



Geographic Information System

Spatial Statistics II Lab Practice

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Outline

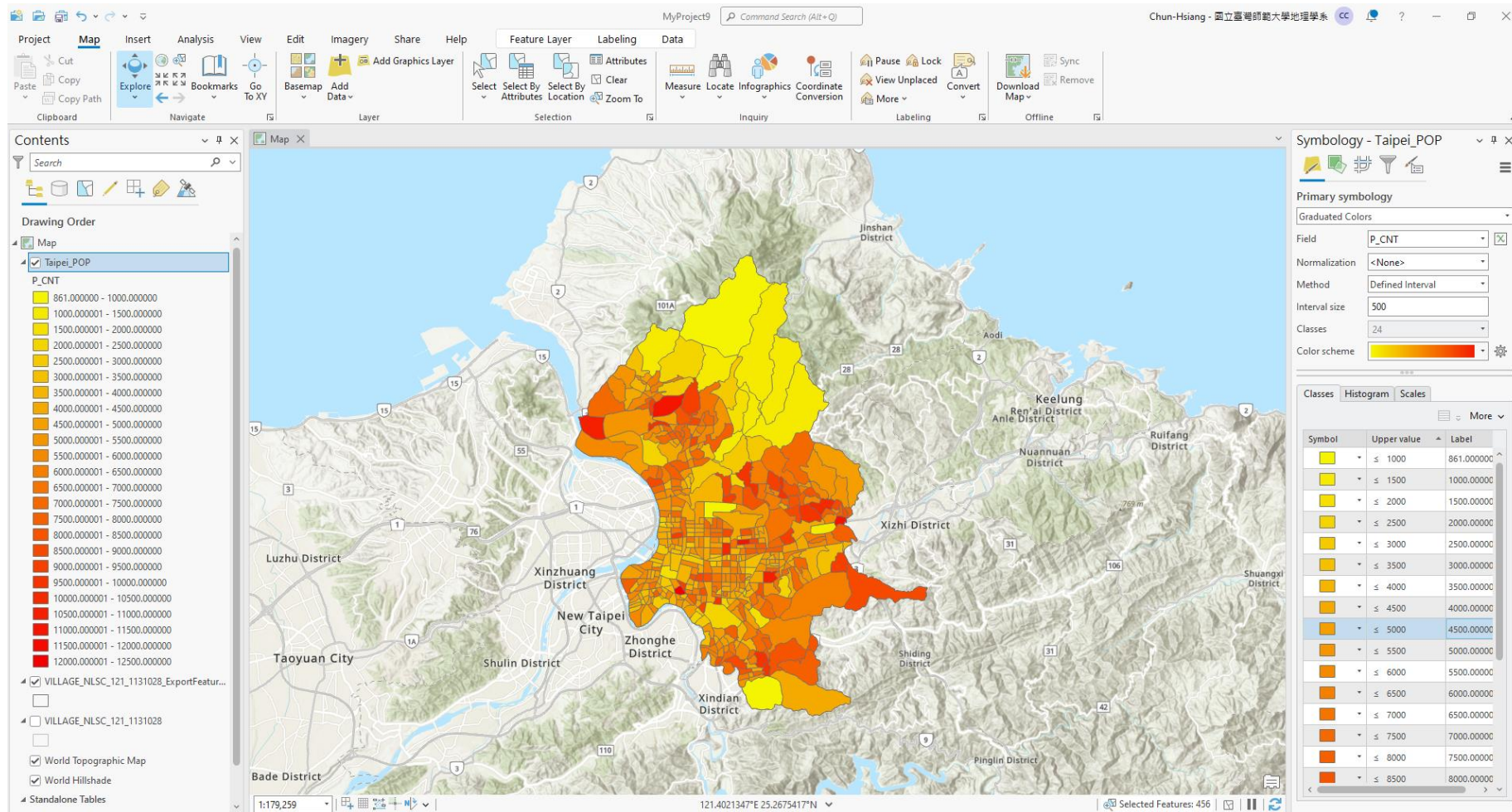
- **Identify the Spatial Distribution of Clusters**
- **Group the Village with Similar Demographic Attributes**



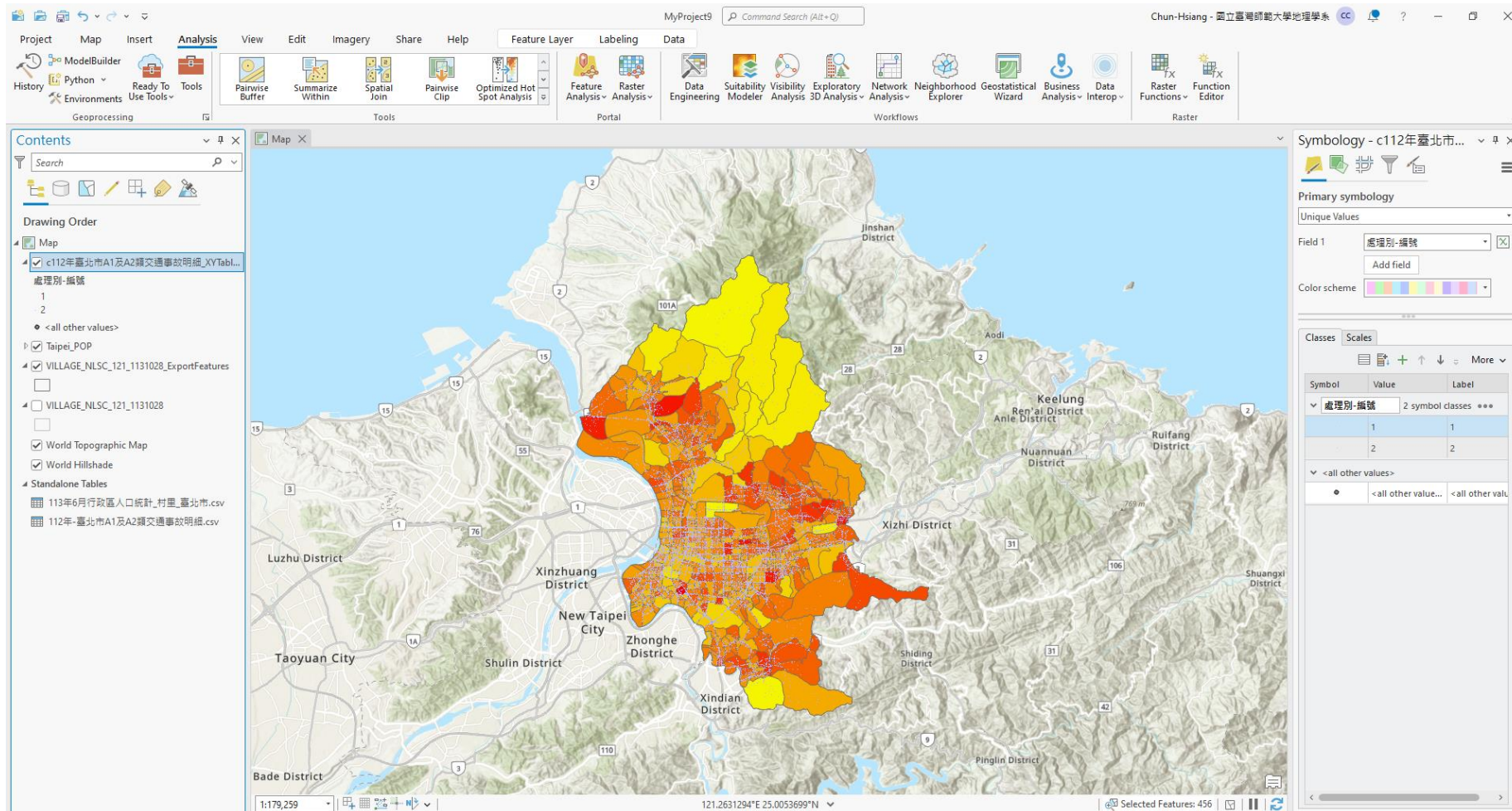
Initial Settings (...)

- 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 named “TrafficAccident_11201” and “TrafficAccident_11207”
- 7) Spatial Join Taipei traffic accident into Taipei_POP

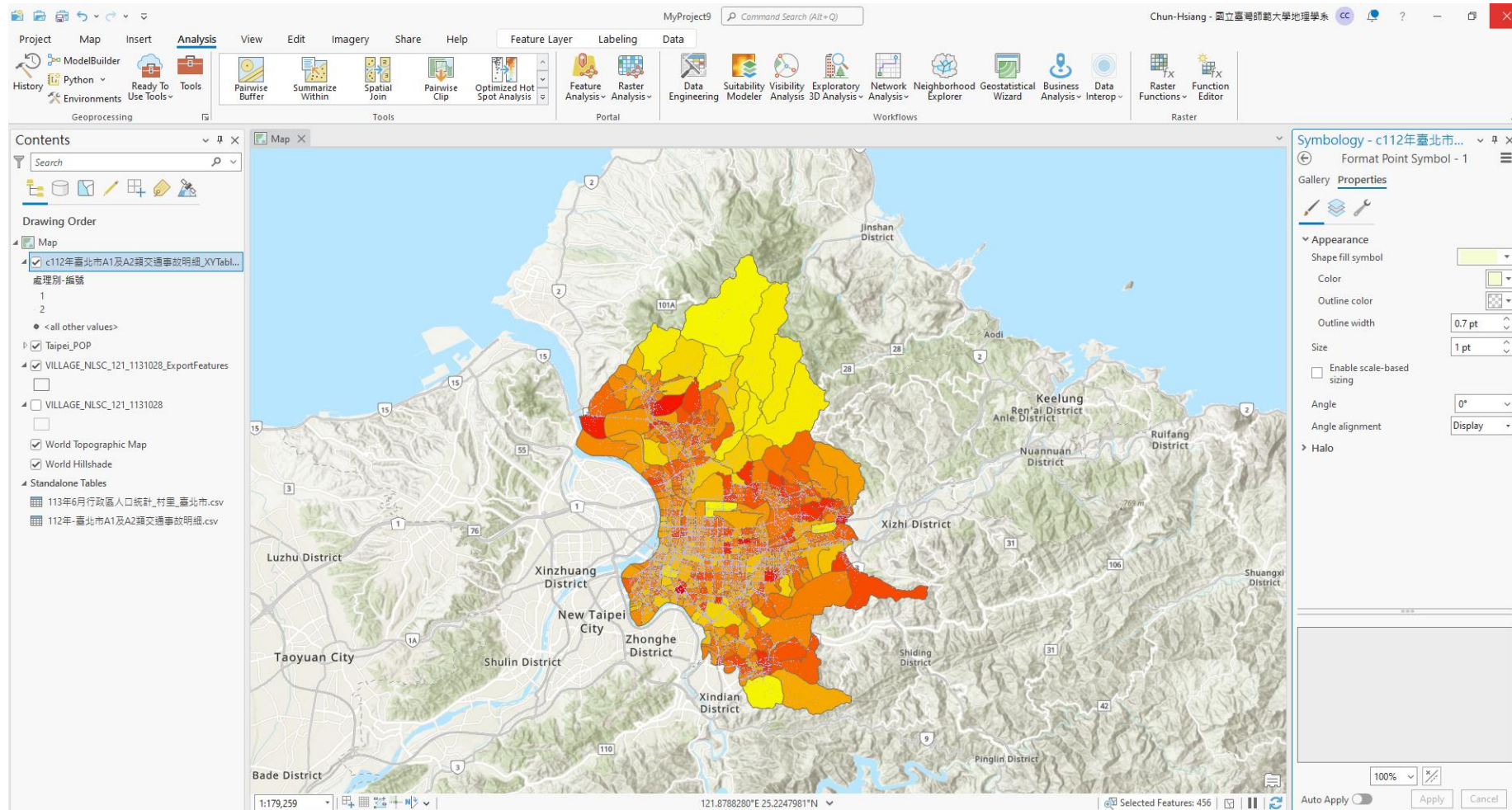
Taipei Population Data



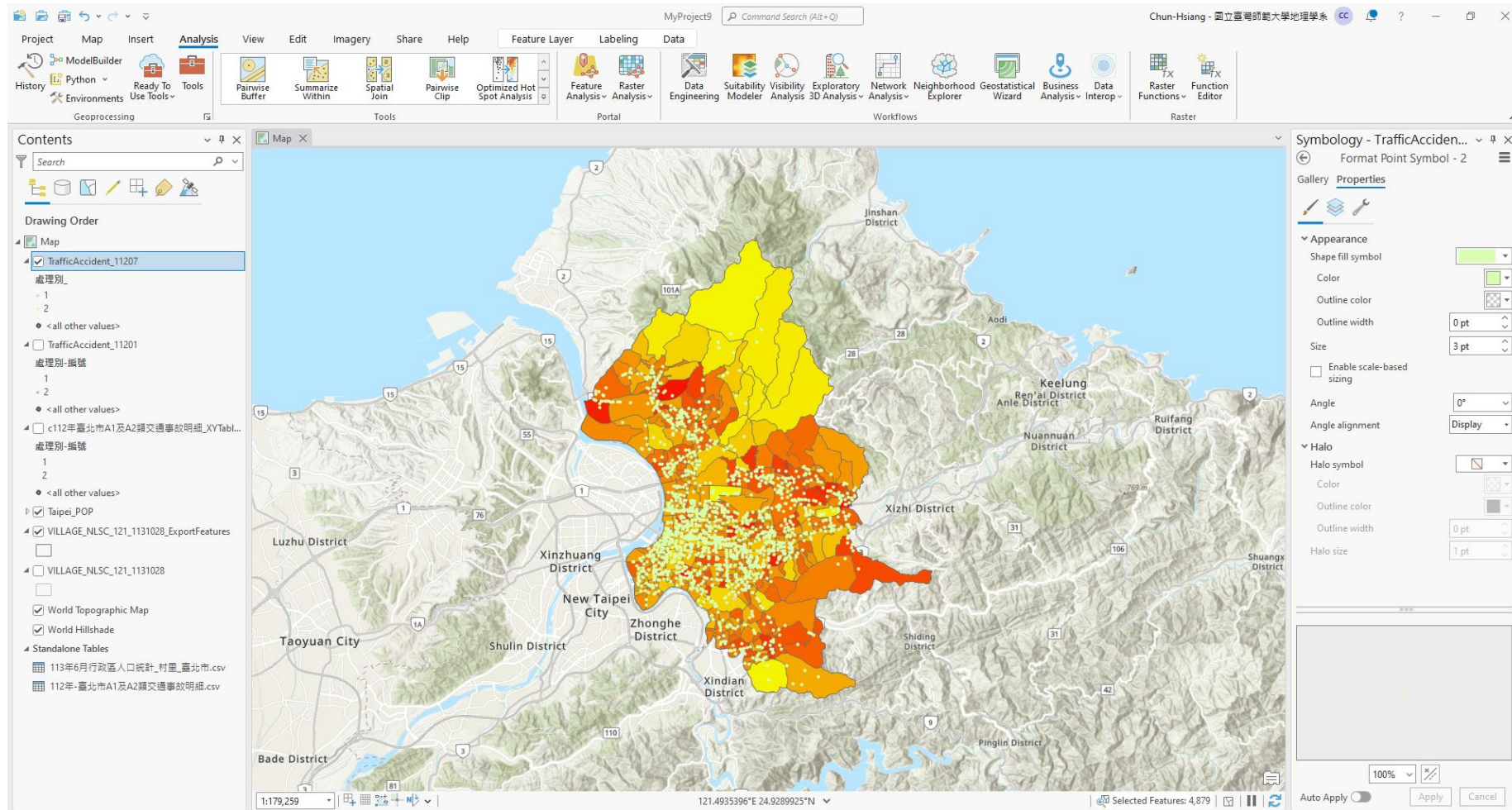
Overlay with Traffic Accident Data



Overlay with Traffic Accident Data



Overlay with Traffic Accident Data



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

The screenshot shows the QGIS software interface. The top menu bar includes Project, Fields, Insert, Analysis, View, Share, and Help. The 'Fields' tab is active, showing options for Filter Name, Filter Domain, Sort Ascending, Sort Descending, and Reset. The 'Data' tab is also visible, showing options for Data Engineering and Data Design.

The main map area displays a map of New Taipei City, Taiwan, with various districts labeled: Keelung, Ren'ai District, Nuannuan District, Ruifang District, Xizhi District, Luzhu District, Xinzhuan District, and New Taipei City. The map is overlaid with a heatmap showing traffic accident density, with colors ranging from yellow to red.

