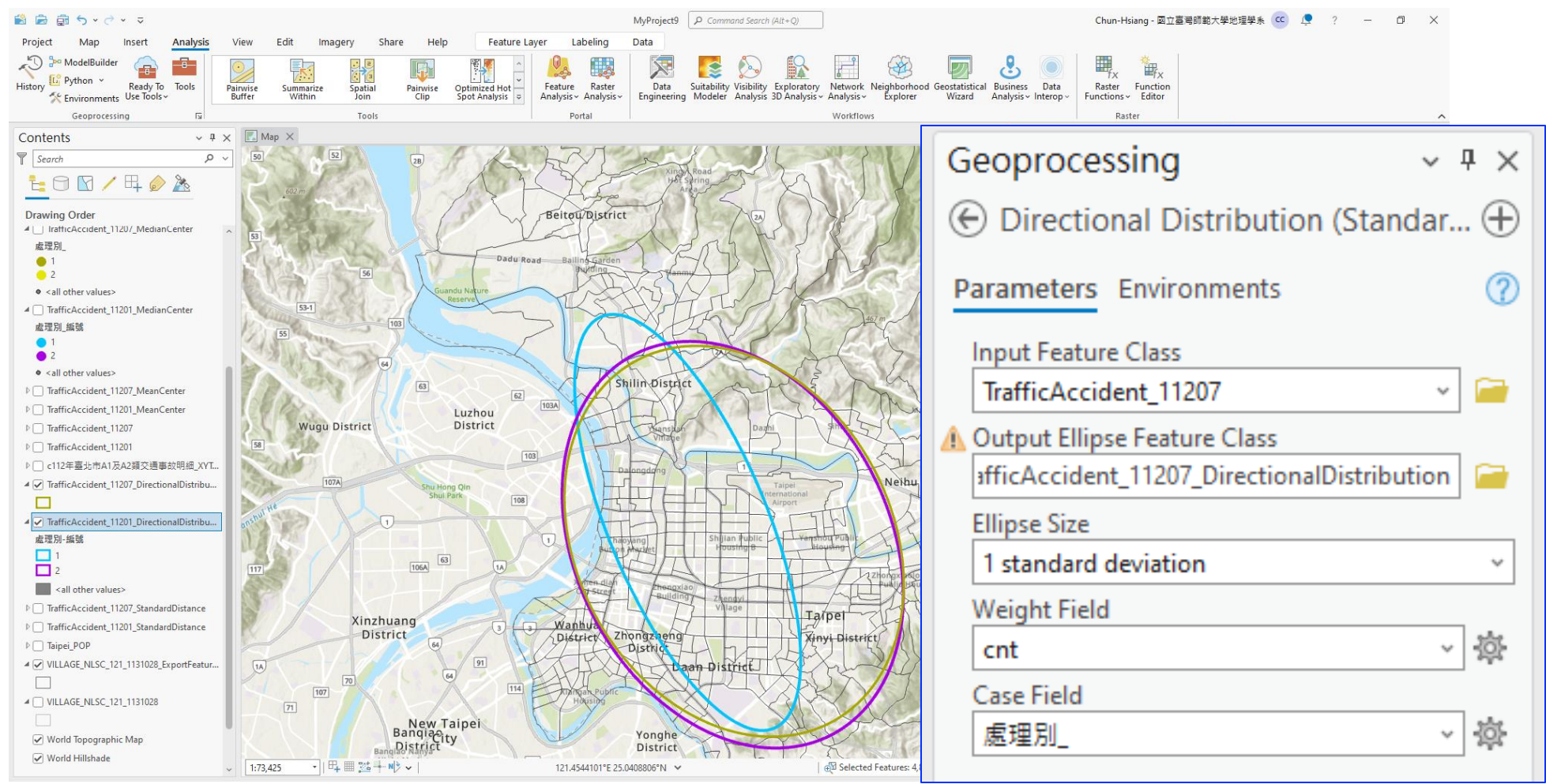
Directional Distribution



Directional Distribution



Directional Distribution :: Symbology



Spatial Statistics Analysis

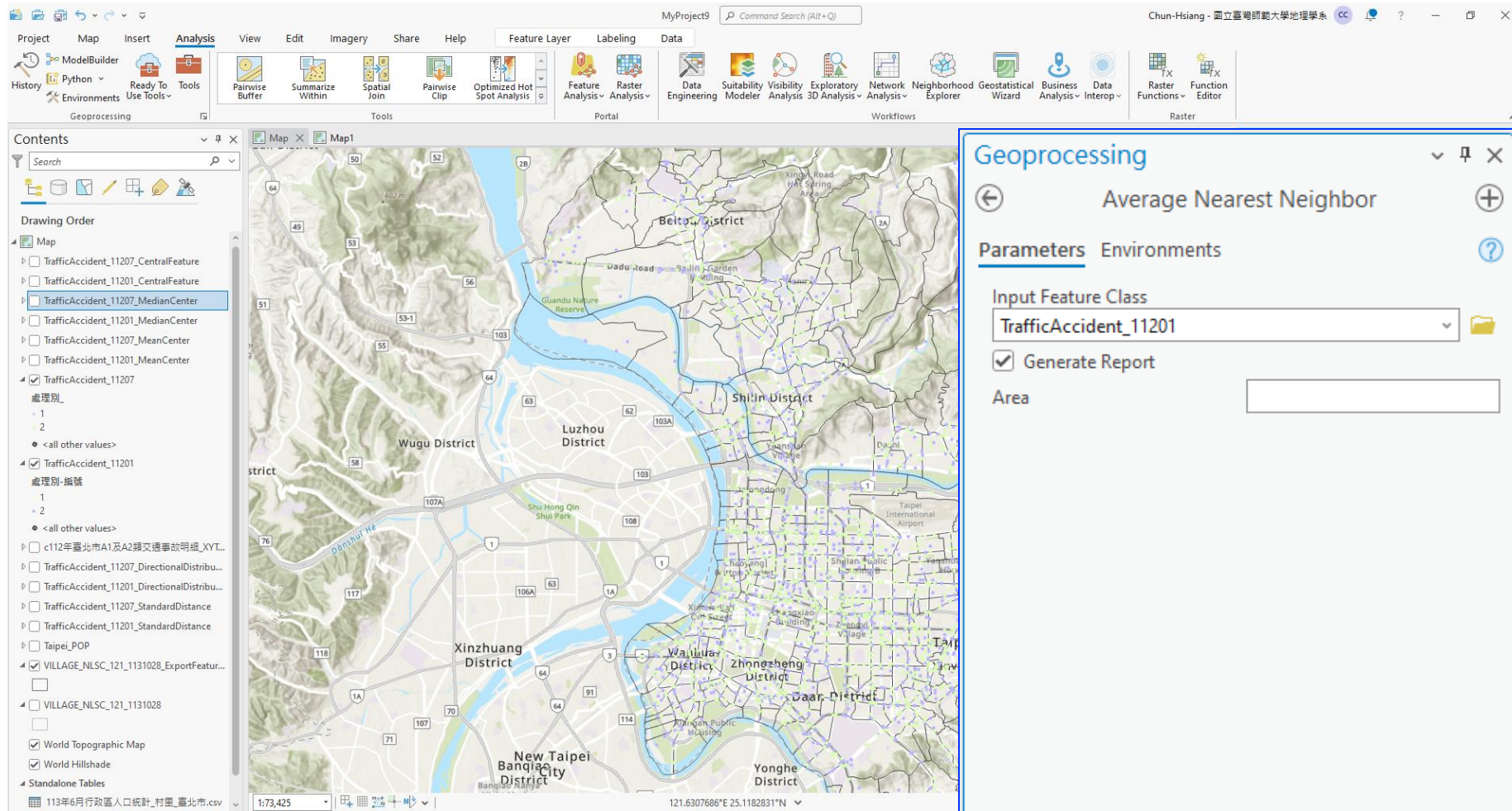
Compute the following function with both TrafficAccident_11201 and TrafficAccident_11207

