Key Dates

Due**: February** 21

Objective

包含選項及操作的地理資訊圖表

Dataset

資料內容為 1800 年起的美國森林大火紀錄，記錄每次事件的影響地區（Data.gov）。近年來因氣候變遷的影響，森林大火的密度和頻率增加，對民眾的生命財產有巨大的影響。美國政府的資料數量共約 33,000 筆，在此次資訊圖表中不需全數涵蓋，請使用所提供已整理過的 dataset 即可。

Deliverables

每個 Task 的 py 檔請分開提供，以 Task1, 2, 3, 4 區別即可

Tasks

Task 1. US County Map with Tooltip (25%)

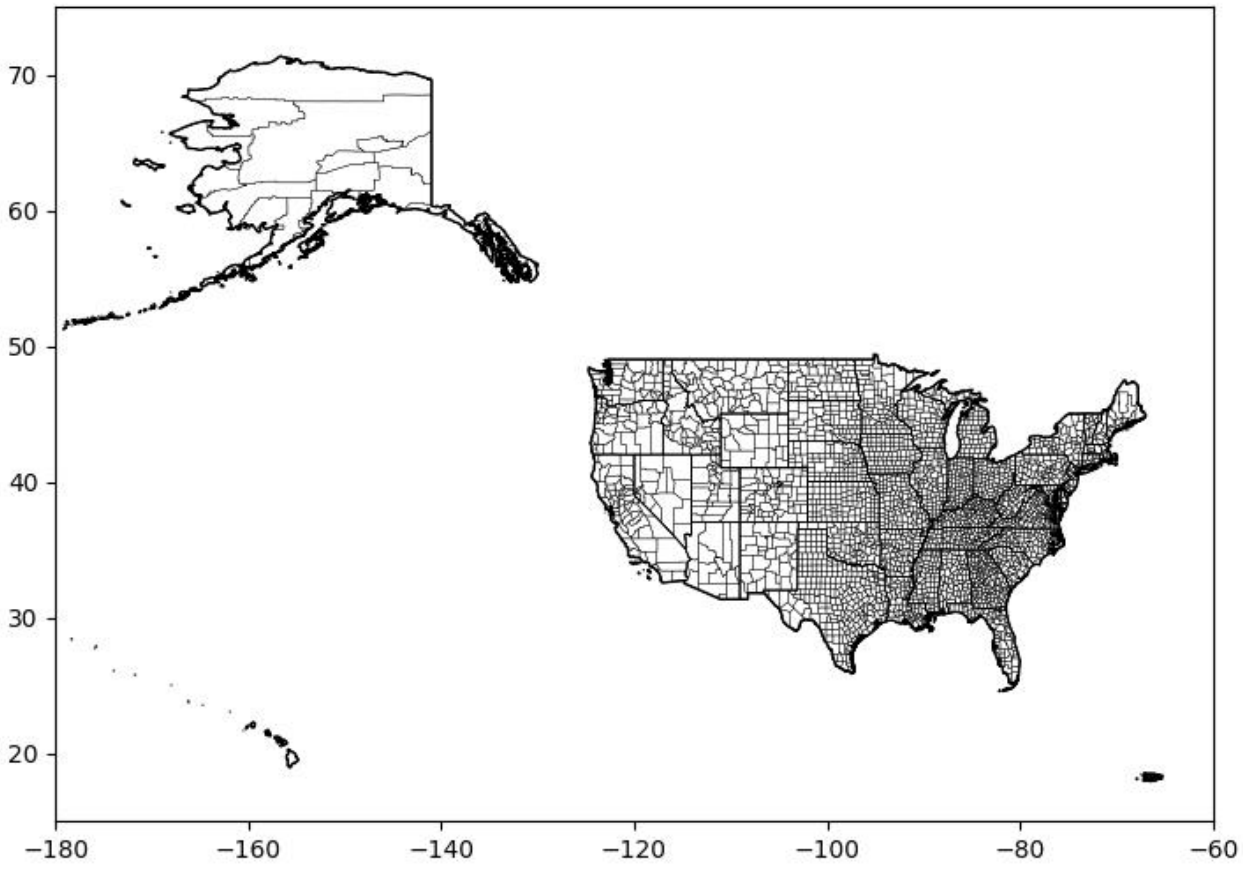
製作地圖，需包含：（1）國家（country）邊界、（2）每個州（state）的邊界，以及（3）每個市（county）的邊界。地圖繪製完成後，需加上 tooltip 標示州名和市名，tooltip 需滑鼠移動到相對位置時才顯示。