The left sidebar shows the 'Contents' panel with a search bar and a list of layers. The 'TrafficAccident_11201' layer is selected, and its 'Fields' tab is active, showing a list of fields with checkboxes for 'Visible' and 'Read Only'.

The 'Current Layer' panel at the bottom shows the attribute table for 'TrafficAccident_11201'. The table has columns for Field Name, Alias, Data Type, Allow NULL, Highlight, Number Format, Domain, Default, and Length. The 'cnt' field is highlighted in green.

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	☒	☐				

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

The screenshot displays the ArcGIS Desktop interface. The main map window shows a geographic area with a heatmap overlay representing traffic accident density. The heatmap uses a color scale from yellow (low density) to red (high density). The map includes labels for various districts and landmarks, such as Keelung, Ren'ai District, Nuannuan District, Ruitang District, Xizhi District, Luzhu District, Xinzhuang District, and New Taipei City. The interface also shows a table view at the bottom with columns for various attributes and a 'cnt' field. A context menu is open over the 'cnt' field, showing options like 'Calculate Field'.

Contents

- 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

Table View

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>

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

The screenshot displays the QGIS interface with the 'Calculate Field' dialog box open. The dialog is set to modify the 'cnt' field in the 'TrafficAccident_11201' layer using a Python expression. The expression is '1'. The background shows a map of Keelung and surrounding areas with a data table at the bottom.

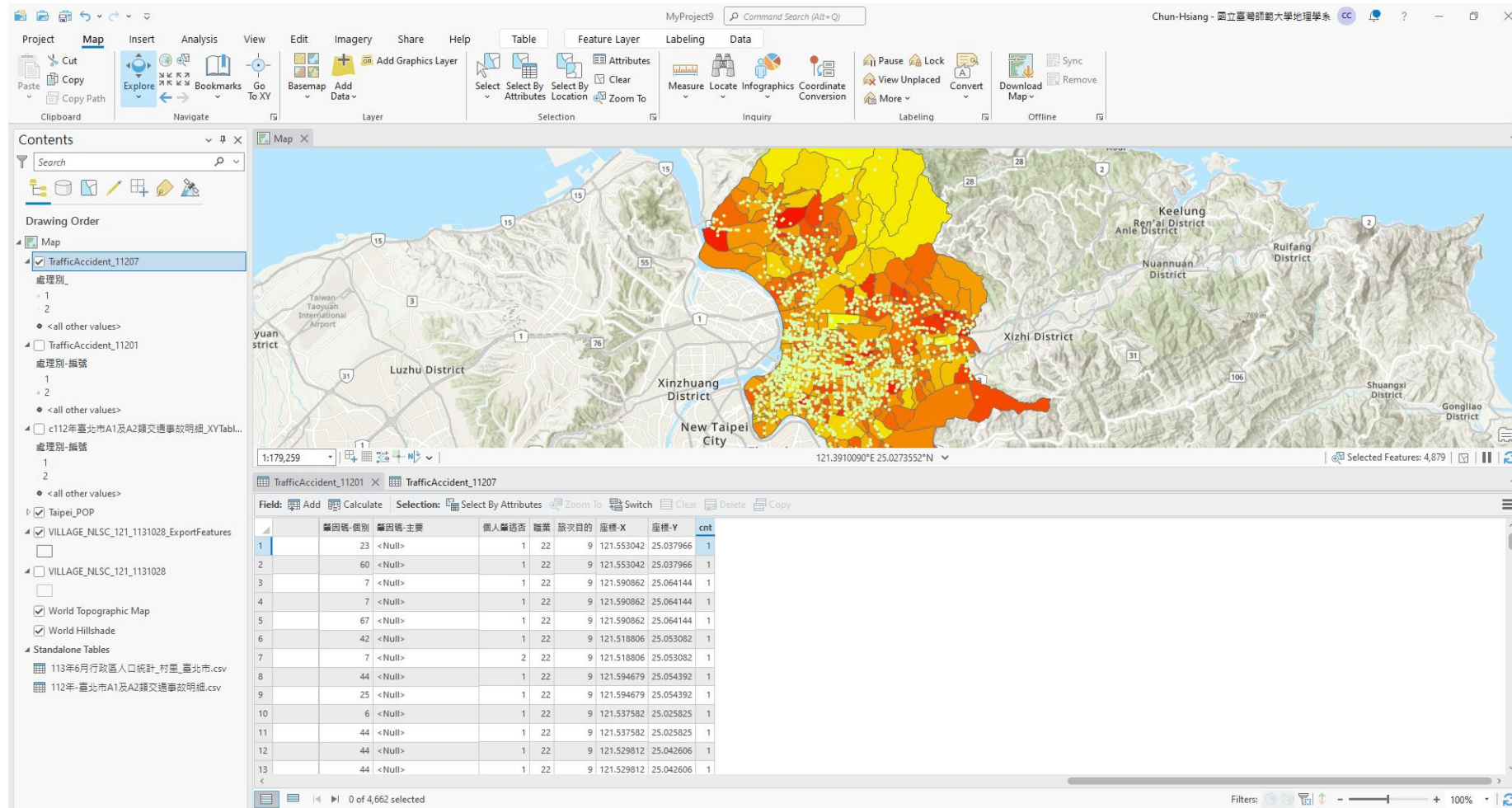
Calculate Field Dialog:

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

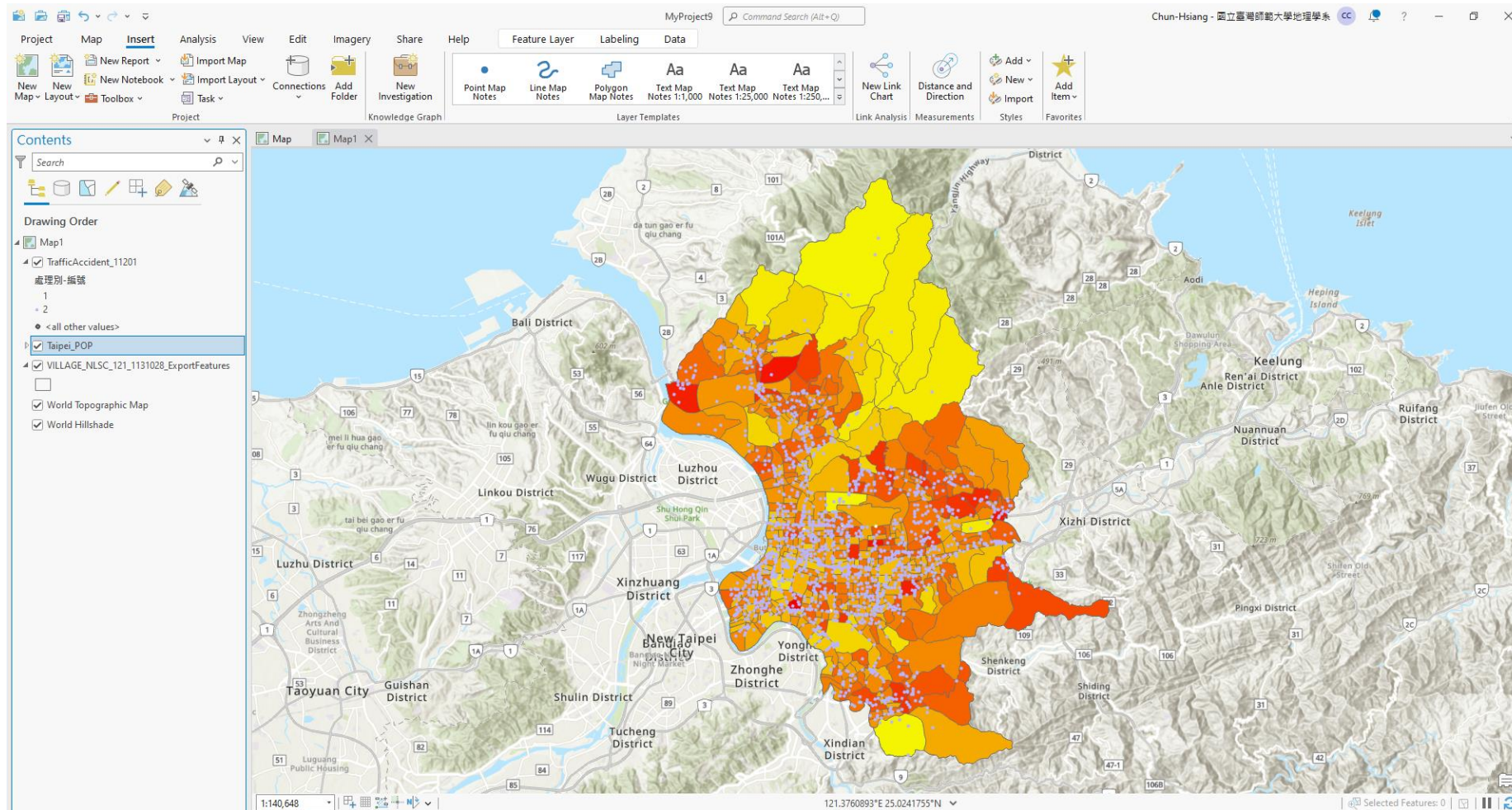
Data Table:

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>

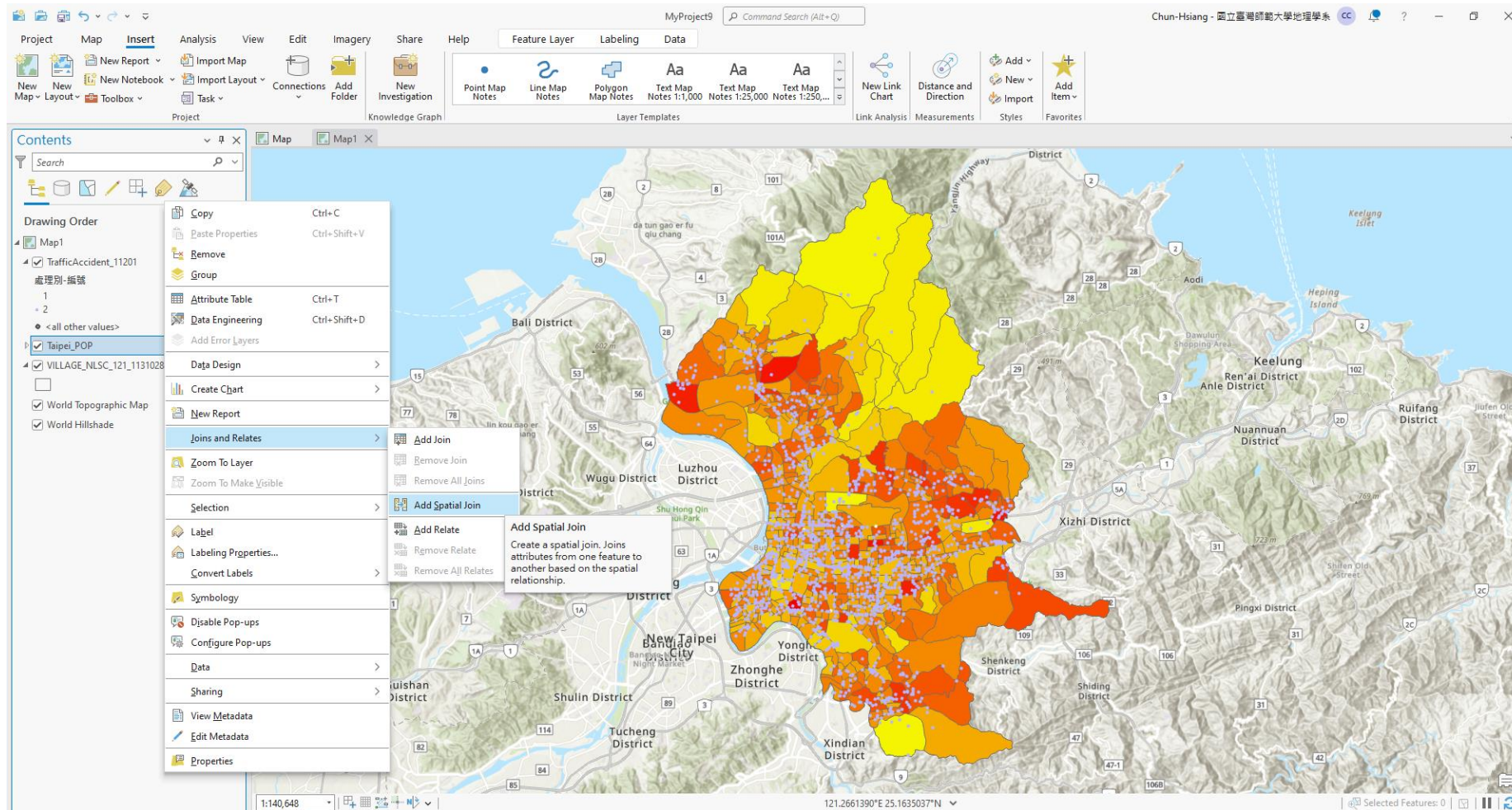
Fill 1 into “cnt” Field to both 11201 & 11207



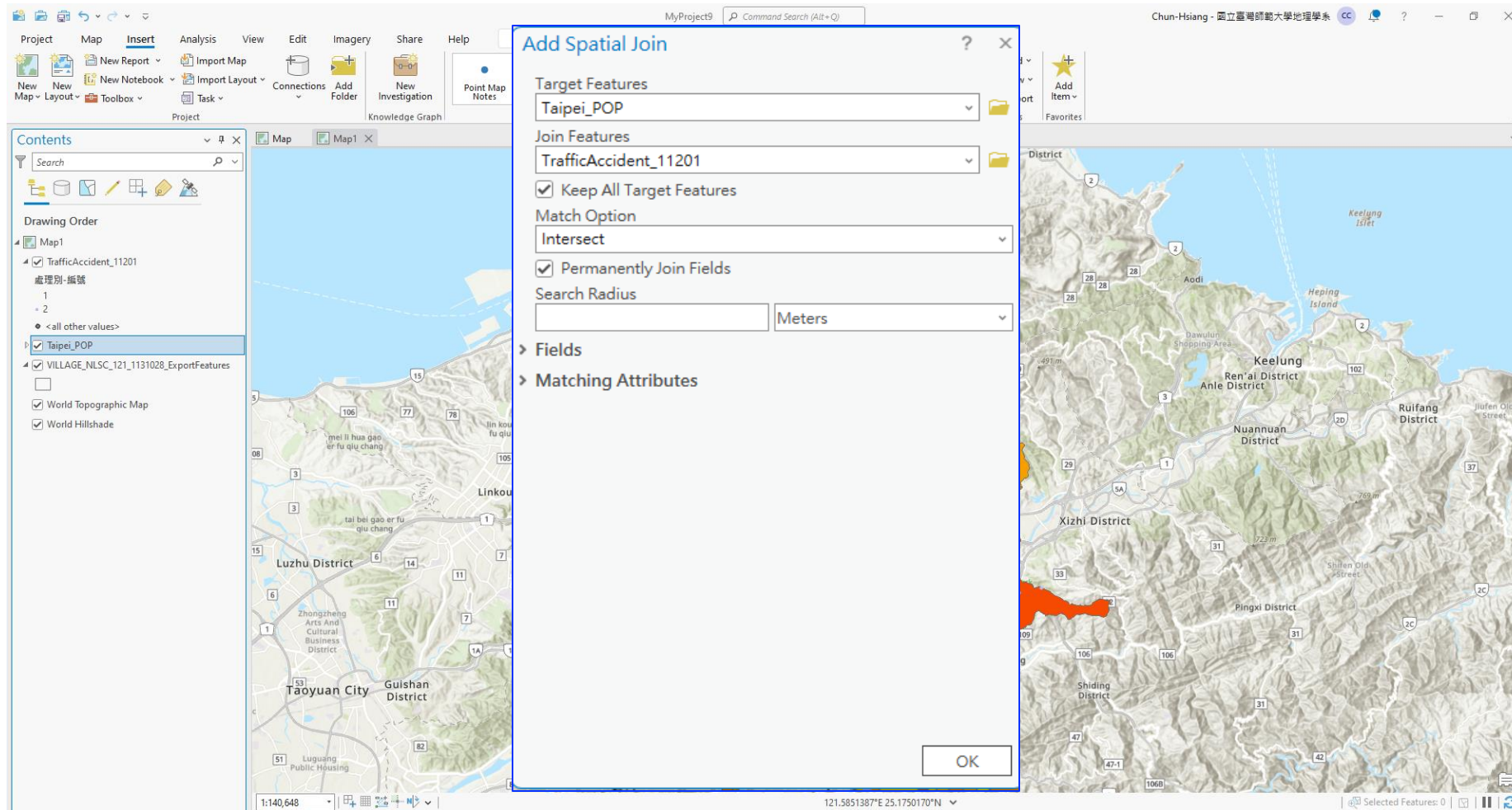
Spatial Join Taipei Traffic Accident Data



