**Instruction file with step-by-step instructions for each figure**

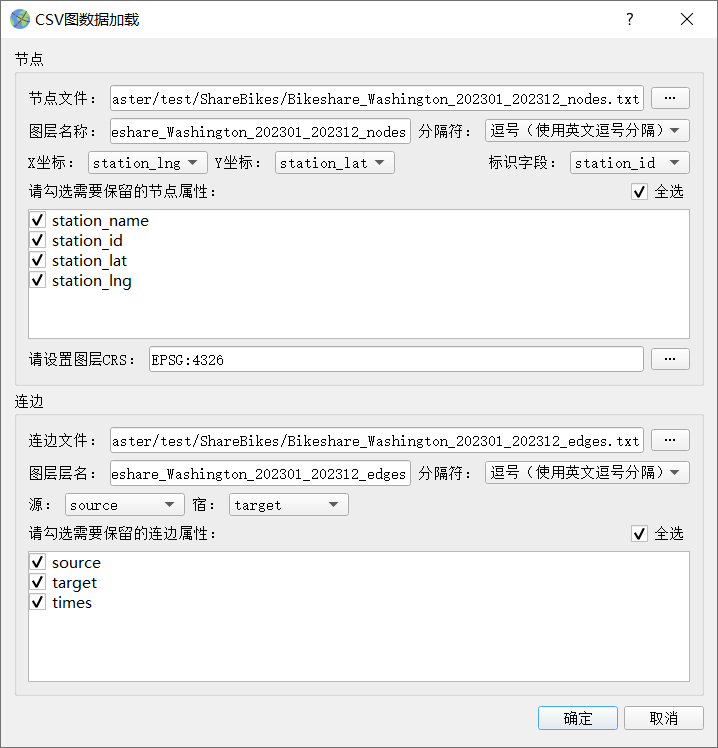
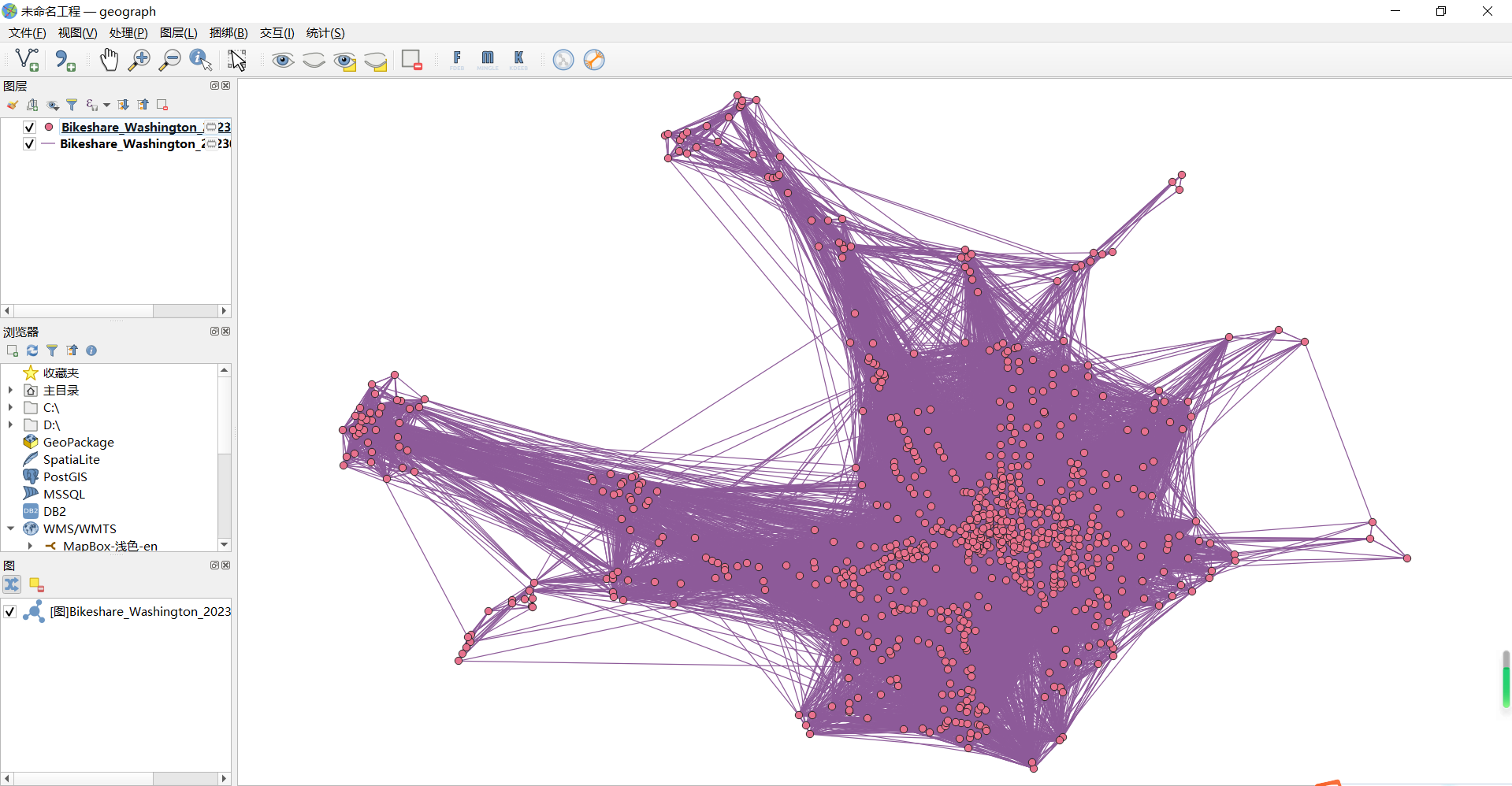
1. **Installation Tutorial**
2. Install QT 5.12.10 and configure QT environment variables.
3. Installing Python 3.10.9 and configure Python environment variables.
4. Modify the configuration path in the bin/qgisbuildpath.txt file to the path corresponding to the file on your computer.
5. Open the geograph.sln file in the src folder, compile and run it
6. **Instructions for Figures and Tables**

