THE GALLERY OF CALLIGRAPHY

TEAM 6

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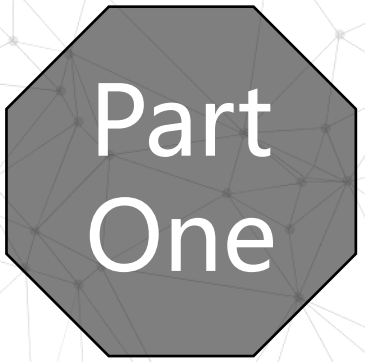
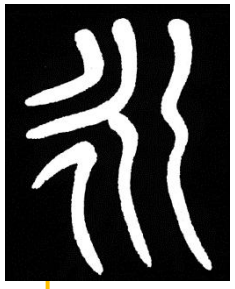
content



INTRODUCTION

Five Styles of Chinese Calligraphy



Seal Script (篆书)
- Rectangular
- Curved brush.
- Beauty of balance

Qin
221-207 BCE

Clerical Script (隶书)
- Flat and square
- A silkworm head and a wild goose

202 BCE-220 CE
Han

Cursive Script (草书)
- Joined together in a flowing manner
- Writing faster

Regular Script (楷书)
- Square and regular

Jin
266 CE-420 CE

Semi-cursive Script (行书)
- Between regular script and cursive script.

Objectives

- Explore the connections between different styles of calligraphy.
- Analyze and validate the evolution of calligraphy.
- Analyze the relationships between calligraphers

Five Styles

Clerical 隶书
Cursive 草书
Regular 楷书
Seal 篆书
Semi-Cursive 行书

Different Calligraphers

Xizhi Wang	Song Dynasty
Fu Mi	Song Dynasty
Zhenqing Yan	Tang Dynasty

Procedure

Collect data and form two datasets.

Use Siamese neural network to generate dissimilarity matrix.

Apply different community detection algorithms.

Do the visualization, analyze and compare the results of the two datasets.

Part Two

CONSTRUCT DATASET

- **Obtain and process images**

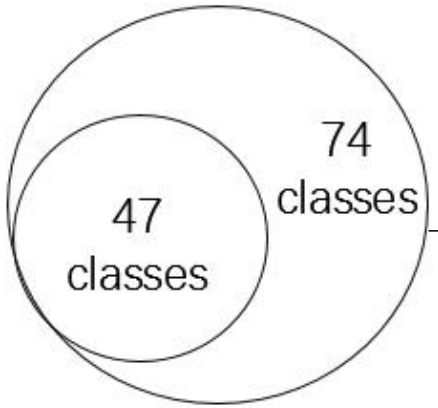
Obtain and Process Data

Using Java to get hundreds of images from the Internet

Image cropped

After image binarization

Structure Of Dataset



Two datasets
(for comparison)

Each class
contains 10 images

- Style
  - Cursive
  - Regular
  - Clerical
  - Semi-Cursive
  - Seal
- Calligrapher

e.g.