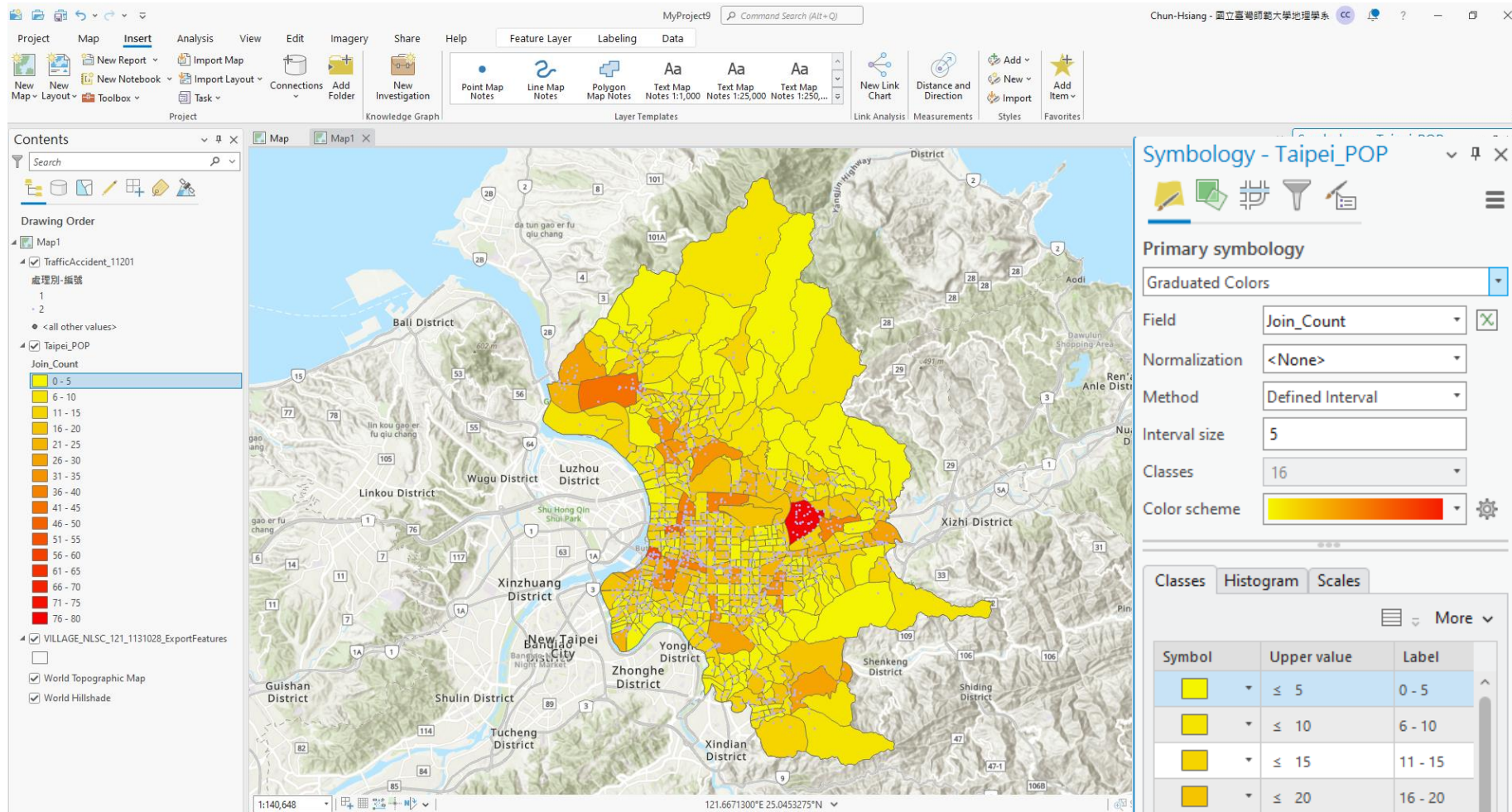
Spatial Join Traffic Accident Data into Village



Spatial Join Traffic Accident Data into Village



Spatial Join Traffic Accident Data into Village

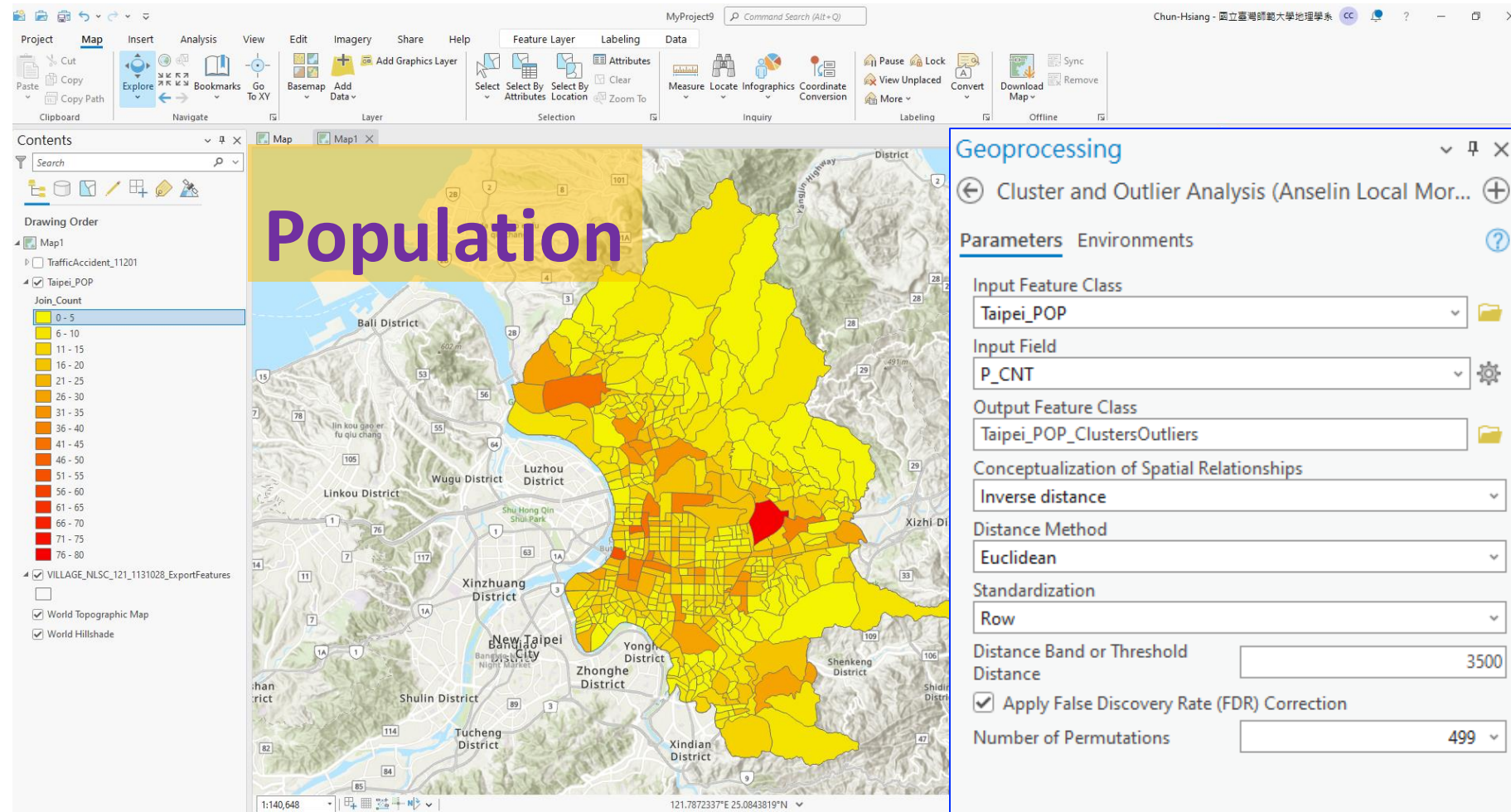


Spatial Statistical Analysis

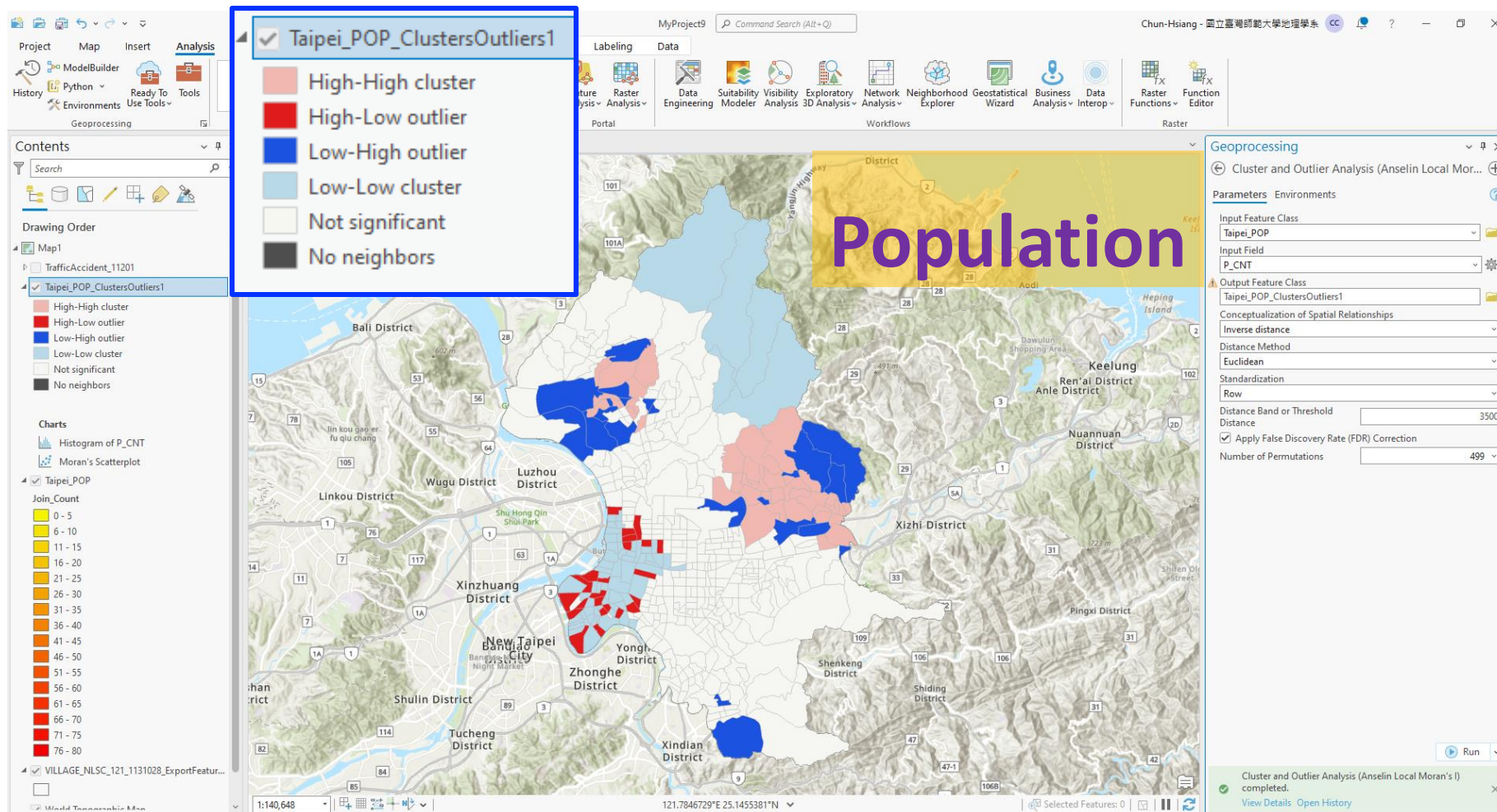
Compute the following functions

- 1) Cluster and Outlier Analysis (Anselin Local Moran's I)
(Population & Traffic Accident)
- 2) Hot Spot Analysis (Getis-Ord G^*) (Population & Traffic Accident)
- 3) Spatial Outlier Detection (Traffic Accident)
- 4) Density-based Clustering (DBSCAN and OPTICS)
- 5) Multivariate Clustering (NumCluster: 5 and 10)

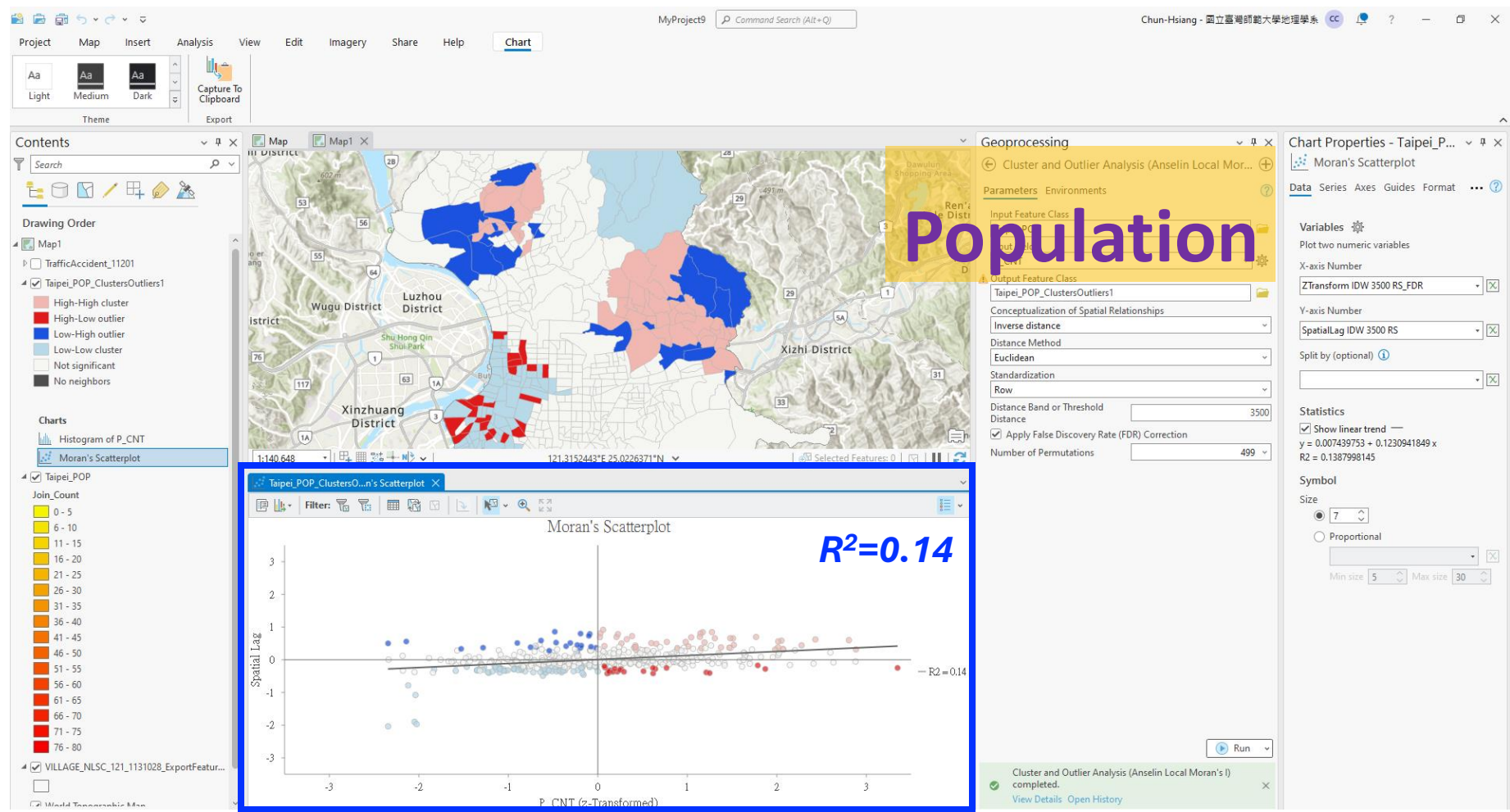
Cluster and Outlier Analysis (Anselin Local Moran's I)