The step-by-step instructions are as follows:

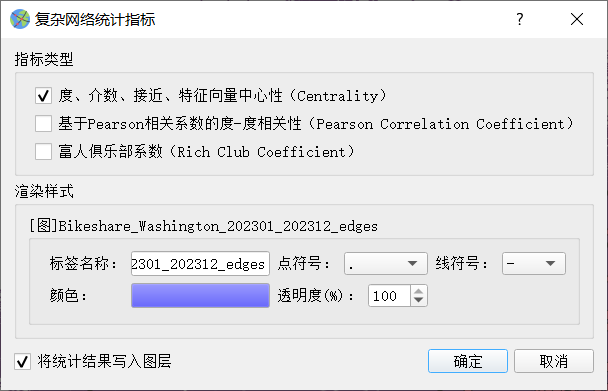
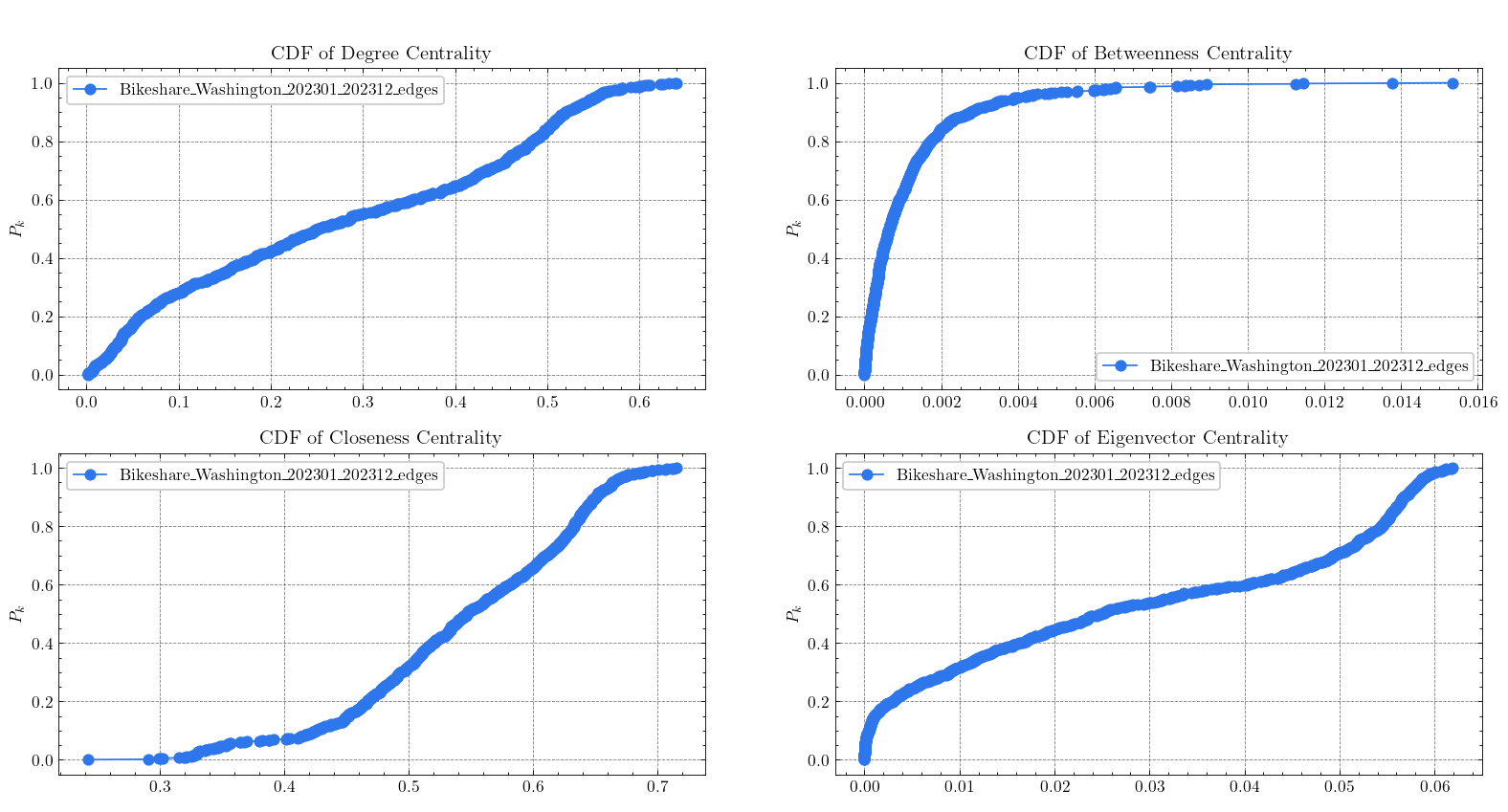
2.1 Table 1