- 1) Average Nearest Neighbor

Compute the following functions with the population data from Taipei POP data.

- 1) Incremental Spatial Autocorrelation
- 2) High/Low Clustering (Getis-Ord General G)
- 3) Repley's k -function
- 4) Spatial Autocorrelation (Global Moran's I)

Average Nearest Neighbor



Average Nearest Neighbor

Project

Map

Insert

Analysis

View

Edit

Imagery

Share

Help

Feature Layer

ModelBuilder

Python

Ready To Use Tools

Environments

Geoprocessing

Tools

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Summarize Within

Spatial Join

Pairwise Clip

Optimized Hot Spot Analysis

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TrafficAccident_11207_CentralFeature

TrafficAccident_11201_CentralFeature

TrafficAccident_11207_MedianCenter

TrafficAccident_11201_MedianCenter

TrafficAccident_11207_MeanCenter

TrafficAccident_11201_MeanCenter

TrafficAccident_11207

處理別

1

2

< all other values >

TrafficAccident_11201

處理別-編號

1

2

< all other values >

TrafficAccident_11207_DirectionalDistribu...

TrafficAccident_11201_DirectionalDistribu...

TrafficAccident_11207_StandardDistance

TrafficAccident_11201_StandardDistance

Taipei_POP

VILLAGE_NLSC_121_1131028_ExportFeatur...

VILLAGE_NLSC_121_1131028

World Topographic Map

World Hillshade

Standalone Tables

113年6月行政區人口統計_村里_臺北市.csv

Map

Map1

Map

Wugu District

Xinzhuang District

New Taipei District

1:73,425

Average Nearest Neighbor

(Spatial Statistics Tools)

Started: Today at 上午 04:08:11

Completed: Today at 上午 04:08:12

Elapsed Time: 1 Second

WARNING 001605: Distances for Geographic Coordinates (degrees, minutes, seconds) are analyzed using Chordal Distances in meters.

Parameters

Environments

Messages (4)

Start Time: 2024年11月13日 上午 04:08:11

WARNING 001605: Distances for Geographic Coordinates (degrees, minutes, seconds) are analyzed using Chordal Distances in meters.

Average Nearest Neighbor Summary

Observed Mean Distance	0.000000
Expected Mean Distance	134.911242
Nearest Neighbor Ratio	0.000000
z-score	-130.622207
p-value	0.000000

Distance measured in meters

Writing html report...

D:\Toodou\GIS\W08\MyProject9\NearestNeighbor_Result_53124_20400

Succeeded at 2024年11月13日 上午 04:08:12 (Elapsed Time: 1.79 seconds)

Chun-Hsiang - 國立臺灣師範大學地理學系

business analysis

Data Interop

Raster Functions

Function Editor

Geoprocessing

Average Nearest Neighbor

Parameters

Environments

Input Feature Class

TrafficAccident_11201

Generate Report

Area

Run

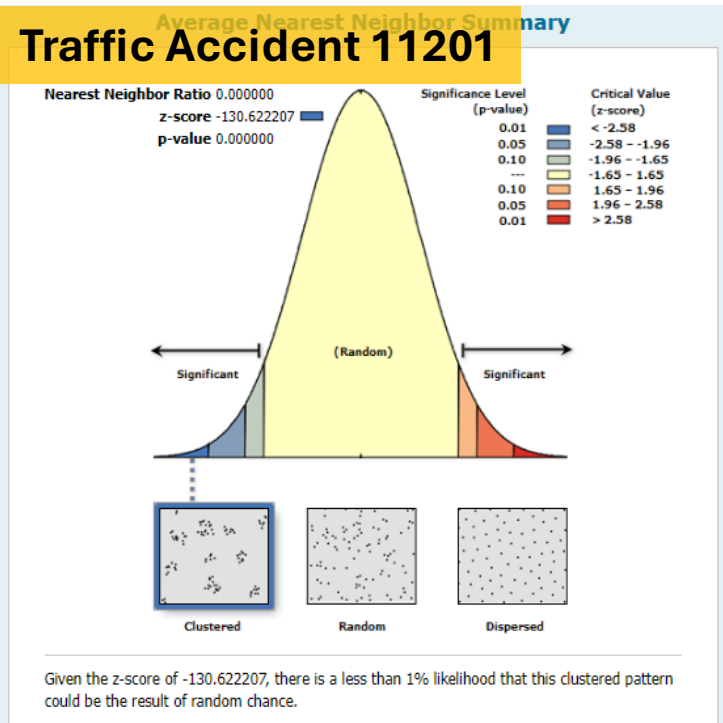
Average Nearest Neighbor completed with warnings.