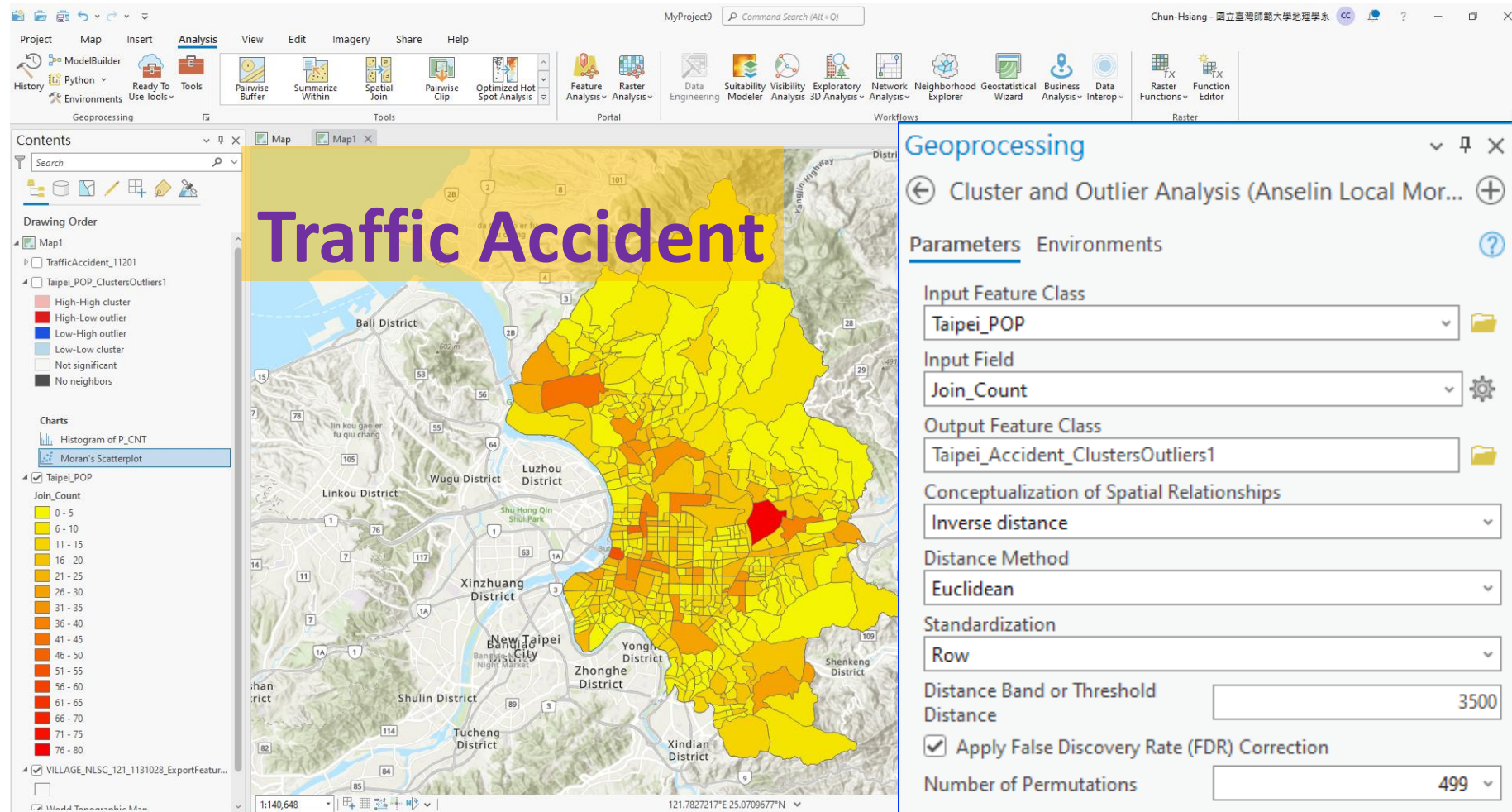
Cluster and Outlier Analysis (Anselin Local Moran's I)



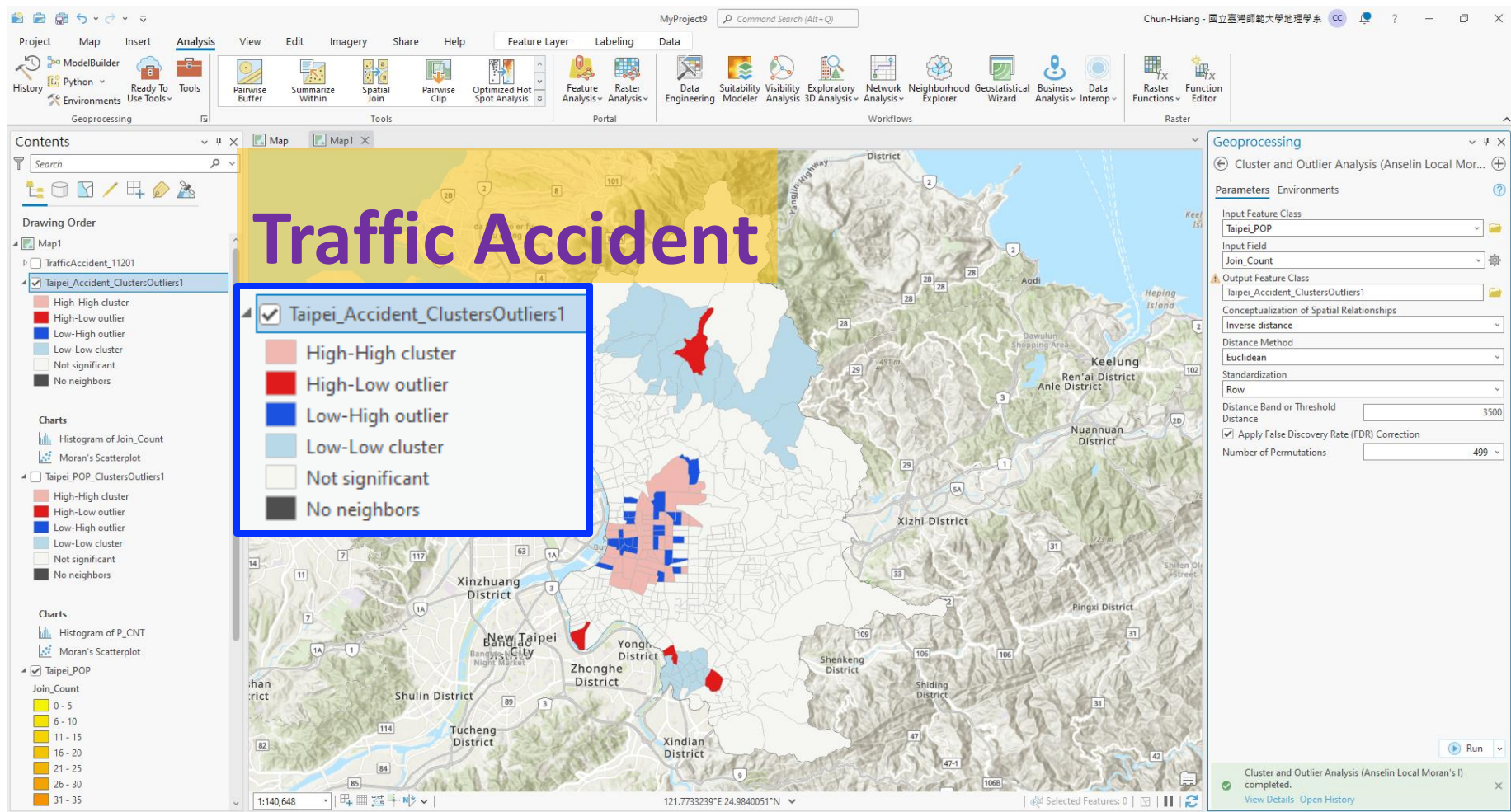
Cluster and Outlier Analysis (Anselin Local Moran's I)



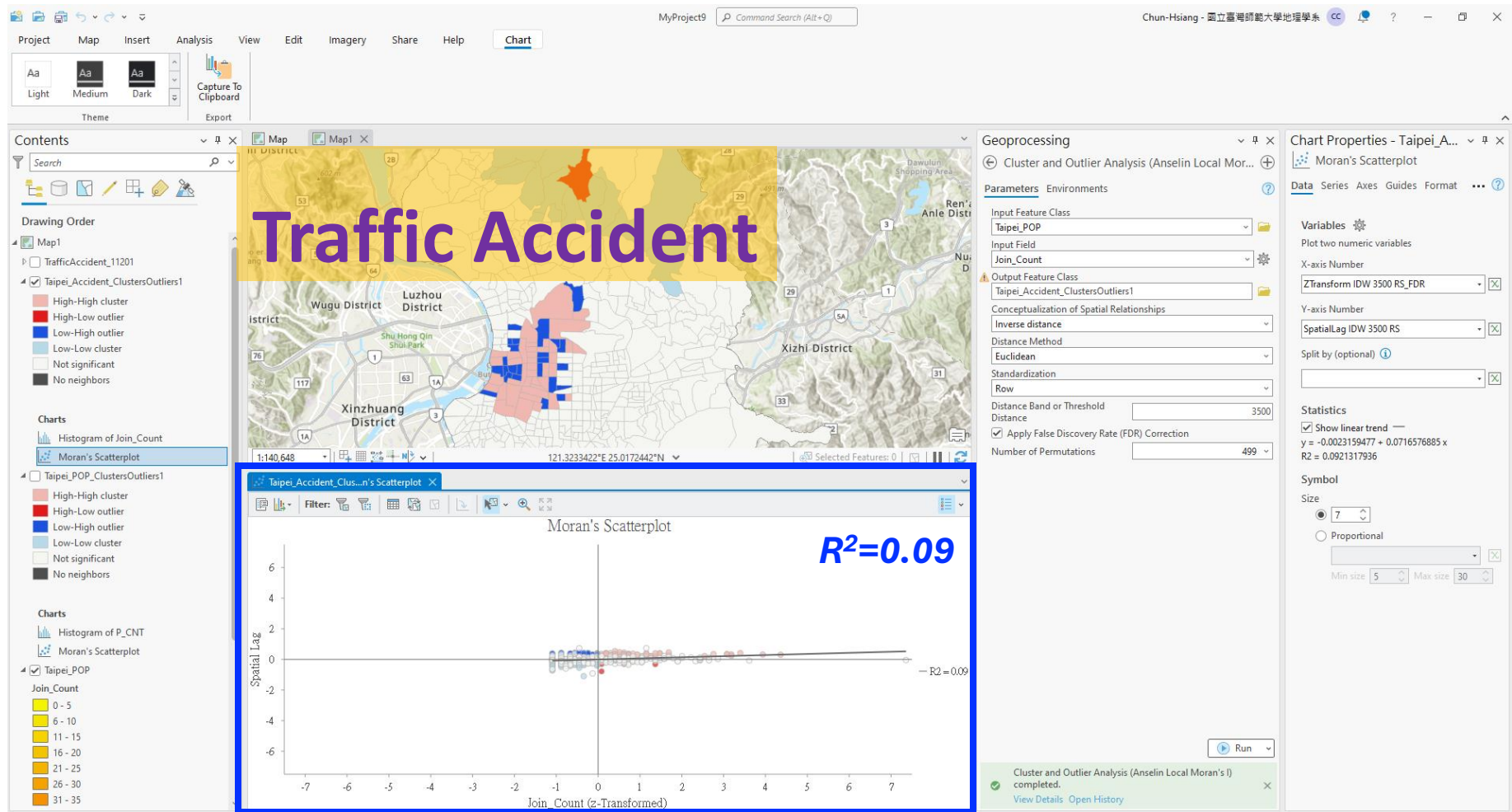
Cluster and Outlier Analysis (Anselin Local Moran's I)



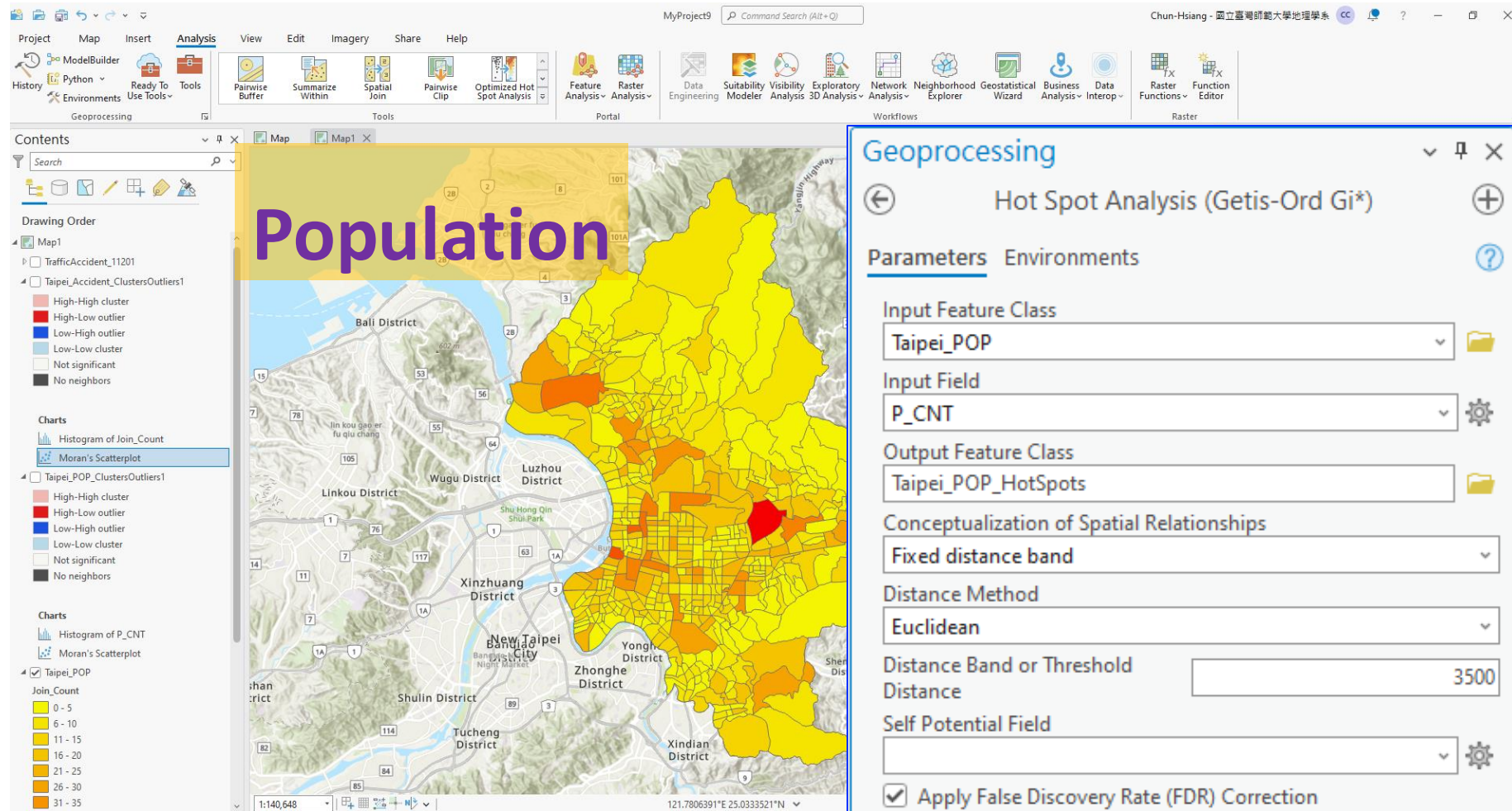
Cluster and Outlier Analysis (Anselin Local Moran's I)