(1) Run geography.

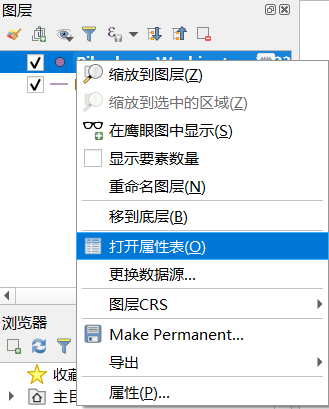
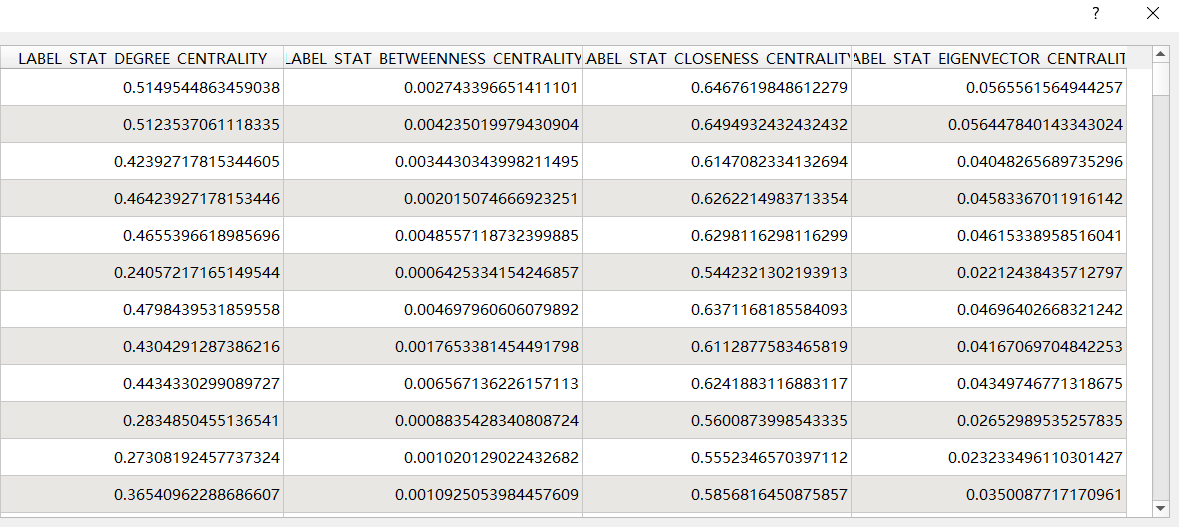
(2) Click on icon “” and open the graph data loading dialog. Load four network data from the “ShareBikes” folder, and fill relevant information in the corresponding line edit box. Click the ok button, and then the visualization result of networks is displayed. (Take the Washington data as an example)