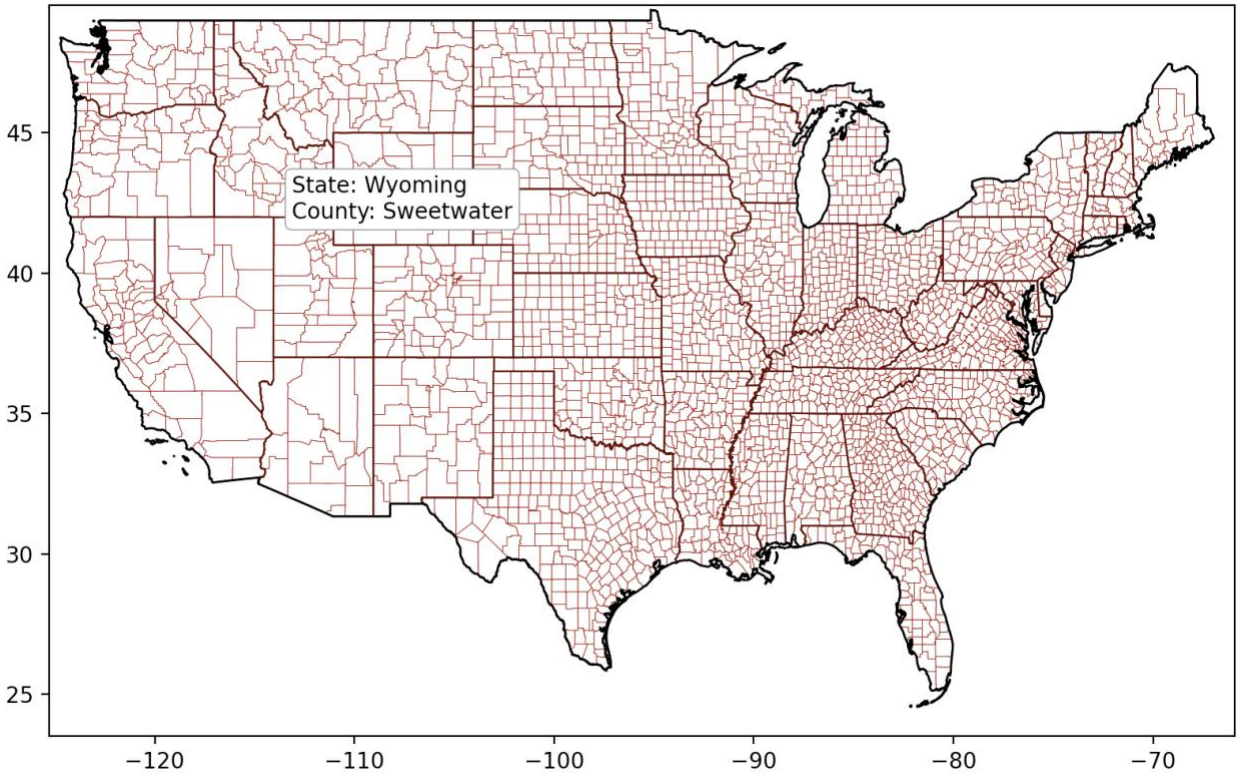
Note: 製作 tooltip 時，可能會碰到無法 hover 和跟蹤機制可能無法正常運作的狀況，因為 county 邊界內是空的/填色區域而非 glyphs。替代方案是使用滑鼠的空間座標來確定包含它的是哪個市。具體而言，需要先辨識包含該點的州，然後辨識包含該點的州內的市。州和市的資料會透過 GeoJSON 檔案提供，且可利用 library 如 shapely 去測試是否包含在他們各自的邊界中。

For the first task, you will visualize a map of the United States that will show 1) the border of the country, 2) the border of every state, and 3) the border of every county. In particular, you should create your visualization in such a way that states' borders remain distinguishable. To enhance your visualization, you will add a tooltip that indicates the name of the state and county in which the mouse is located. The tooltip will only be shown when the mouse button is clicked instead of being continuously displayed.

Important note: the standard hover tracking mechanism may not work properly here since selections will be made within counties, which are empty (and possibly colored) regions and not glyphs. An alternative solution to implement the tooltip consists in using the spatial coordinates of the current mouse position (in data space) to determine which county contains it. Practically, you will probably want to proceed in two steps: first, identify the state that contains the point, then identify the county within that state that contains the point. The geometry of each state and county is provided to you in the form of GeoJSON maps and you can use a library like shapely to test for inclusion in their respective borders.