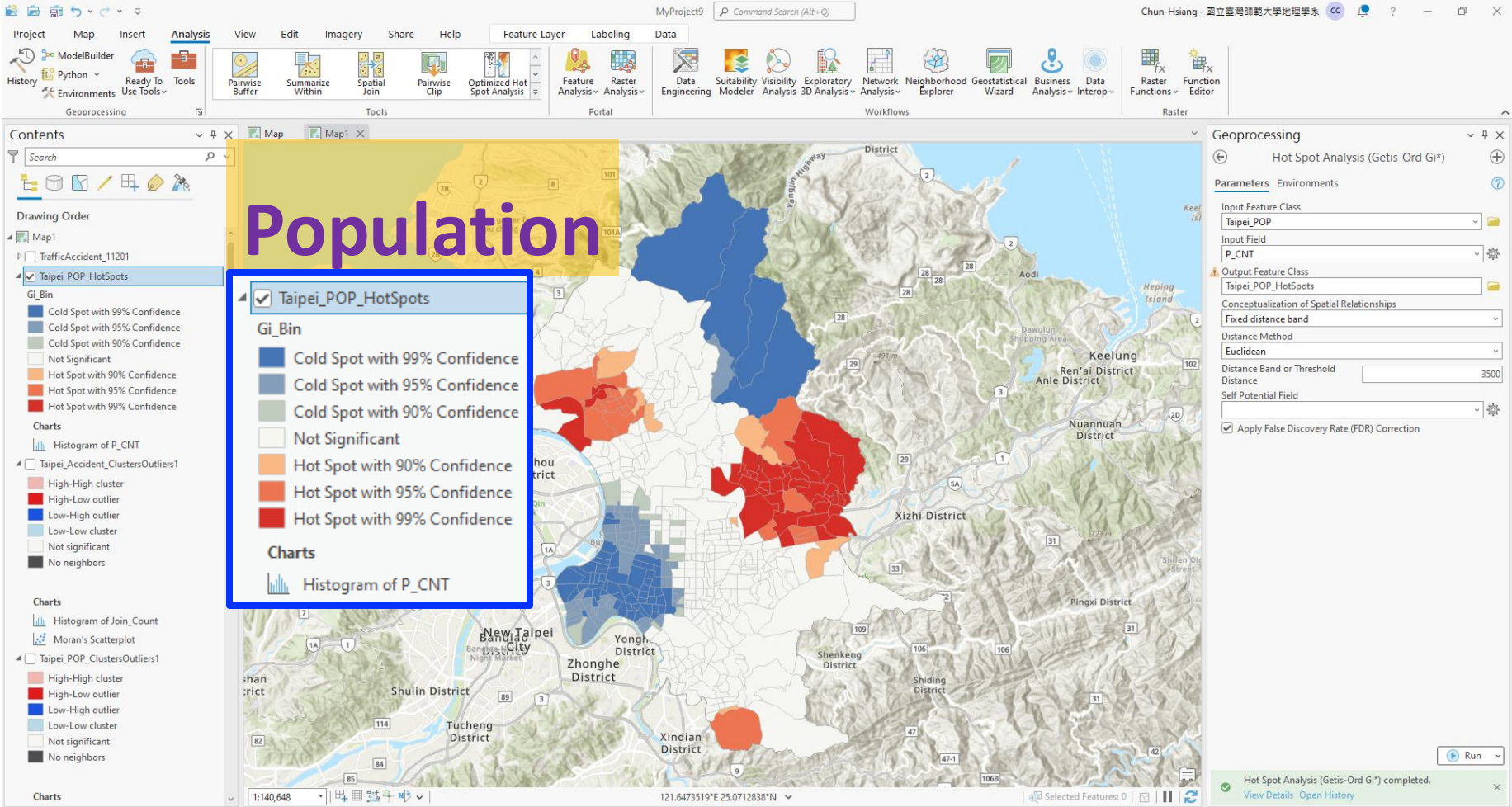
Cluster and Outlier Analysis (Anselin Local Moran's I)



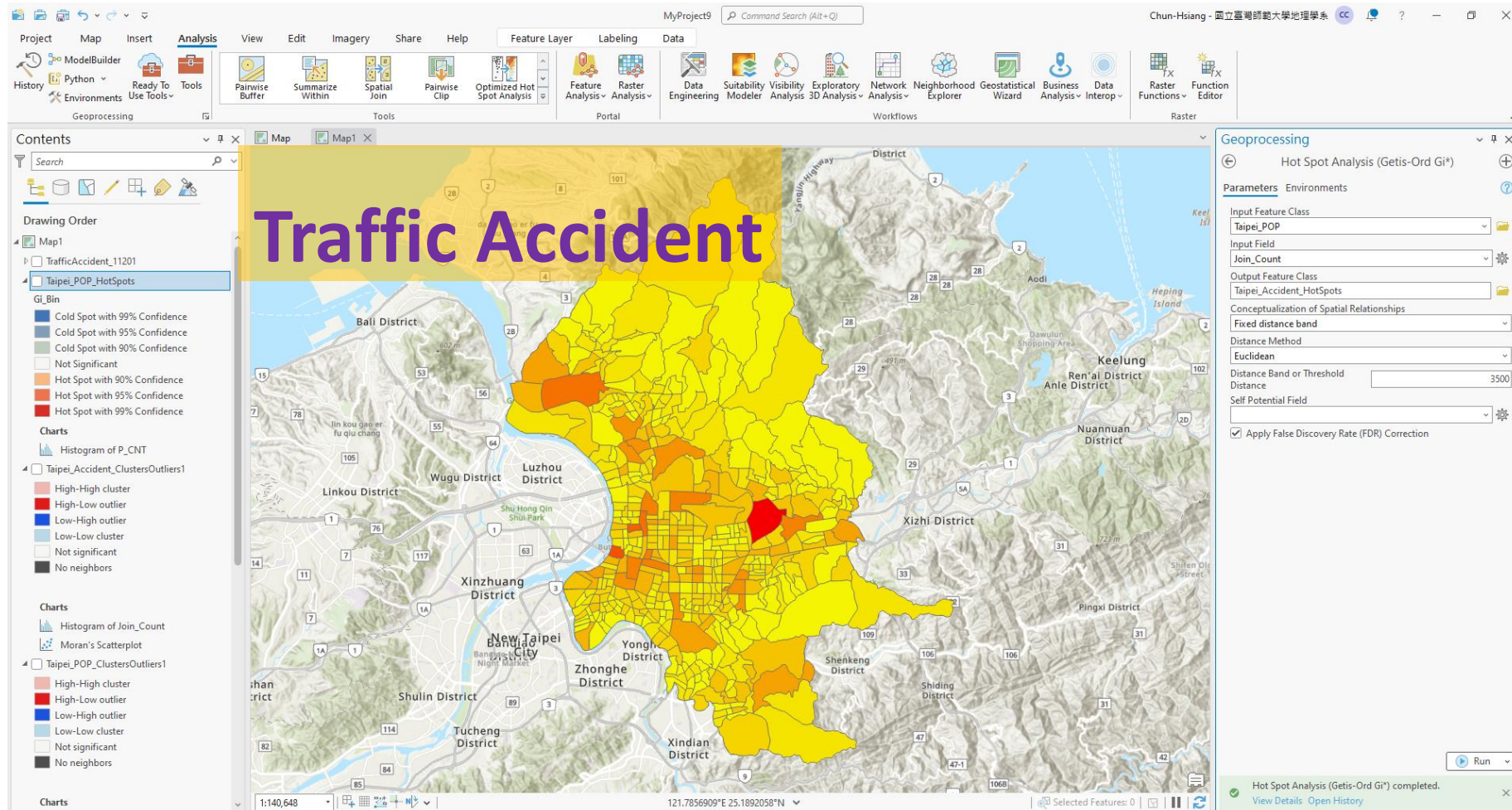
Hot Spot Analysis (Getis-Ord G^*)



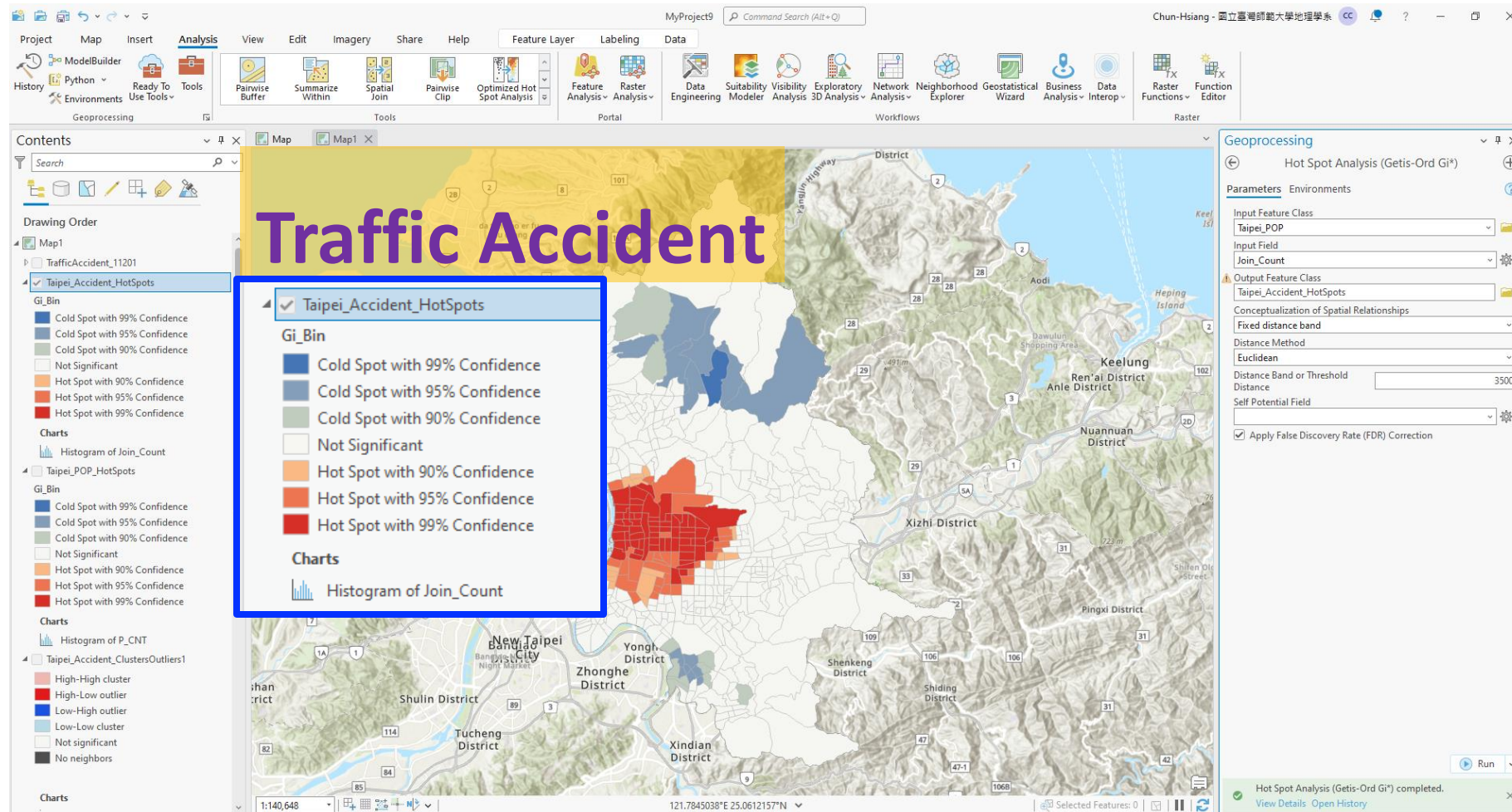
Hot Spot Analysis (Getis-Ord G*)



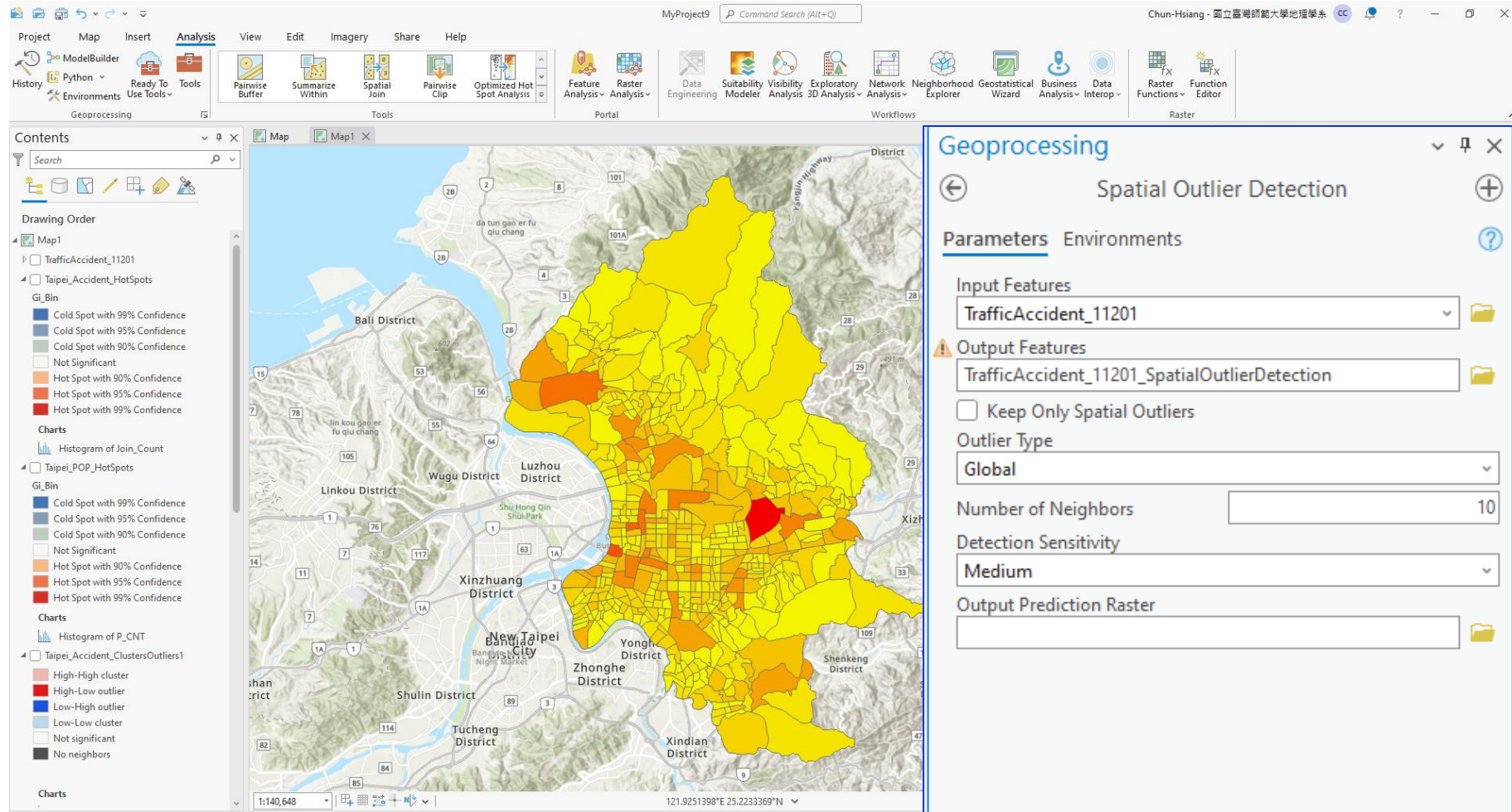
Hot Spot Analysis (Getis-Ord G^*)