View Details

Open History

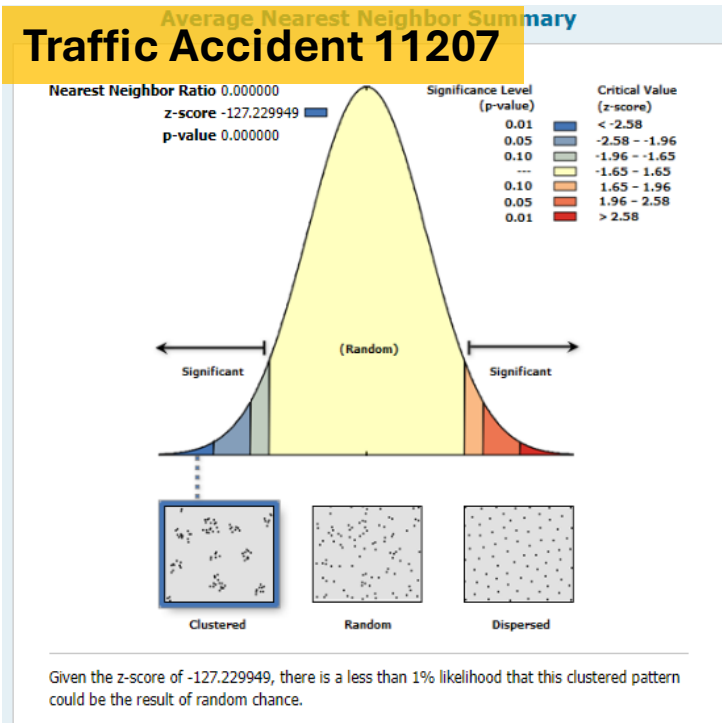
Selected Features: 4,879

Average Nearest Neighbor



Average Nearest Neighbor Summary	
Observed Mean Distance	0.0000 meters
Expected Mean Distance	134.9112 meters
Nearest Neighbor Ratio	0.000000
z-score	-130.622207
p-value	0.000000

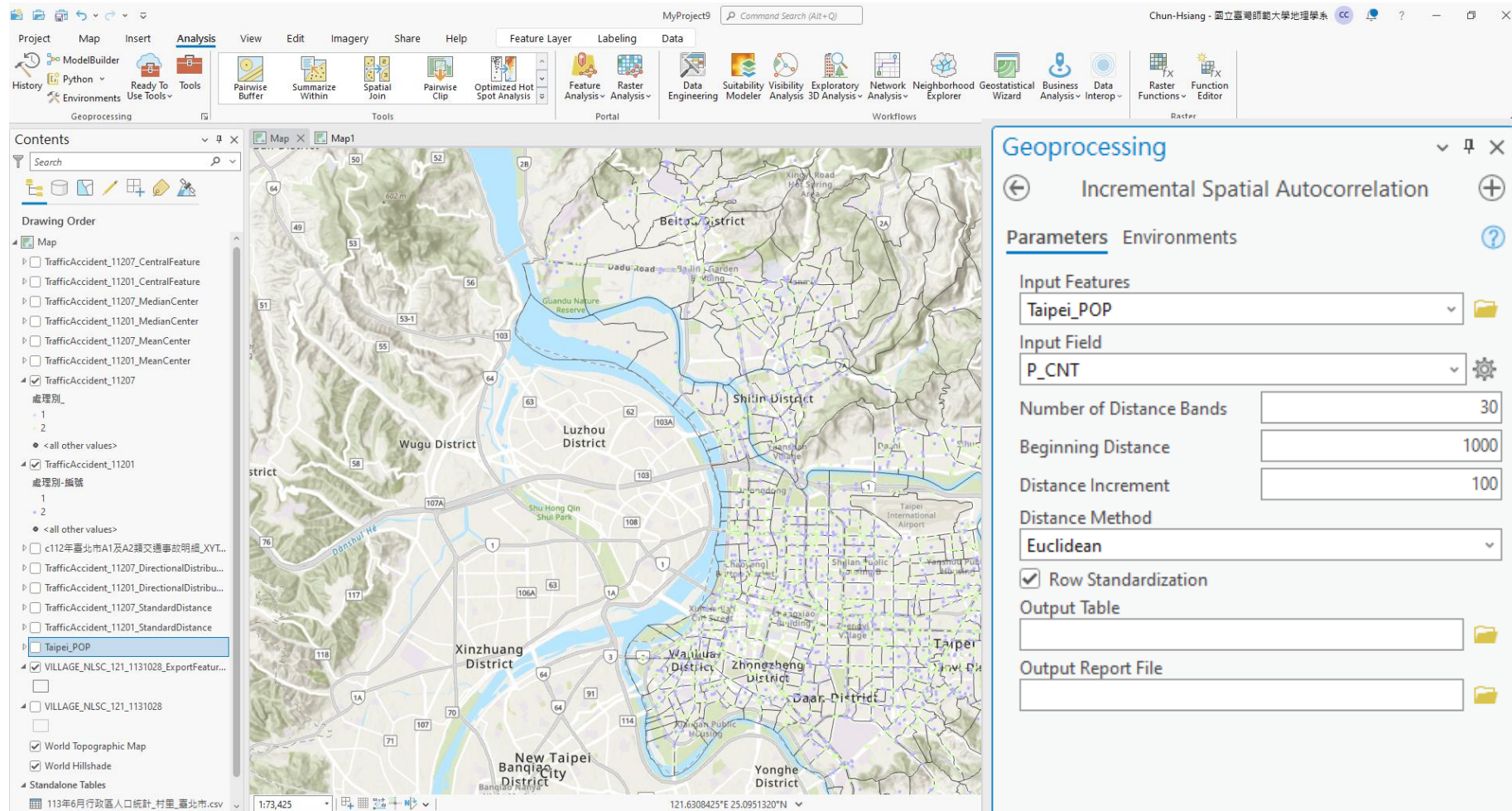
Dataset Information	
Input Feature Class	TrafficAccident_11201
Distance Method	EUCLIDEAN
Study Area	3394130551219921
Selection Set	False