Sample results:


70
60
50
40
30
20
−180
−160
−140
−120
−100
−80
−60


State: Wyoming
County: Sweetwater
45
40
35
30
25
−120
−110
−100
−90
−80
−70

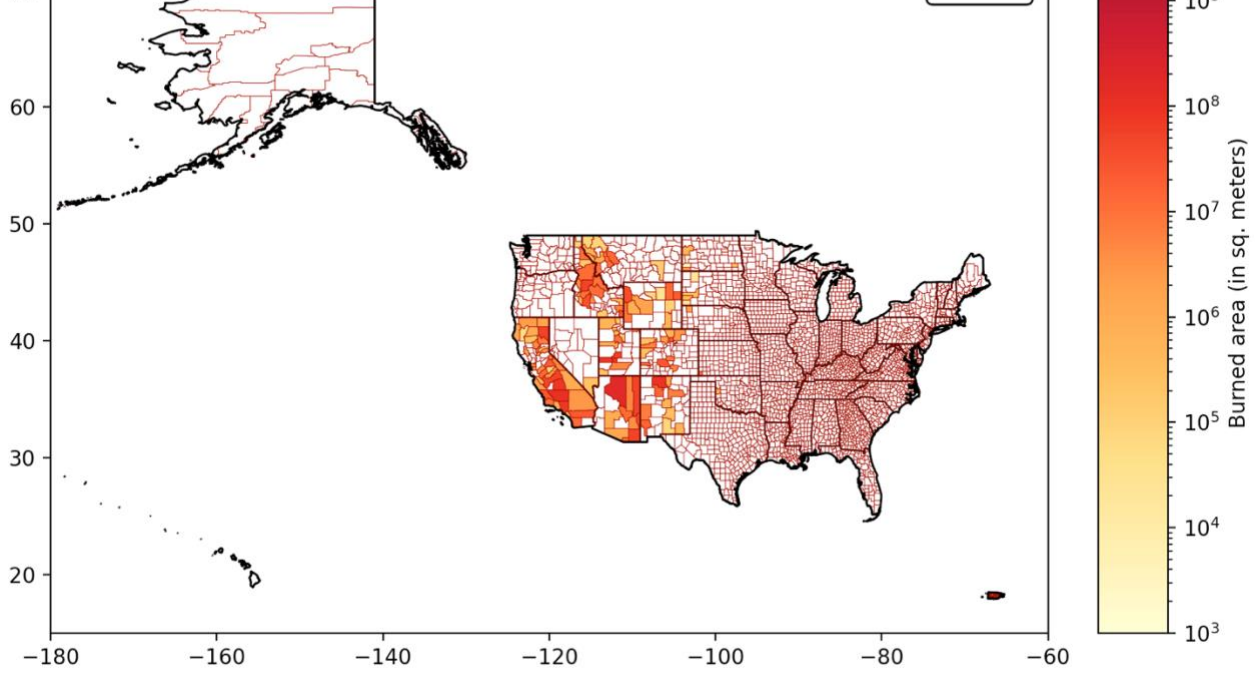
Task 2. Choropleth of Yearly Wildland Fires (25%)

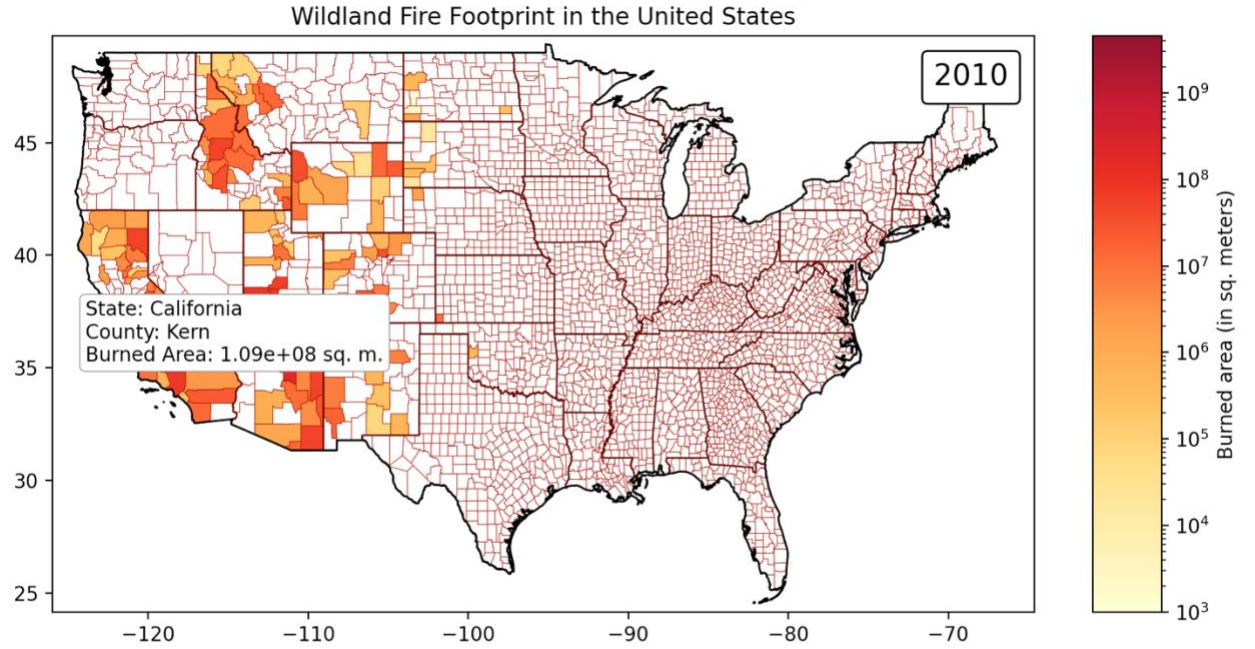
視覺化年度森林大火的紀錄。資料中會有每年和影響範圍的資料，請使用 choropleth 提供資訊，用顏色代表每個市的值，且需加上說明顏色與值的圖例，並在 tooltip 中加入影響範圍的值。最後，請加上讓使用者可以操控的 slider bar，讓使用者可以選擇看到不同年份的資訊圖表。