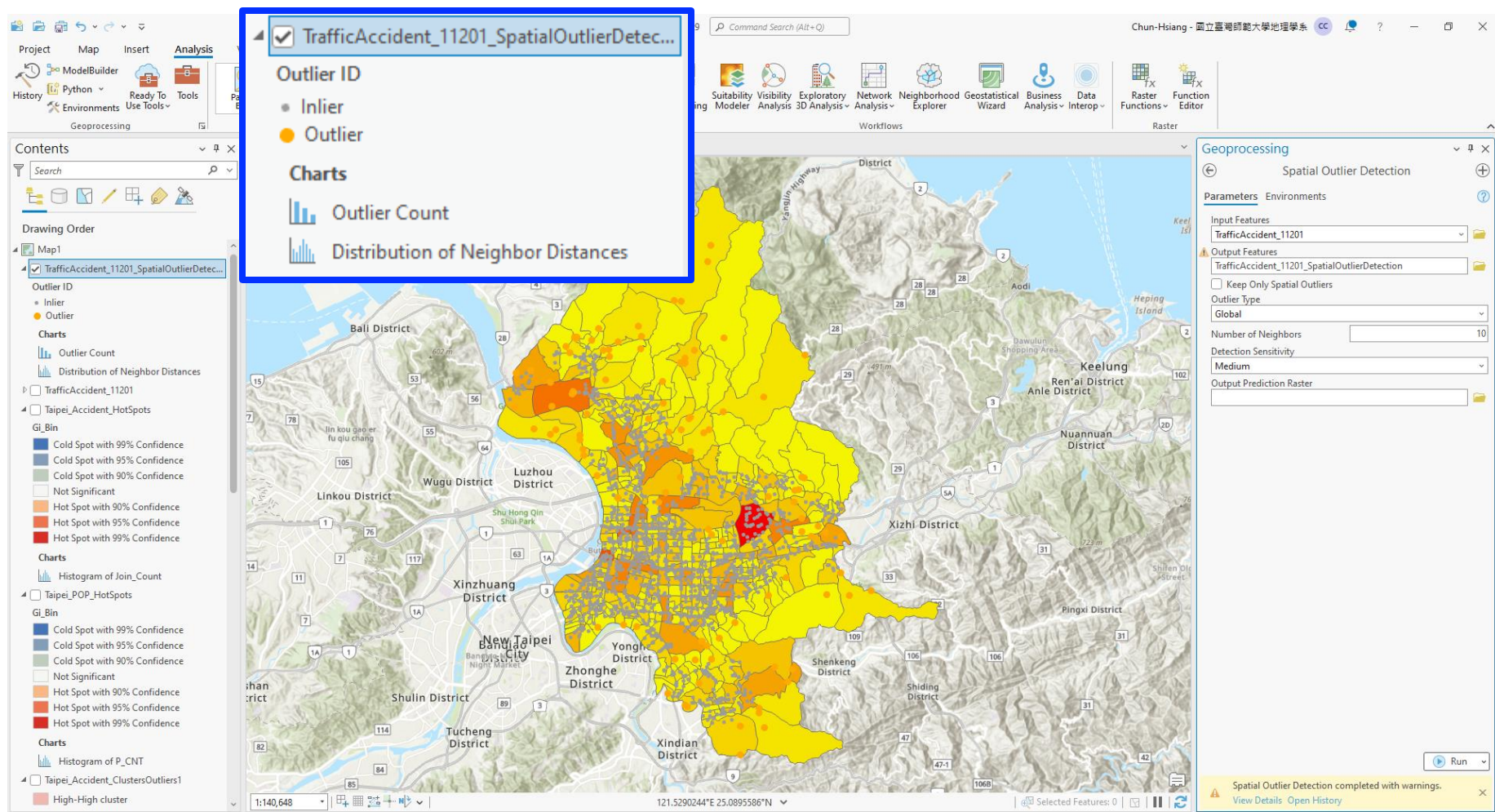
Hot Spot Analysis (Getis-Ord G*)