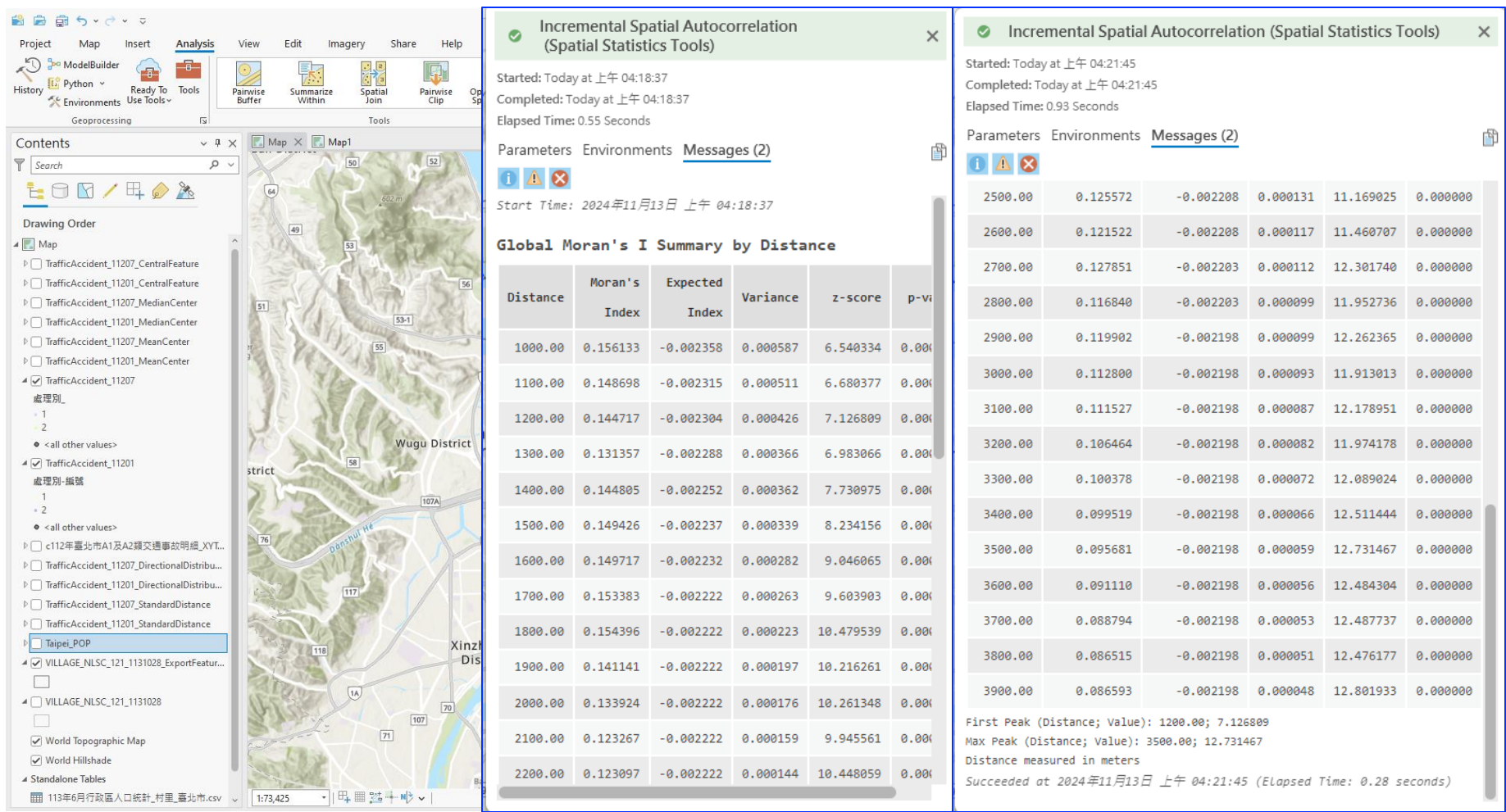
Average Nearest Neighbor Summary	
Observed Mean Distance	0.0000 meters
Expected Mean Distance	137.7066 meters
Nearest Neighbor Ratio	0.000000
z-score	-127.229949
p-value	0.000000

Dataset Information	
Input Feature Class	TrafficAccident_11207
Distance Method	EUCLIDEAN
Study Area	335495527.346745
Selection Set	False

