Lab9 地圖學與GIS _{定量主題地圖}:

點子圖、流動地圖、面量地圖、多變量地圖

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Thematic map

- ① 點子圖 (dot density map)
- ② 流動地圖 (flow map)
- ③ 面量圖 (choropleth map)
- ④ 整合應用
 - 雙變量面量圖 (bi-variate choropleth map)
 - 面量圖 + 比例符號

GIS processing

- 產生幾何中心點 (polygon centroid)
- Spatial join

• Review:

- ✓ Field calculator
- ✓ Calculate geometry

- ✓ Dissolve
- ✓ Join
- ✓ Data selection

Data

• 點子圖

- twn_population.shp (鄉鎮市區)
- twn_county.shp(縣市)
- 流動地圖
 - **OD data**: crude_oil.csv
 - region_level.csv
 - country.shp
- 面量圖
 - crime_103.shp
 - crime_104.shp
 - TPE_town.shp





- 觀察資料 (open attribute table)
 - 資料單位:鄉鎮市區
- 資料處理 (field calculator)
 - 老年人口數
- Quantities → Dot density



- 多少人為一點、點的大小
- 呈現上一層級的行政邊界







- ① 流動資料
 - OD data: pair data
- ② 工具:XY to Line
- ③ 資料處理:
 - 建立點
 - 計算XY坐標
 - Join資料

↑ 符合工具的input data所需的內容與格式



流動資料

OD table

	↓ 起點	↓ 終點	↓ 屬性資料			
	А	В	С	1		
1	orig	des	crude.oil			
2	US	US	0	● ◆ 一筆	資料	3
З	Canada	US	157.8			
4	Mexico	US	34.3			
5	South and Central America	US	79.7			
6	Europe	US	1.3			
7	Russia	US	1.4			
8	Other CIS	US	0.7	l	÷	
9	Middle East	US	74.1		US	(
10	Africa	US	14	US	0.0	
11	Australasia	US	0.5	Canada	157.8	
12	China	US	0	South and Central America	34.3 79.7	-
13	India	US	0.1	Europe	1.3	
14	Japan	US	0	Russia Other CIS	1.4 0.7	-
15	Singapore	US	0	Middle East	74.1	
				Africa	14.0	

Another type: OD matrix

	÷ US	÷ Canada	÷ Mexico	South ‡ and Central America	÷ Europe	÷ Russia	÷ Other CIS	‡ Middle East	÷ Africa
US	0.0	21.0	0.00	0.40	1.80	0.00	0.00	0.20	0.30
Canada	157.8	0.0	0.05	0.05	1.40	0.00	0.00	0.00	0.00
Mexico	34.3	0.0	0.00	0.40	13.70	0.00	0.00	0.00	0.00
n and Central America	79.7	0.6	0.00	0.00	14.60	0.05	0.00	0.00	0.00
Europe	1.3	0.8	0.00	1.20	0.00	0.05	0.05	0.05	0.40
Russia	1.4	0.0	0.00	0.90	158.50	0.00	23.20	0.20	0.90
Other CIS	0.7	0.6	0.00	0.00	56.00	2.90	0.00	6.60	0.70
Middle East	74.1	4.1	0.00	4.90	108.30	0.05	0.00	0.00	12.90
Africa	14.0	5.5	0.00	11.90	133.75	0.00	0.00	0.30	0.00

Data Management Tools \rightarrow Features \rightarrow XY to Line

	NY To Line	
OD data ←	 Input Table 	XY To Line
	 Output Feature Class 	Creates a new feature
		class containing geodetic line features constructed
起點坐標 ←	Start X Field	based on the values in a start x-coordinate field,
	Start Y Field	start y-coordinate field, end x-coordinate field, and end
	End X Field	y-coordinate field of a table.
終勐坐信←	End Y Field	
	▼ Line Type (optional)	
	GEODESIC	
	ID (optional)	
	Spatial Reference (optional)	
	GCS_WGS_1984	
	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·
	OK Cancel Environments	Tool Help

Data Management Tools \rightarrow Features \rightarrow Feature to point

🔨 Feature To Point		
Input Features Output Feature Class	Feature To Point Creates a feature class contai the representative locations of	ning points generated from
Inside (optional)	MULTIPOINT INPUT	OUTPUT
	Multipoint A	0 0 0 0
		OUTPUT
	Multipart line	2 5.
————————————————————————————————————	POLYGON INPUT	OUTPUT
産土党刊中心結←	Aultipart polygon	♦ 0
OK Cancel Environments << Hide Help	Tool Help	