Spatial Outlier Detection

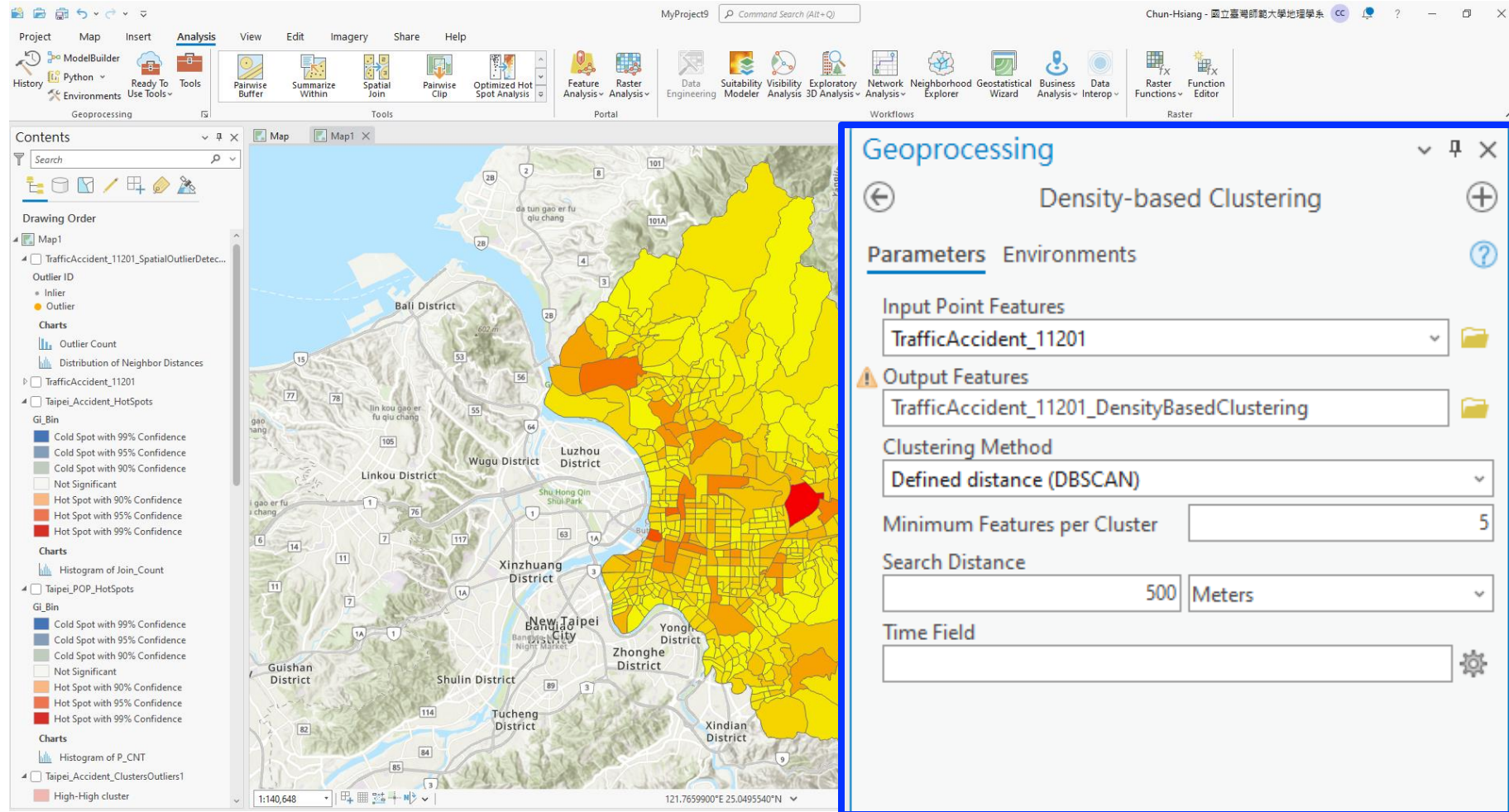


Spatial Outlier Detection



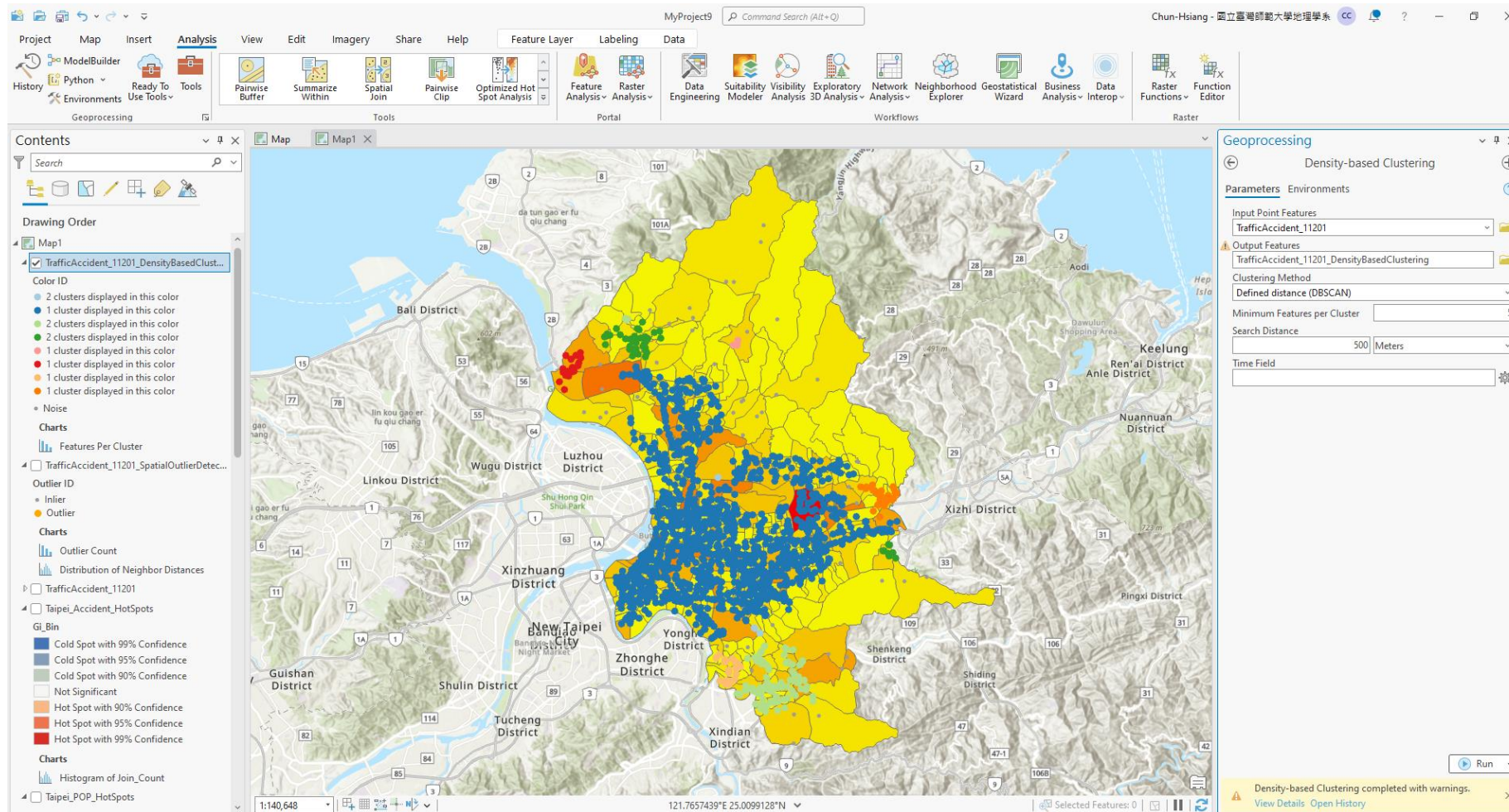
Density-based Clustering :: DBSCAN

MinPt: 5; SearchDist: 500



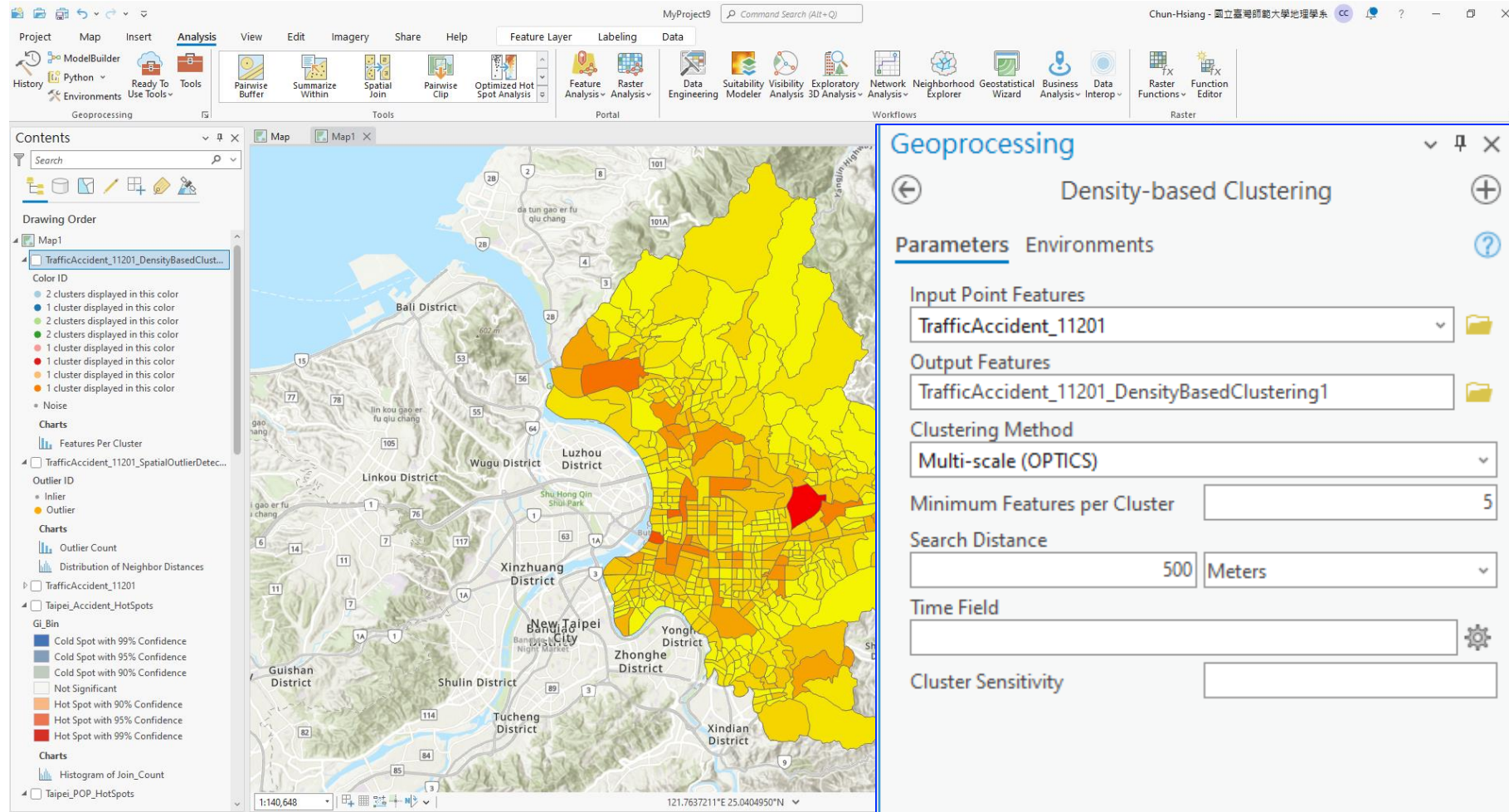
Density-based Clustering :: DBSCAN

MinPt: 5; SearchDist: 500



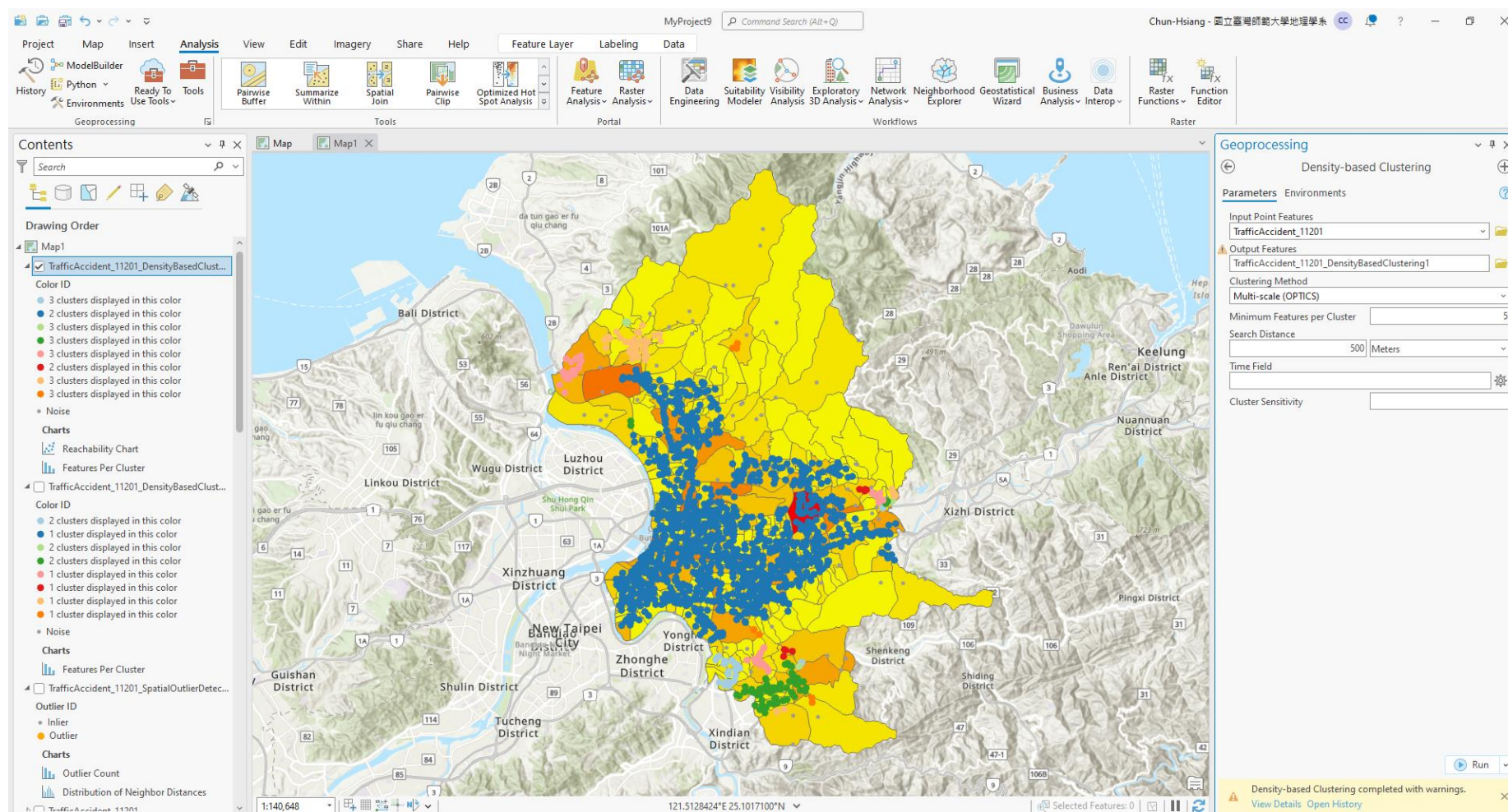
Density-based Clustering :: OPTICS

MinPt: 5; SearchDist: 500



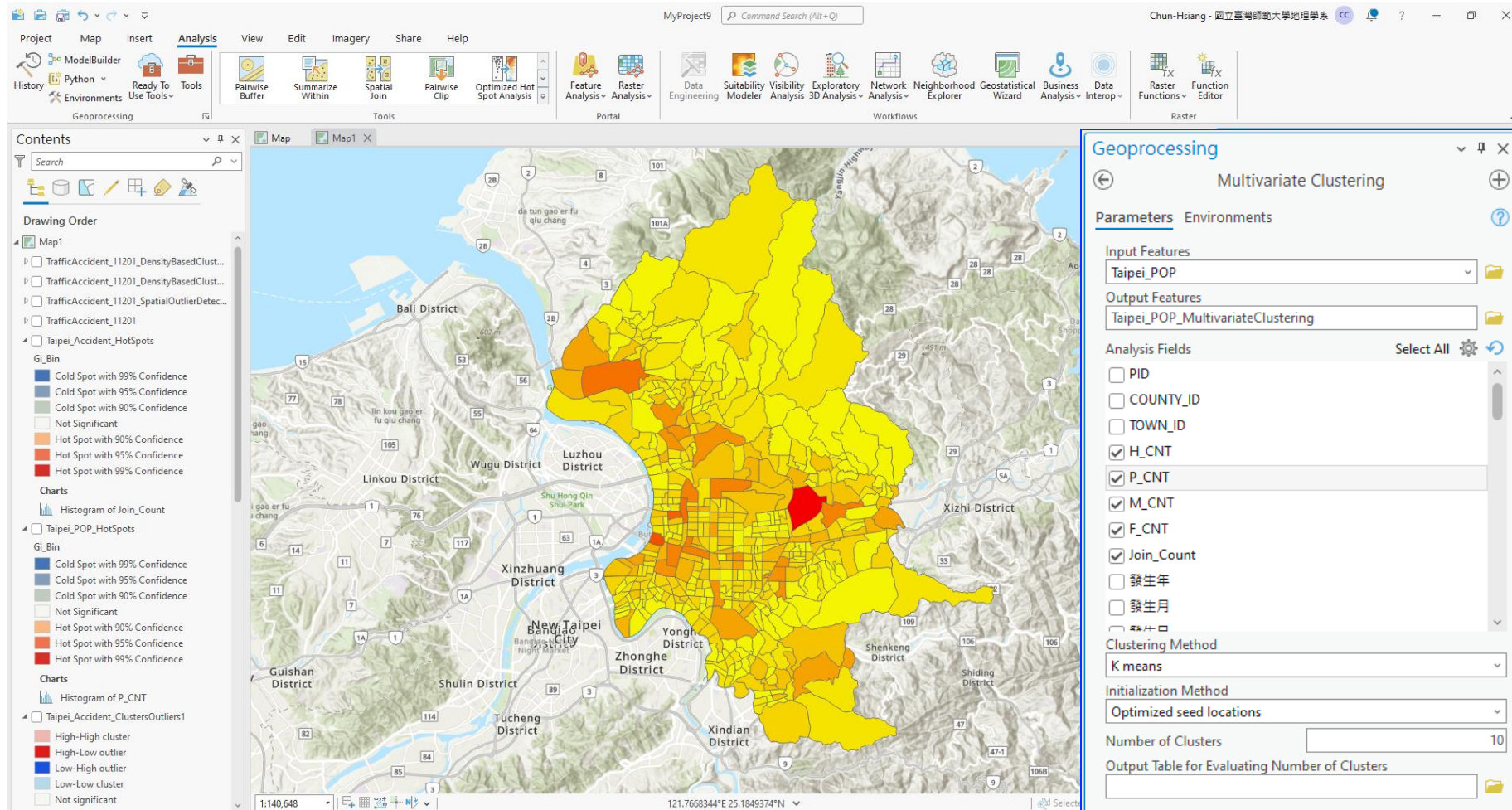
Density-based Clustering :: OPTICS

MinPt: 5; SearchDist: 500



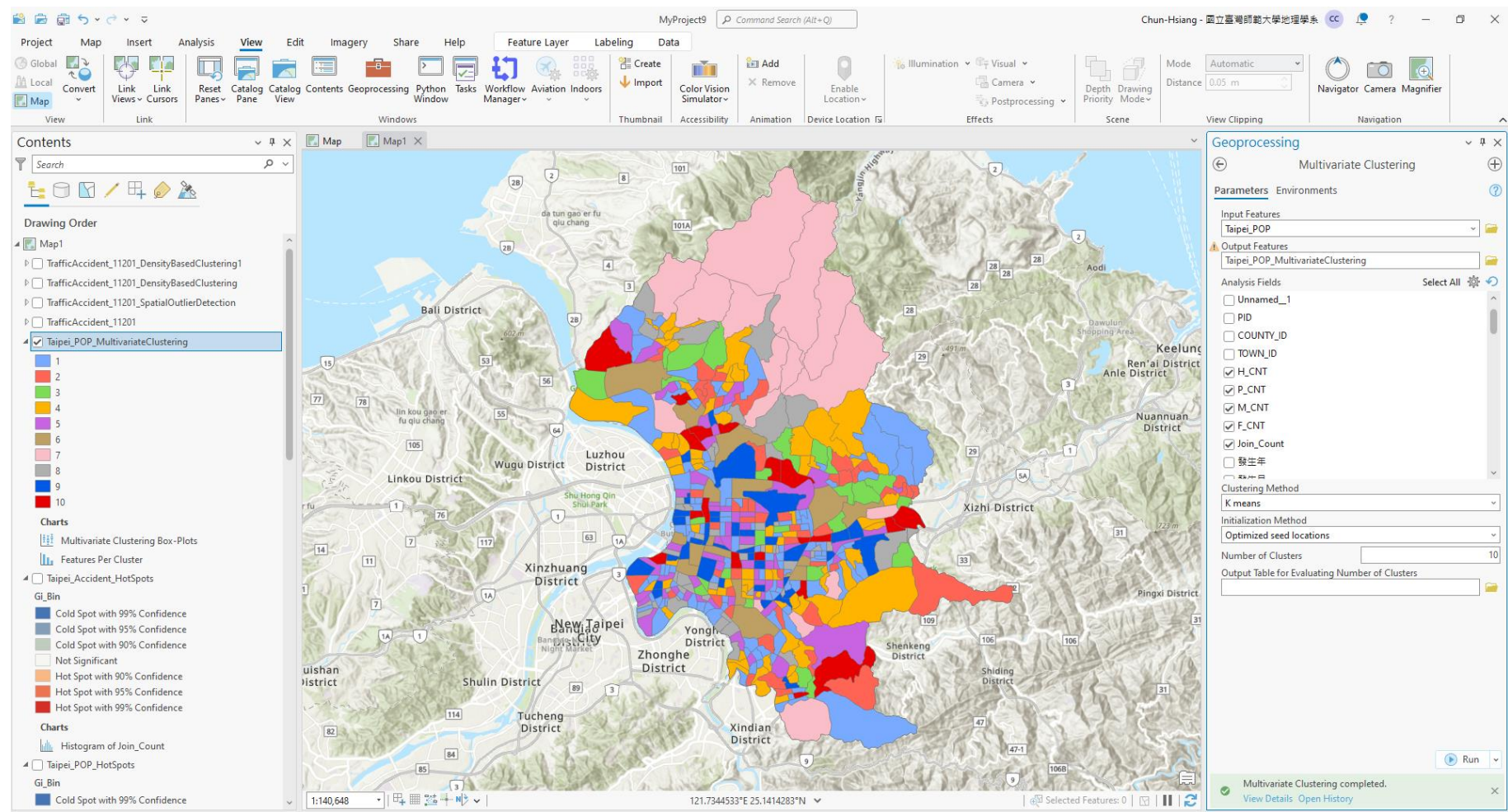
Multivariate Clustering :: *k*-means

NumCluster: 10



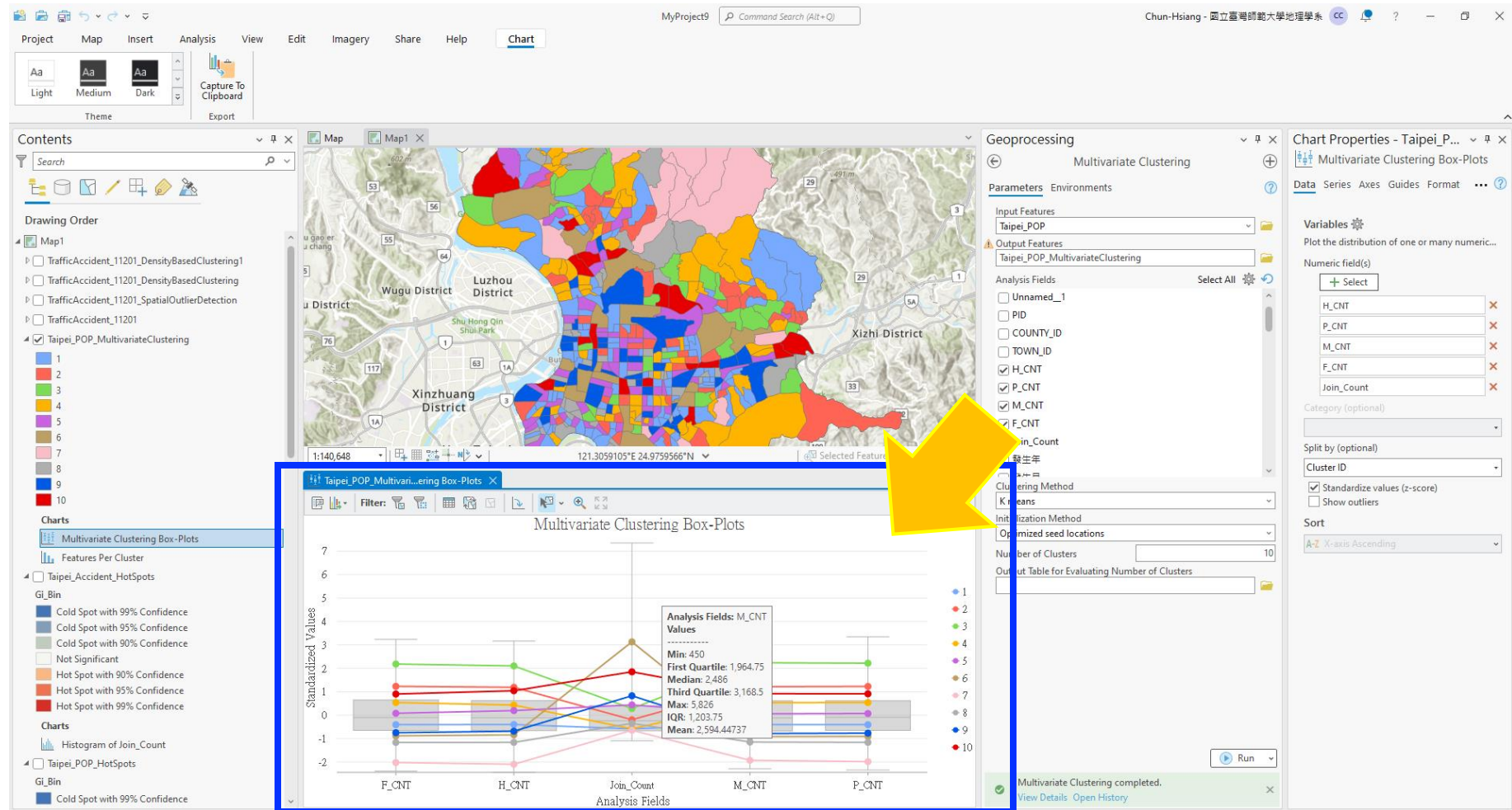
Multivariate Clustering :: *k*-means

NumCluster: 10



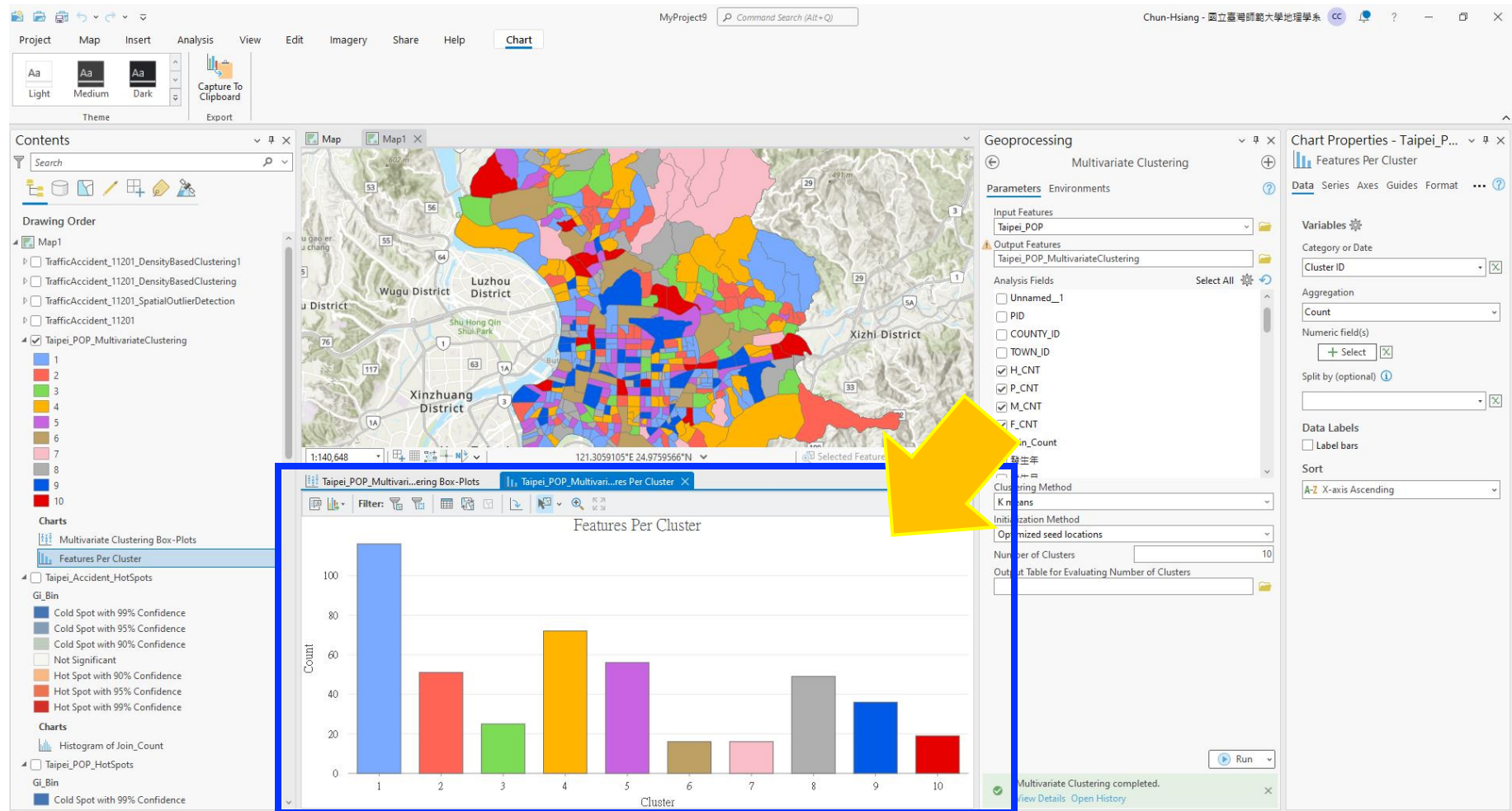
Multivariate Clustering :: *k*-means

NumCluster: 10



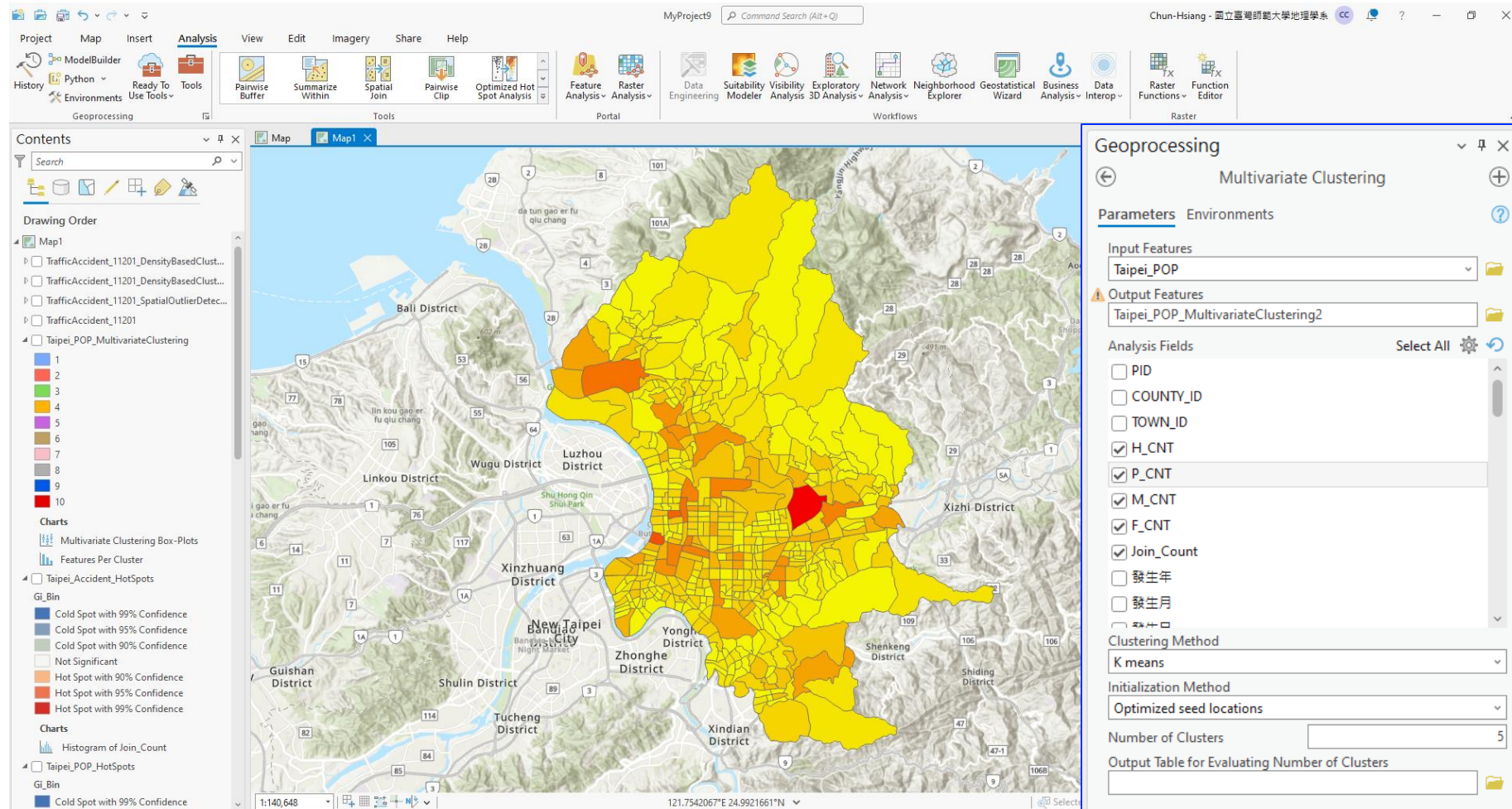
Multivariate Clustering :: *k*-means

NumCluster: 10



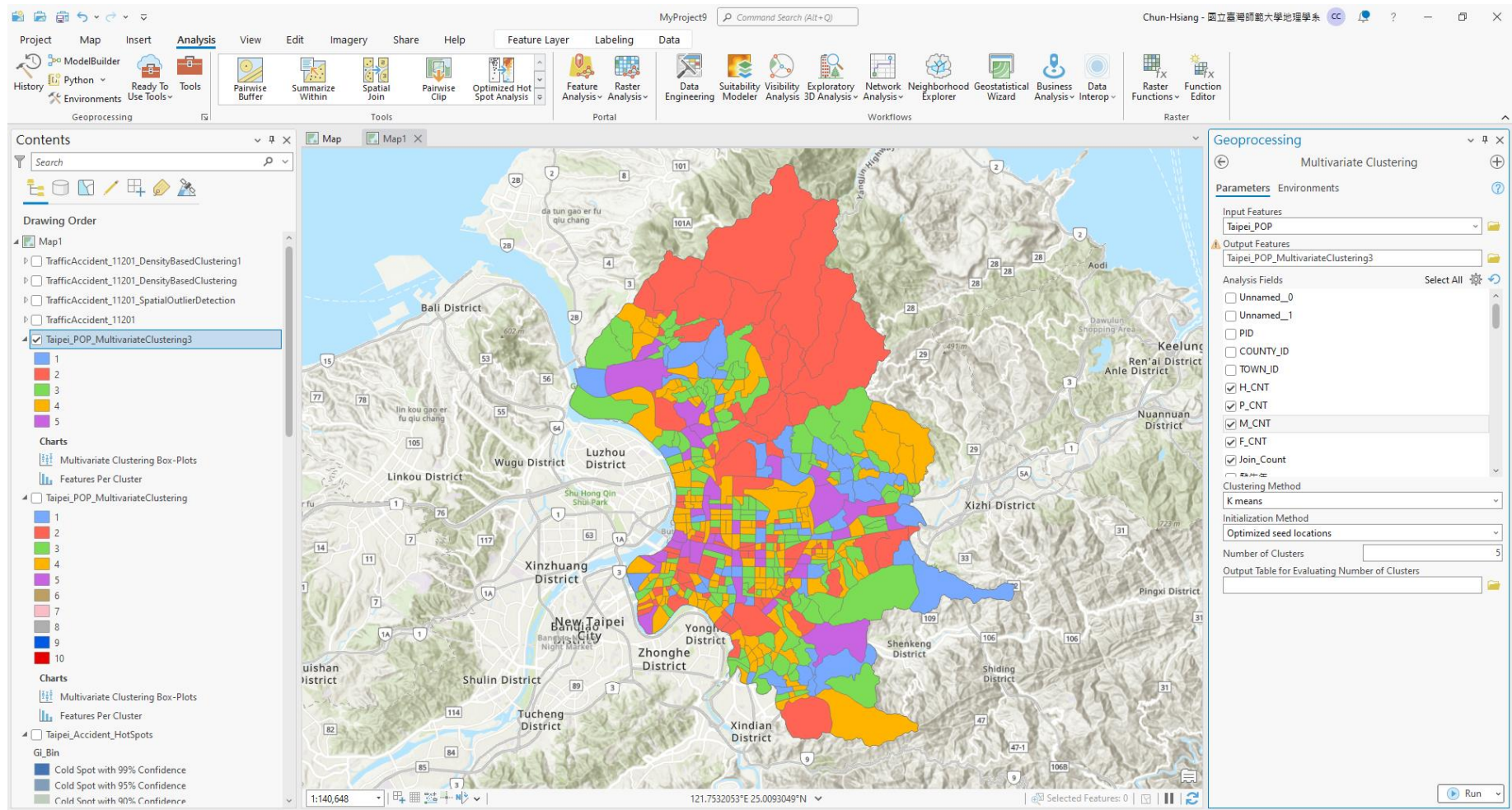