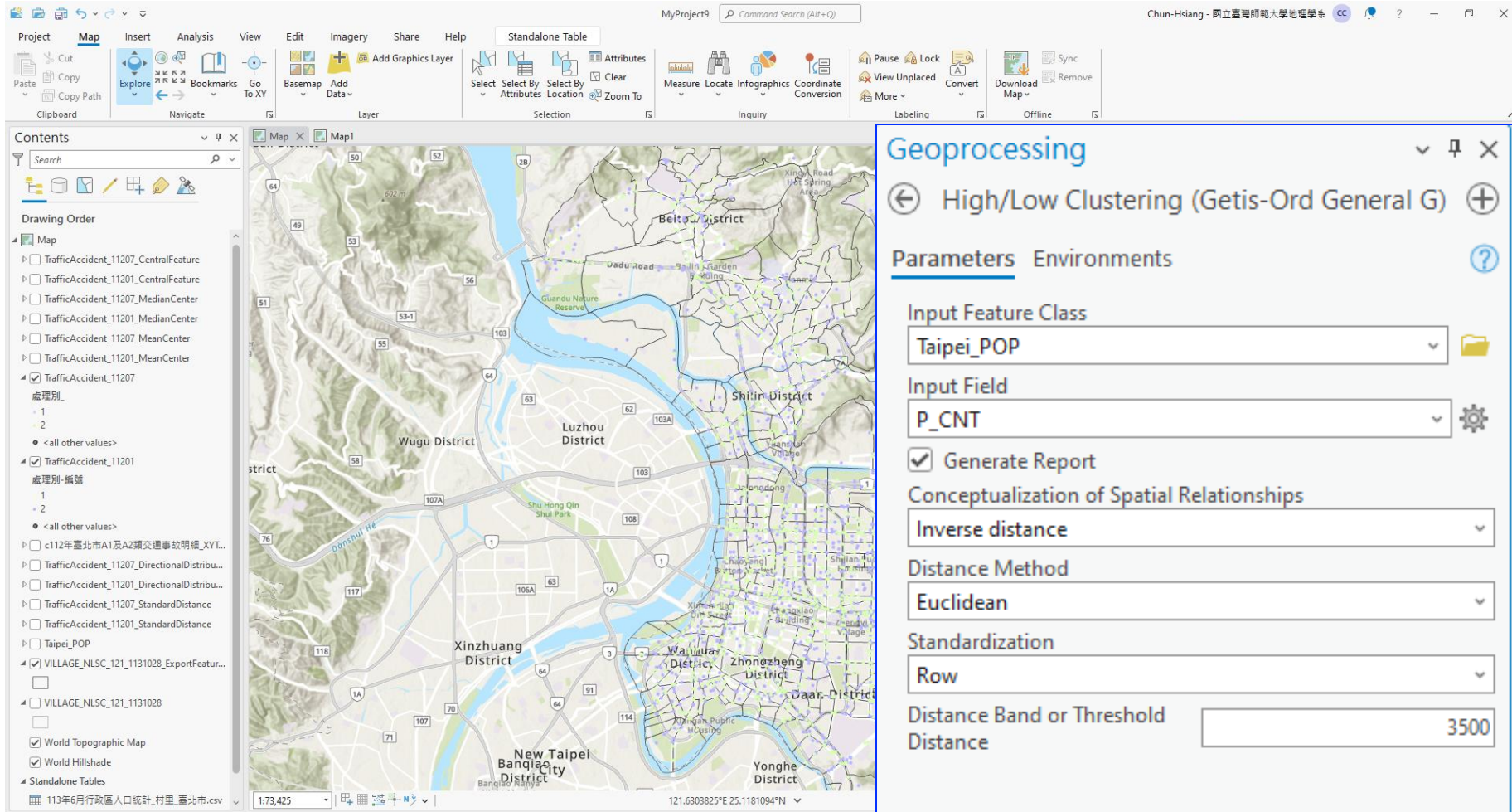
Incremental Spatial Autocorrelation



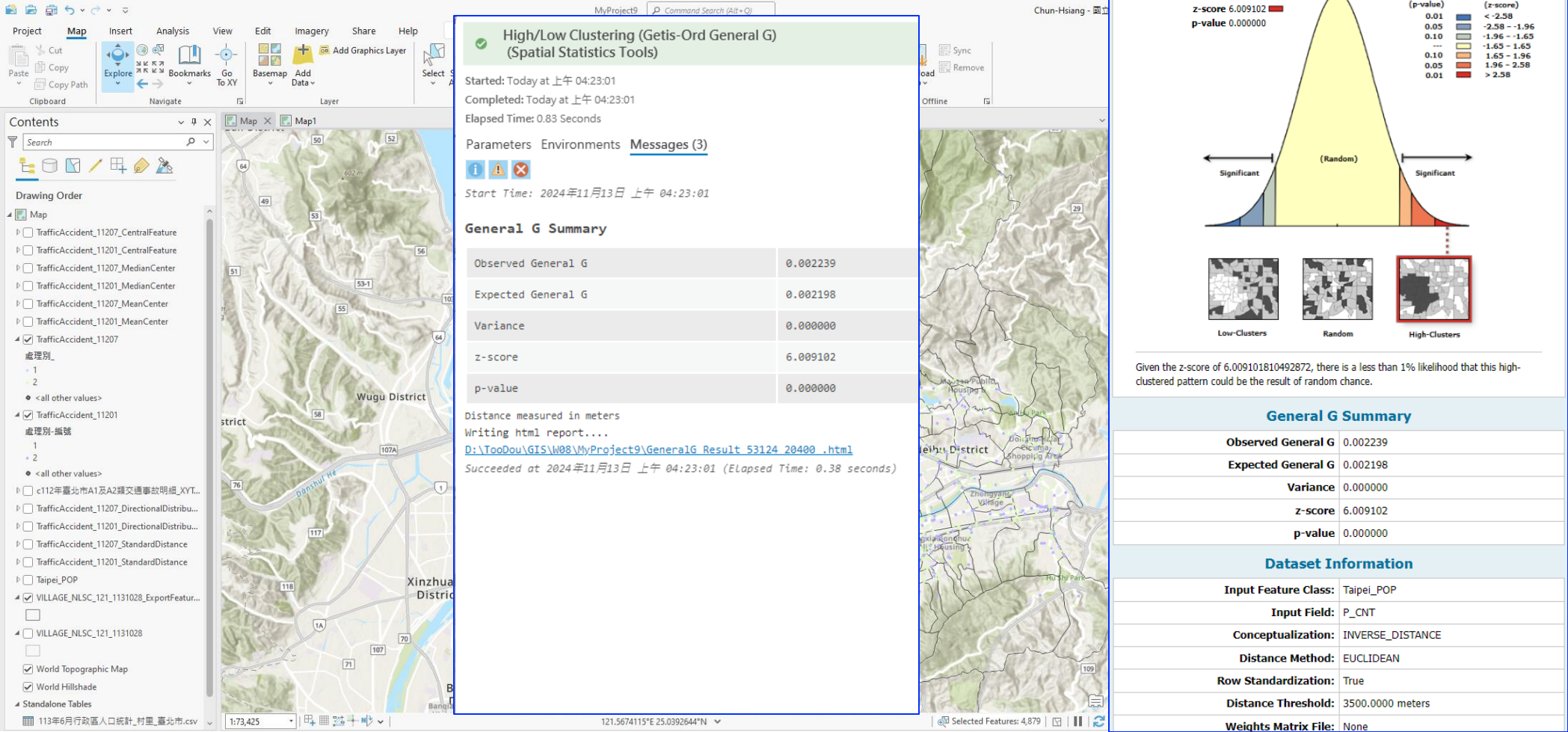
Incremental Spatial Autocorrelation