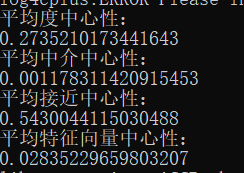
(3) Click on menu “” and open the statistical dialog of network. Click the ok button, and then the diagram of CDF curves is displayed. (Take the Washington data as an example)

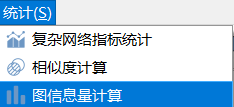
 

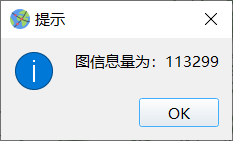
(4) Close the diagram of CDF curves, and select the node layer. Then, click the right button and pop-up the context menu. Click the “open attribute sheet” item, and the values of DC, BC, CC and EC are shown.

As for the average values of DC, BC, CC and EC, you can find them from the console. (Corresponding to the third row in Table 1)

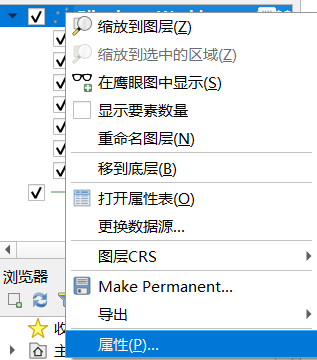
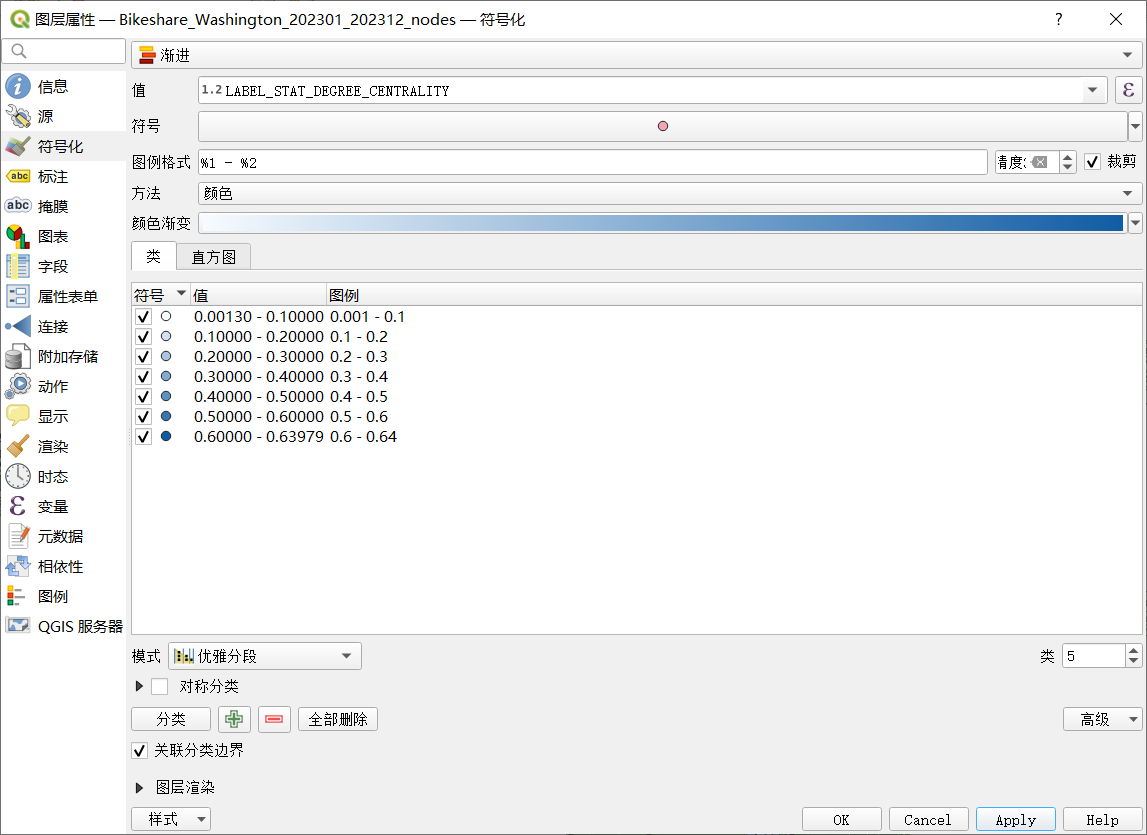