For the second task, you will visualize the yearly records of wildland fires that I am providing you. As indicated previously, you will have for each year and for each county the area (in acres) that was burned. You will visualize that information with a choropleth that maps each county to a color representation of that value. You will include a color bar to indicate how values map to colors. In addition to the name of state and county, your tooltip will also indicate the value of the burned area. Finally, you will provide a slider bar GUI to allow the user to select and change the year that is visualized. Note that the color map and color bar should remain unchanged when the year changes (so that values can be compared across years), which will require you to set its bounds appropriately (*). Final point, you will use a logarithmic scale for your color mapping.

(*) FWIW the maximum per-county area burned is about 4.6e+9 square meters.

Sample results:


Wildland Fire Footprint in the United States
2010
70
60
50
40
30
20
−180
−160
−140
−120
−100
−80
−60
10^9
10^8
10^7
10^6
10^5
10^4
10^3
Burned area (in sq. meters)


Wildland Fire Footprint in the United States
2010
State: California
County: Kern
Burned Area: 1.09e+08 sq. m.
45
40
35
30
25
−120
−110
−100
−90
−80
−70
10^9
10^8
10^7
10^6
10^5
10^4
10^3
Burned area (in sq. meters)

Task 3. Cumulative Visualization (25%)

完成年度資料後，接下來請製作包含多年資料的累積影響。具體來說，若給定一個年份 Y，需創建一個等值線，顯示每個市的 Y-N+1 年和 Y 年之間所有燒毀面積的總和。此處的 N 扮演一個時間尺度的角色，在此時間尺度上的年度影響總和。在前一項工作中已建立一個 slider bar，現在需在建立第二個，讓使用者可以控制參數 N 的值，範圍請設定在[1,50]，其中值 1 應可看到一年的資料，依此類推。如前一項工作所是，同樣地，無論透過操作的各種選擇如何，都應以一致的方式選擇顏色的表示及右方的顏色圖例，但可視化的其餘部分應隨著使用者的選擇而有所變化。

Now that you have visualized individual yearly records, you will visualize the cumulated effect of wildland fires over multiple years. Specifically, given a selected year *Y*, you will create a choropleth that shows in each county the sum of all the burned areas between the year *Y-N+1* and the year *Y*. Here, *N* plays the role of a *temporal scale* at which the yearly effects are aggregated. Compared to the previous task, you will add to your GUI a second slider bar to control the value of this parameter *N*. Practically, you should allow that value to be selected in a range [1, 50], whereby a value of 1 corresponds to visualizing a single year, as in Task 2. Again, your color scale (and therefore your color bar) should be selected in such a way as to remain unchanged regardless of the various selections made through the GUI. However, the rest of your visualization should automatically adjust to any selection changes made through the GUI.

Sample results: （待提供）

Task 4. Visualizing the Evolution of Wildland Fires (25%)

最後一項工作的目標是生成先前生成的資料圖表的時間動畫。也就是說，給定時間尺度 N 的選擇，資料巡表應該顯示從 1800 到 2021 連續更動年

份選擇的結果。具體來說，使用者應該能夠透過使用開始、停止和倒帶動畫按鈕，請將這些控制按鈕加到現有的圖表上。

The previous steps laid the groundwork for this final task. Your goal here is to produce a temporal animation of the visualizations created previously. That is, given a choice for the time scale *N* your visualization should show the result of continuously changing the year selection, from 1800 to 2021. Concretely, the user should be able to start, stop, and rewind the animation through the use of corresponding buttons. You will therefore need to add these buttons to your existing GUI.

Sample results: （待提供）

Data Set

Wildland_fires_1800-2021.json: 1800 年至 2021 年的森林大火紀錄

us_map.json:美國地圖線框圖

us_states_map.json:美國各州及邊界地圖

us_counties_map.json: 美國縣市地圖

fips.csv: 美國各州及各縣市 FIPS codes，這些 codes 可以讓你轉換在森林大火紀錄檔案中的州的 codes 和縣市地圖及其相對應的名字。