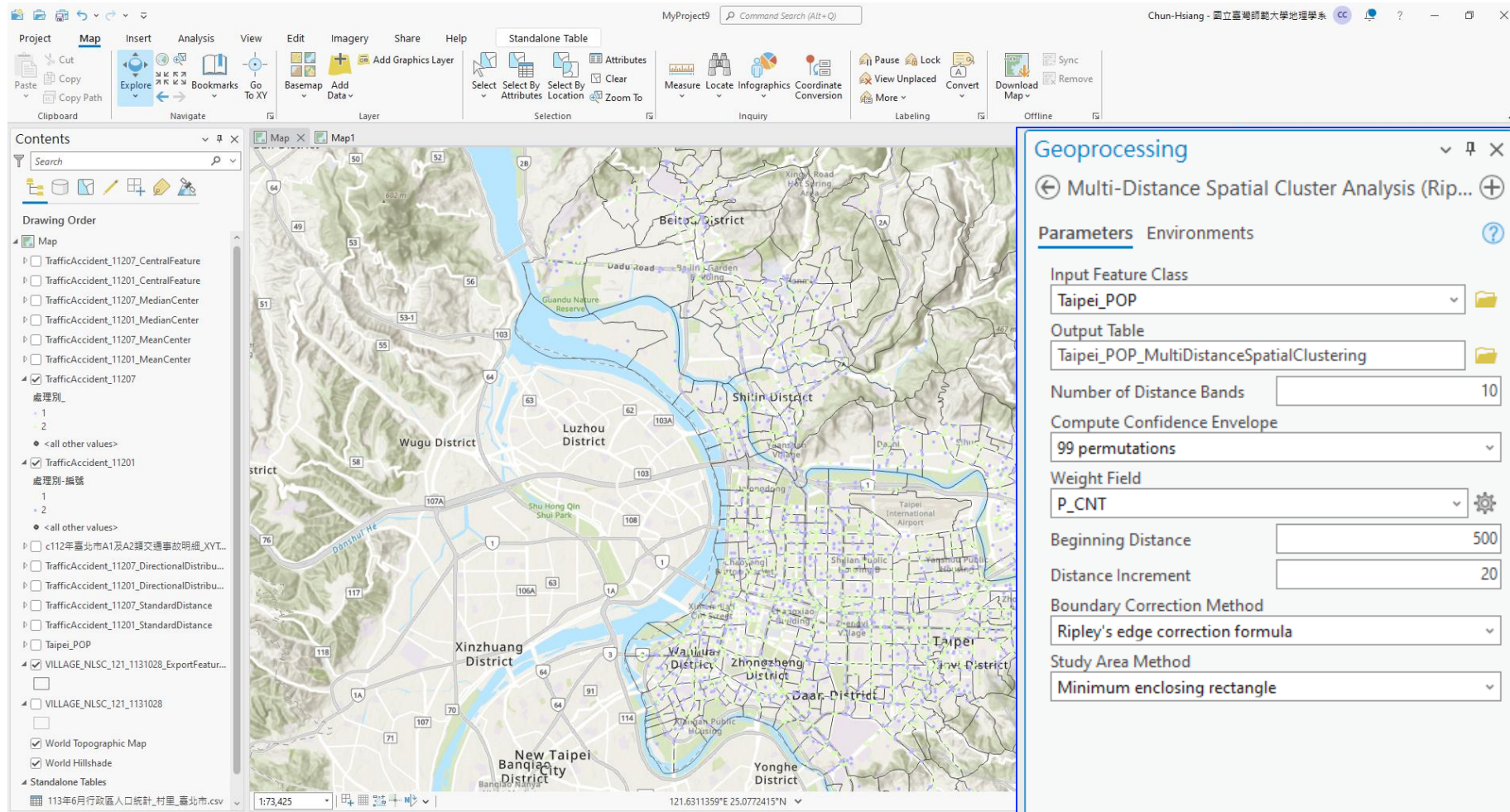
High/Low Clustering (Getis-Ord General G)



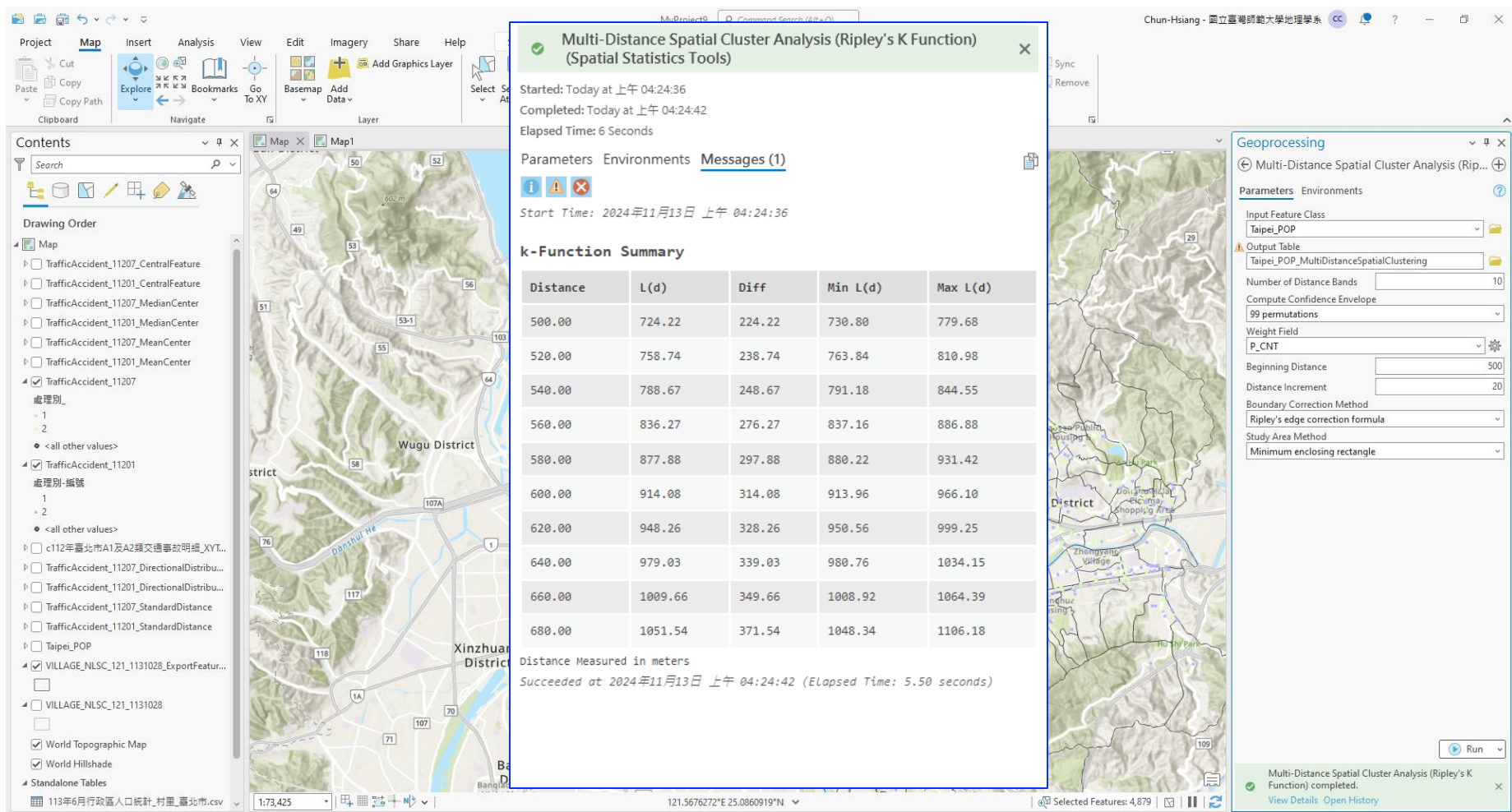
High/Low Clustering (Getis-Ord General G)