Spatial Join

Ji fe	oin lets you append additional data to this layer's attribute table so you can, or example, symbolize the layer's features using this data.
V	Vhat do you want to join to this layer?
-	Join data from another layer based on spatial location $ullet$
	1. Choose the layer to join to this layer, or load spatial data from disk:
	🔅 crime_103 💽 🖻
	2. You are joining: Points to Polygons
	Select a join feature class above. You will be given different options based on geometry types of the source feature class and the join feature class.
	Each polygon will be given a summary of the numeric attributes of the points that fall inside it, and a count field showing how many points fall inside it.
	How do you want the attributes to be summarized?
	Average Minimum Standard Deviation
	Sum Maximum Variance
	Each polygon will be given all the attributes of the point that is closest to its boundary, and a distance field showing how close the point is (in the units of the target layer).
	Note: A point falling inside a polygon is treated as being closest to the polygon, (i.e. a distance of 0).
	3. The result of the join will be saved into a new layer.
	Specify output shapefile or feature class for this new layer:
	H:\r05228031\crime_choropleth\Join_Output.shp
	bout joining data

Output: shapefile ←



雙變量面量圖+比例符號 台北市103-104年住宅竊盜增加率&人口密度&平均所得地圖

← derived values

← derived values

← total values; ratio

>>> >> > ><

- 住宅竊盜增加率
- 人口密度
- 平均所得税
- •表現方式:
 - Multiple attributes
 - 2 **Bi-variate 3×3 label**



	Join	15 & Relates		Time		HTML Pop	up
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① Multiple attributes

1+2

• <u>1類別在2屬性</u>上的變異

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					確定	2 取消	套用(A)

# ① Multiple attributes - 1





# ① Multiple attributes - 2

Layer Properties						<b>-</b>	Draw quantities using color to show values. Way1:	
Joir	ns & Relates		Time Shareholo an		HTML Popup		Value: growth Natural Breaks (Jenks) graduat	ted
General Source	Selection	Display	Symbology	Fields	Definition Query	Labels		
Features Categories Quantities Charts Multiple Attributes	Draw quantitie	s for each c	Label	r Scheme ation by olor Ram <u>p</u>	Import Symbol Size Count	2	Color mamp:          Symbol       Range         -0.458333       -0.458333         -0.458332 - 0.176471         -0.458332 - 0.176471         -0.176470 - 0.043478         -0.176470 - 0.043478         -0.043479 - 0.375000         0.043479 - 0.375001         0.375001 - 0.818182         O.375001 - 0.818182         Show class ranges using feature values	
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				確定	取消	(A)	OK Cancel	

## ② Bi-variate 3×3 label

- 3×3 label → 9類
- Field calculator: if else 條件式分成9類
- 針對9個類別分別指定顏色



# If – else in field calculator

Dim density	— 定義函數	Field Calculator	
If [den_class] = "L" And [grow_class] = "L" Then density = "1"		Parser VB Script   Python	
elseif [den_class] = "L" And [grow_class] = "M" Then density = "2"		Fields:	Type: Functions:
elseif [den_class] = "L" And [grow_class] = "H" Then density = "3"		TOWN_ID TOWN COUNTY_ID	String         Cos ( ) Exp ( )           Date         Fix ( ) Int ( )           Log ( )         Fix ( )
elseif [den_class] = "M" And [grow_class] = "L" Then density = "4"	if-else	COUNTY FID_1 FID_12 FID_1_1	Sin ( ) Sqr ( ) Tan ( )
elseif [den_class] = "M" And [grow_class] = "M" Then density = "5"		Show Codeblock Pre-Logic Script Code:	
elseif [den_class] = "M" And [grow_class] = "H" Then density = "6"		Dim density If [den_class] = "L" And [grow_class] = " density = "1"	'L" Then
elseif [den_class] = "H" And [grow_class] = "L" Then density = "7"		elseif [den_class] = "L" And [grow_class] density = "2"	i = "M" Then
elseif [den_class] = "H" And [grow_class] = "M" Then density = "8"		ttl_class = density	
else density = "o"		About calculating fields	<u>C</u> lear Load <u>S</u> ave
end if			OK Cancel

### Hint:台北市103-104年住宅竊盜增加率&人口密度&平均所得地圖

- Step1: 決定各變數應以何種方式繪製、呈現
- Step2: 整理繪圖所需的資料樣態
  - 連續/離散資料?
- 善用圖層疊加繪製地圖

# This lab...

• Thematic map:點子圖、流動地圖、面量地圖、多變量地圖

### GIS processing

- Feature to point (產生幾何中心點)
- Spatial Join
- Field calculator
- Calculate geometry
- Dissolve
- Join
- Data selection



- 1. 105年全國人口分布點子圖
- 2. 全球石油交易流動地圖
  - □ 查核點:
    - ✓ 呈現石油出口量大小
    - ✓ 呈現流動量大小
    - ✓ 選擇任一種世界地圖的投影方法,並以文字註解
- 3. 台北市103-104年住宅竊盜增加率&人口密度&平均所得地圖
  - □ 查核點:
    - ✔ 以1張地圖呈現3個變量
    - ✓ 文字說明地圖中看到的現象

- 繳交檔案:3張地圖(.jpg) 壓縮上傳至ceiba作業區
- 繳交期限: 5/25 (五) 中午12點