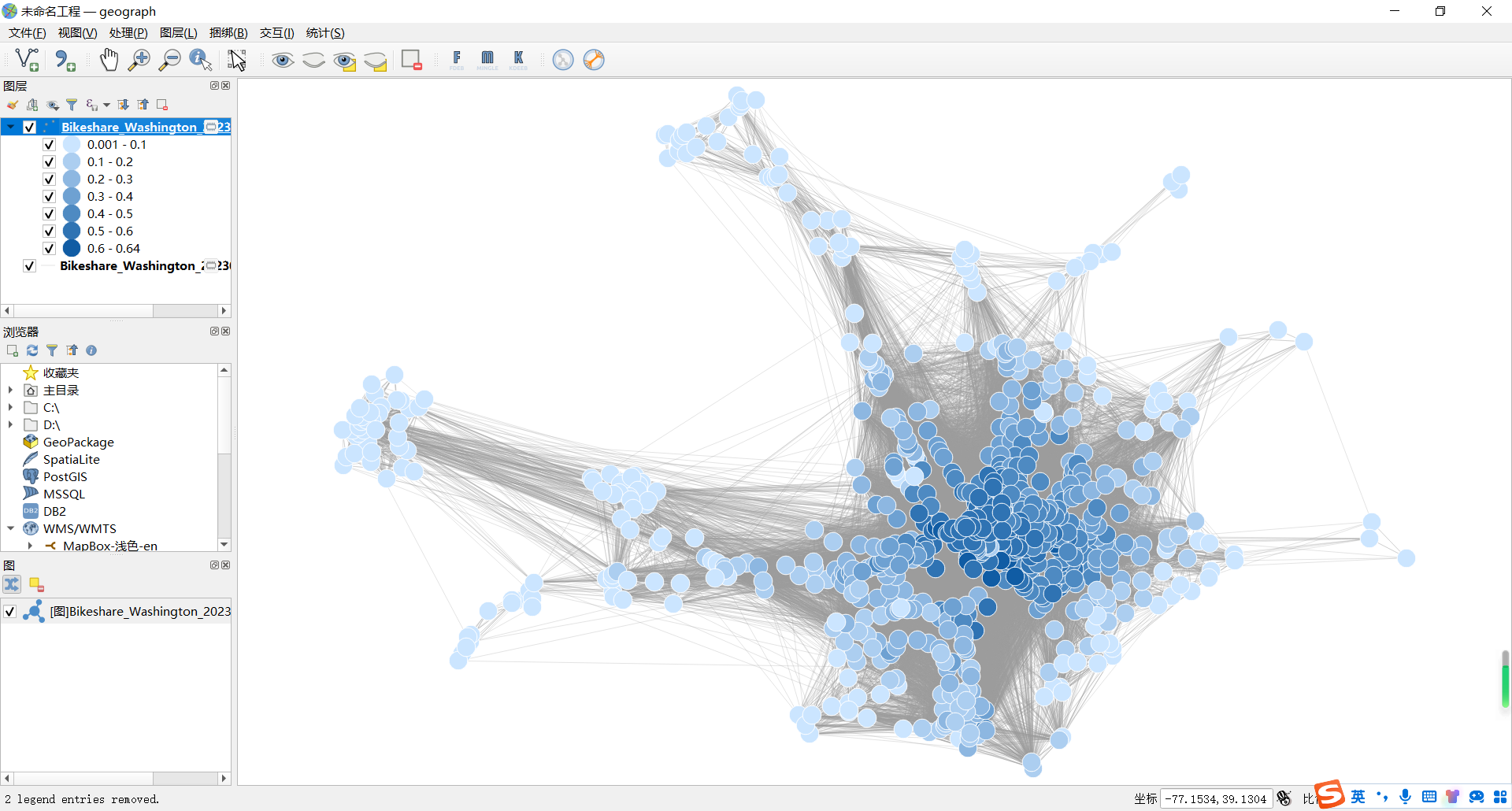
(5) Click the menu “” and pop-up the dialog of network information amount. (Corresponding to the third row and last column in Table 1)



2.2 Figure 1

Right click on the node layer item, and open the properties dialog. Select an indicator as the grading value, and click the ok button. (Take the DC as an example)