Multivariate Clustering :: *k*-means

NumCluster: 5



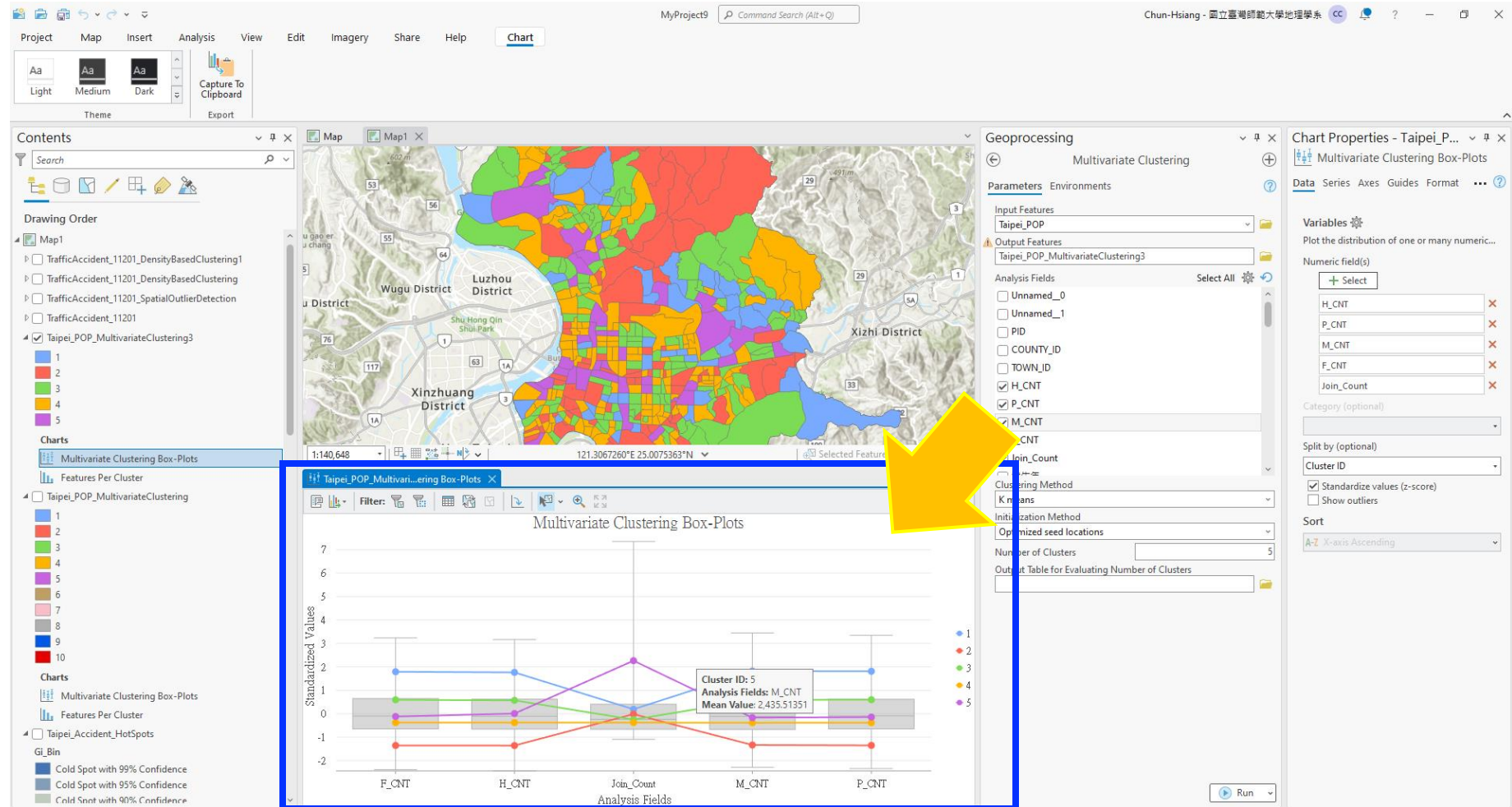
Multivariate Clustering :: *k*-means

NumCluster: 5



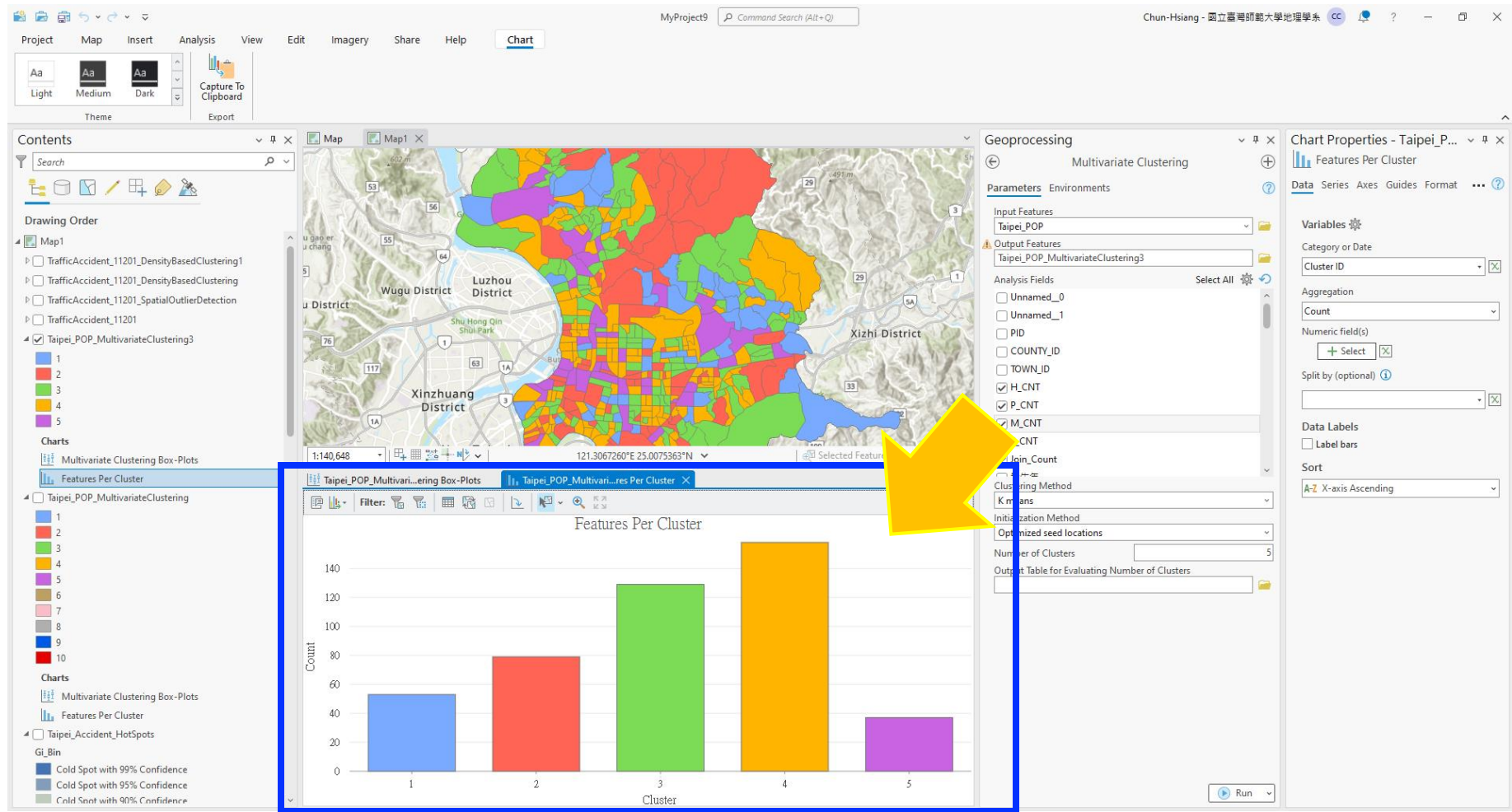
Multivariate Clustering :: *k*-means

NumCluster: 5



Multivariate Clustering :: *k*-means

NumCluster: 5



Notice

- You have to explain the meanings of the results point-by-point.
- For example...
 - We found that  district exhibited a statistically significant cold spot, whereas , , and  districts demonstrated statistically significant hot spots. Because the population of  was relatively low; however, the neighboring districts at least had an average population.
 - ...

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 are bright yellow and orange, contrasting against the dark blue of the oceans and the black of space.

The End

Thank you for your attention!

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Web: toodou.github.io