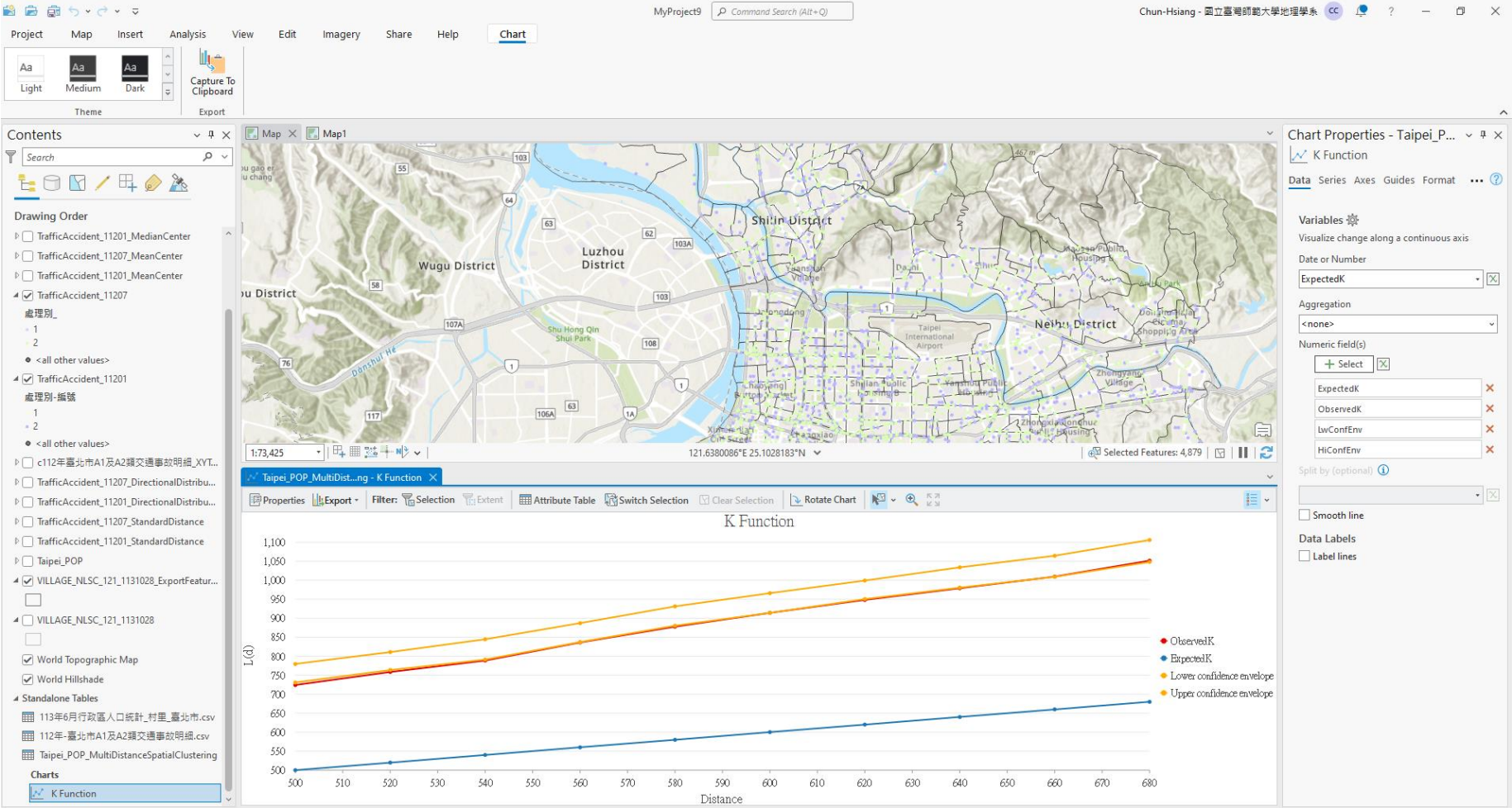
Repley's k -function



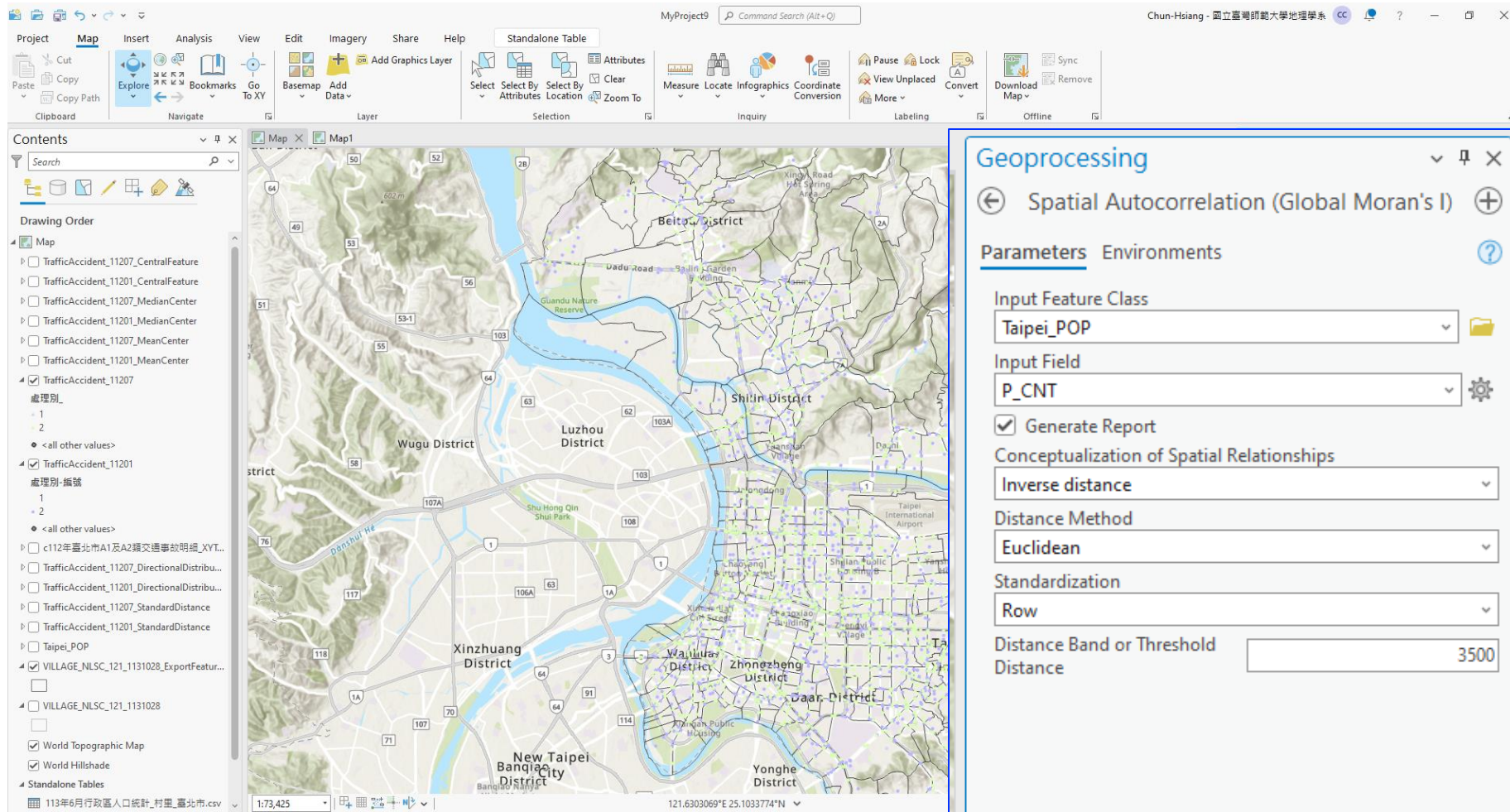
Repley's *k*-function



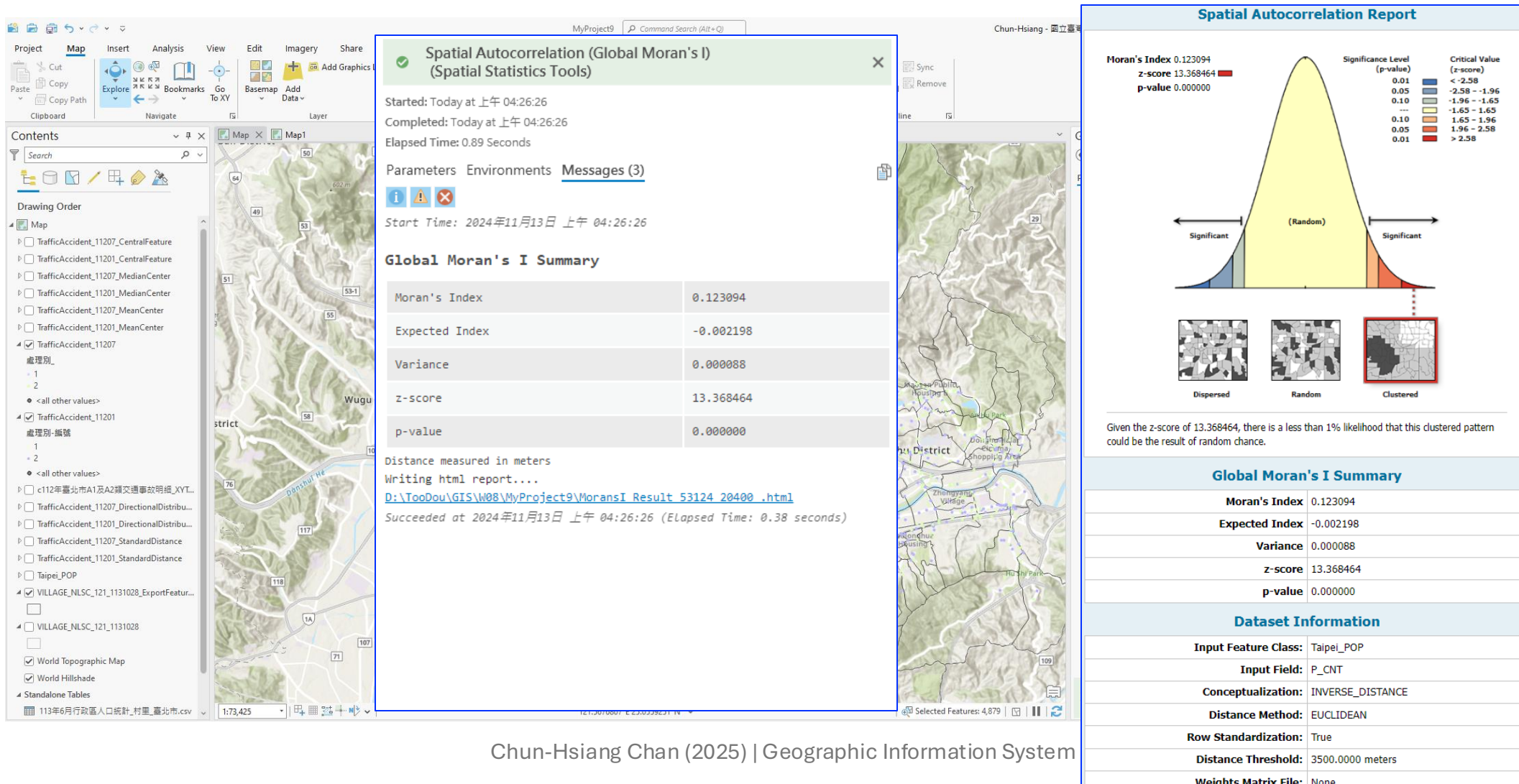
Repley's *k*-function



Spatial Autocorrelation (Global Moran's I)



Spatial Autocorrelation (Global Moran's I)



A satellite night view of Earth, showing a dense network of city lights and connections across the continents, primarily North and South America. The lights form a complex web, with major hubs and numerous smaller nodes. The background is the dark blue of the oceans.

The End

Thank you for your attention!

| Email: chchan@ntnu.edu.tw
Web: toodou.github.io