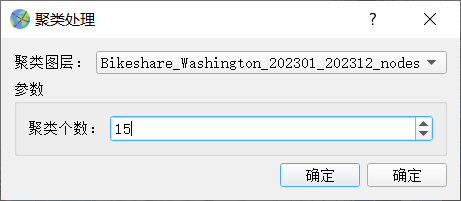
 



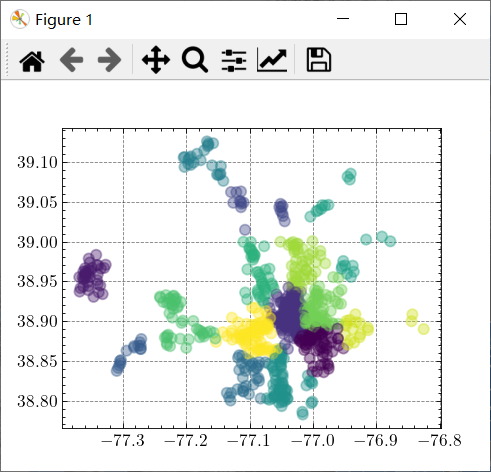
(Corresponding to the result of Washington in Figure 1)

2.3 Figure 3

(1) Click the menu of clustering, and open the dialog.(Take the Washington data as an example)

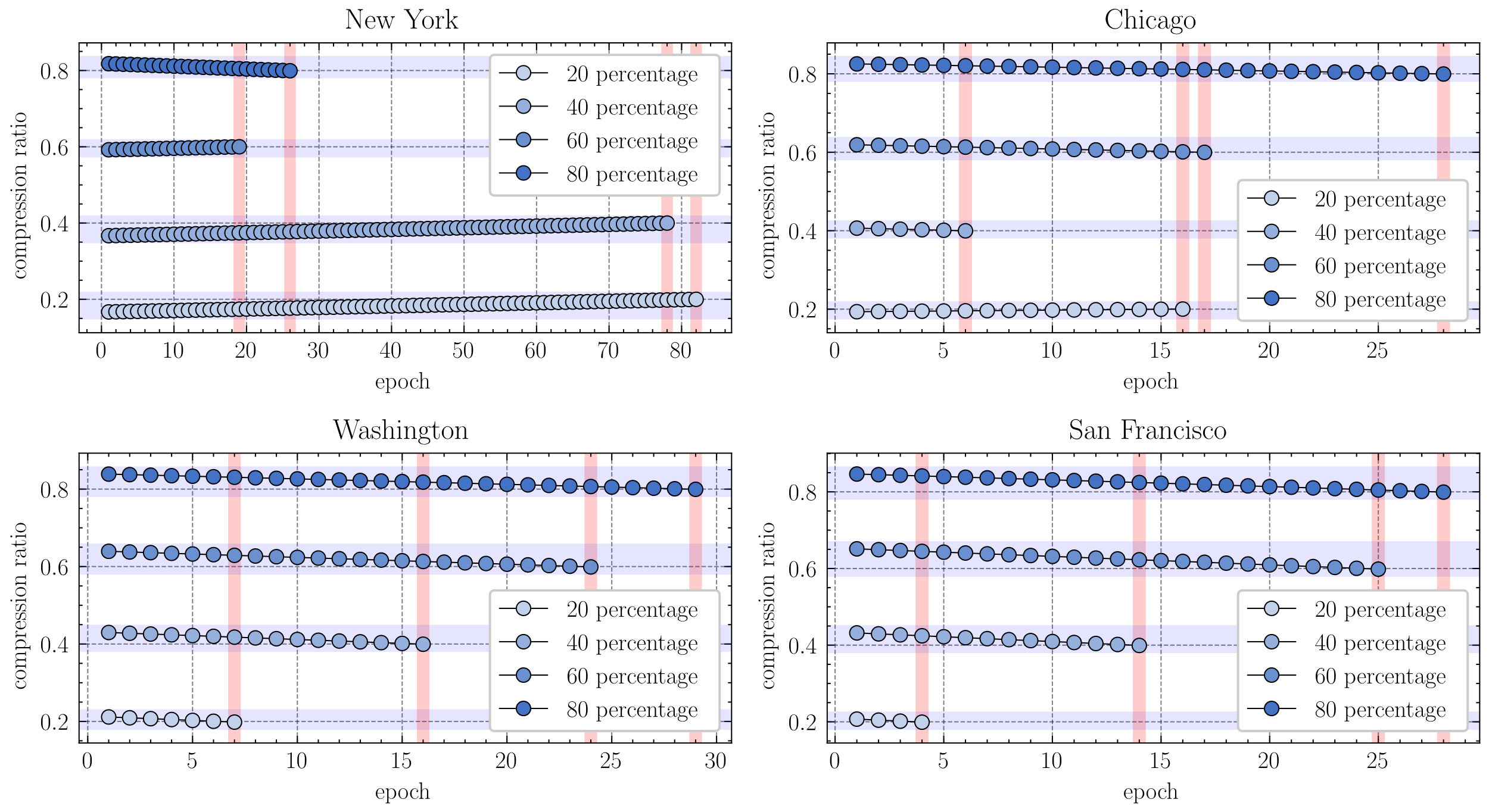
 

(2) Click the ok button to show the diagram of clustering. (Corresponding to the result of Washington in Figure 3)



2.4 Figure 4

You can install a VS Code software to run the code, or run the Python script directly. (drawCurves.py in the “Python” folder)

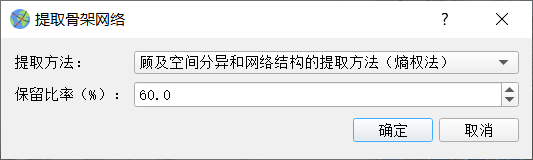


2.5 Figure 6

(1) Calculate indicators (DC, BC, CC, and EC) for spatial interaction networks. (Please refer to 2.1 for the corresponding operation steps)

(2) Clustering for nodes of spatial interaction networks. (Please refer to 2.3 for the corresponding operation steps)

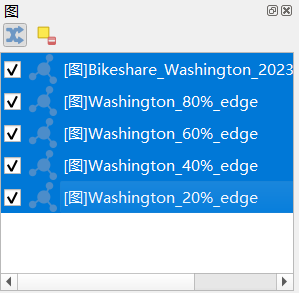
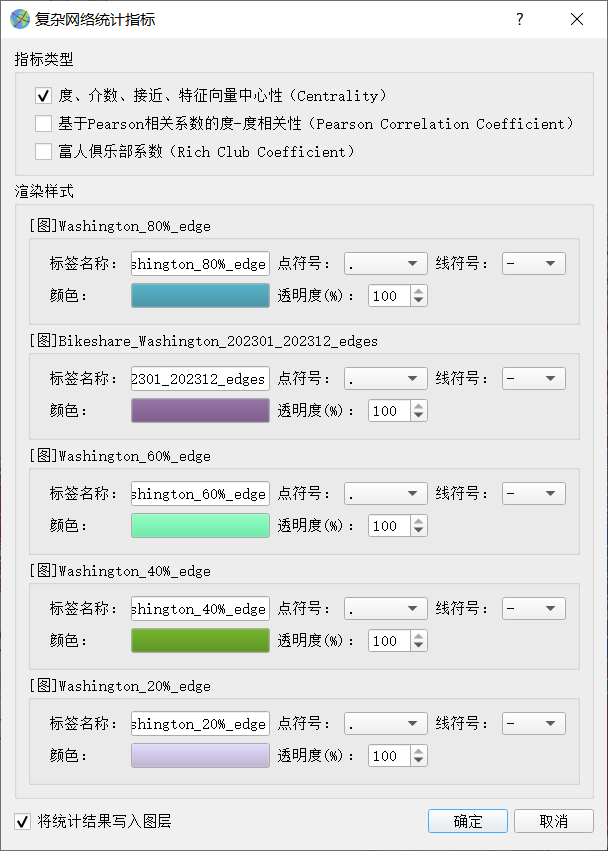
(3) Click the skeleton extraction menu to open the dialog. There are 5 skeleton extraction methods in the drop-down menu, among which the first item corresponds to the proposed method in this paper.

(4) Click the ok button to execute the skeleton extraction. (Due to the large scale of data in spatial interaction networks, extraction operations may take several hours)

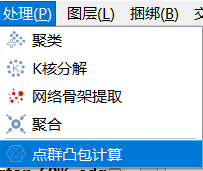
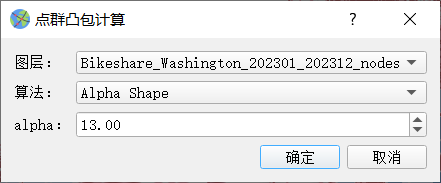
2.6 Table 4

Please refer to 2.1 (1)-(3) for the corresponding operation steps. The difference is that multiple networks need to be selected simultaneously to display multiple CDF curves. (Press the Ctrl key for multi-selection)

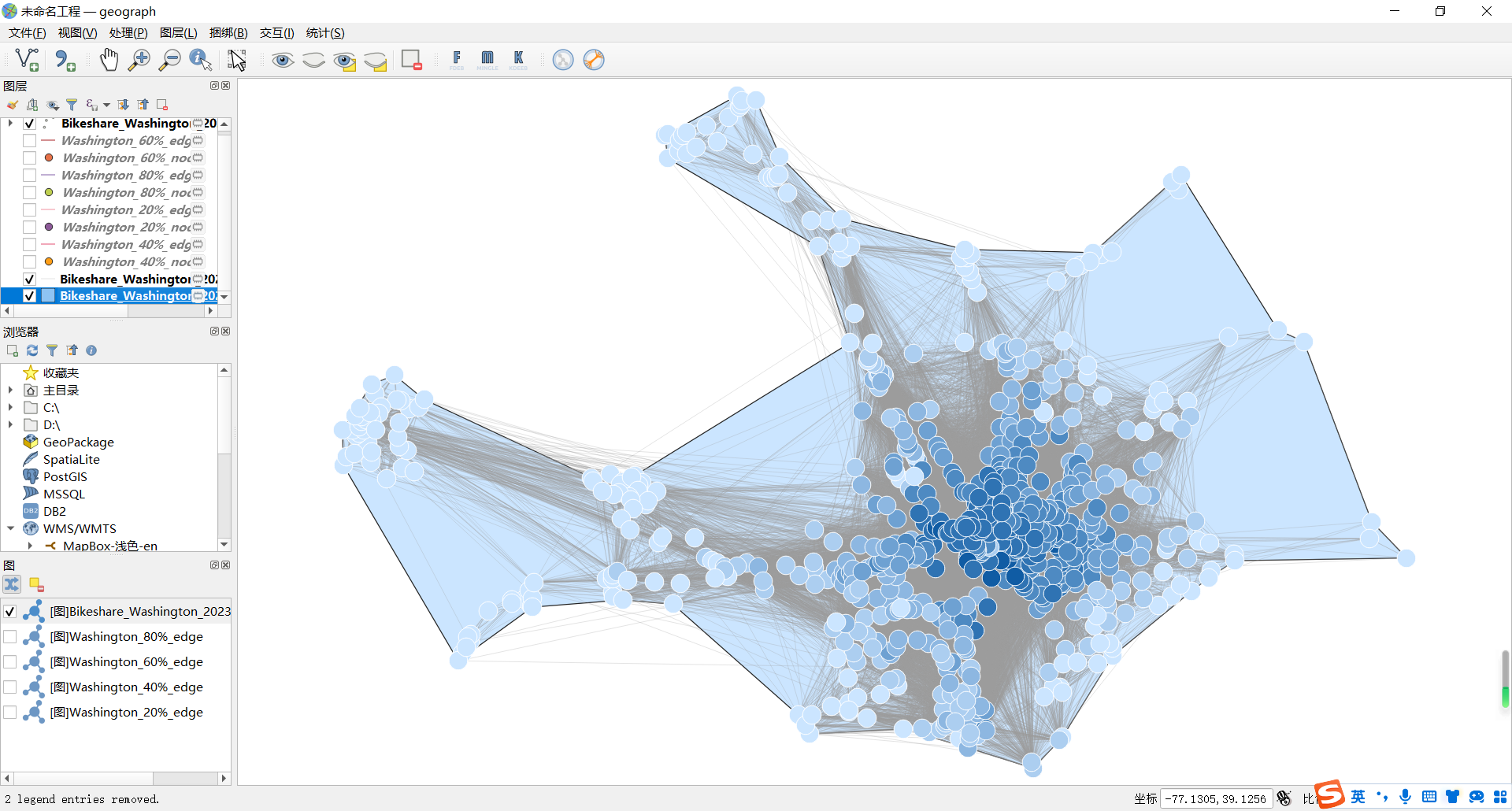
 

2.7 Figure 8

(1) Click on the menu item of convex hull calculation to open the dialog.

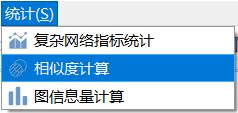
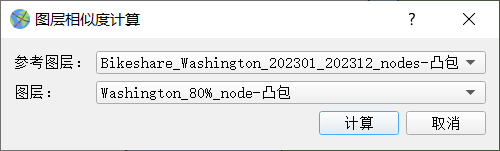
(2) Select the Alpha-shaped Algorithm in the drop-down list. Set the value of alpha to 13. Click the ok button. (Take Washington as an example)



2.8 Table 5

(1) Calculate the convex hulls of networks referring to the steps in 2.7.

(2) Click on the similarity calculation menu item to open the dialog.

(3) Select layers in the drop-down list for similarity calculation. Click the ok button to show the results. (The first value is the length similarity, the second value is the area similarity, and the third value is the center offset)