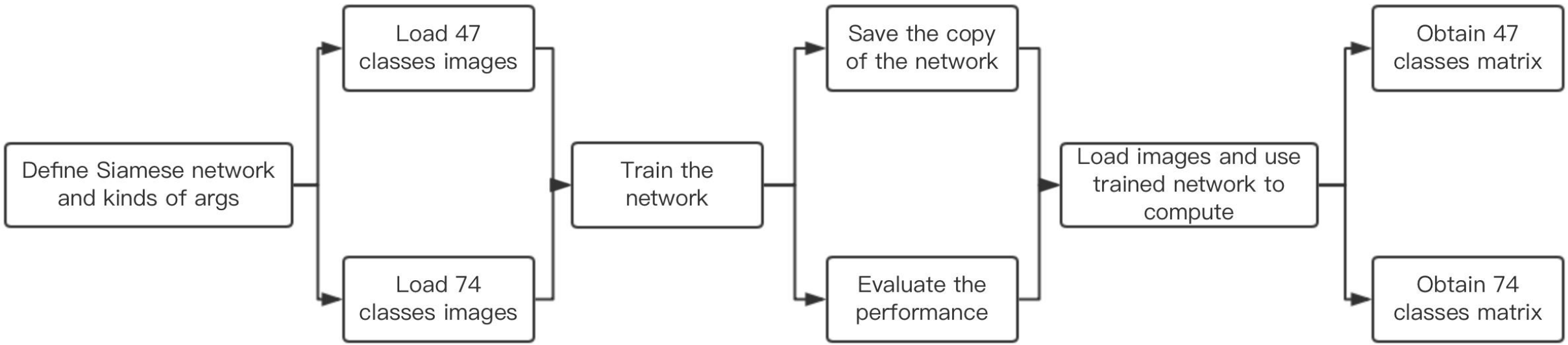
Xizhi Wang's Regular Characters

Part Three

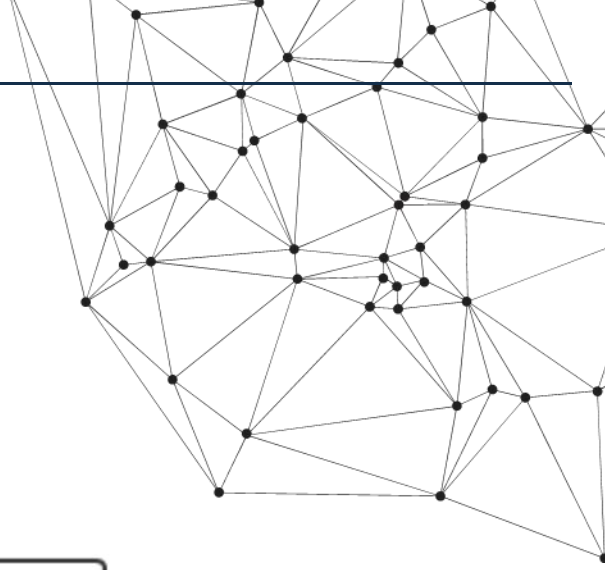
COMMUNITY DETECTION

- **Compute dissimilarity matrix**
- **Bulid graph and network**
- **Community detection**

Compute Dissimilarity Matrix

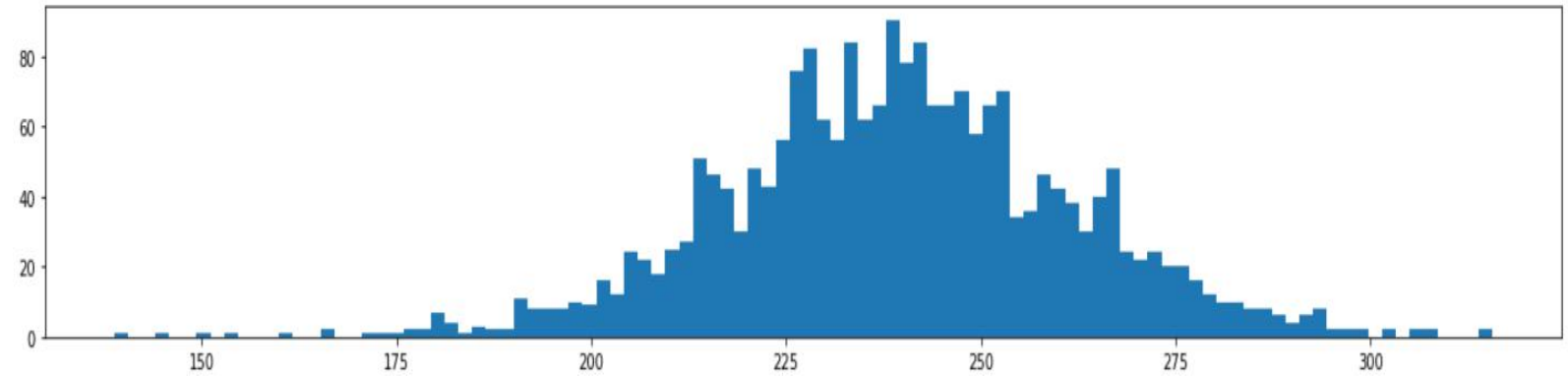


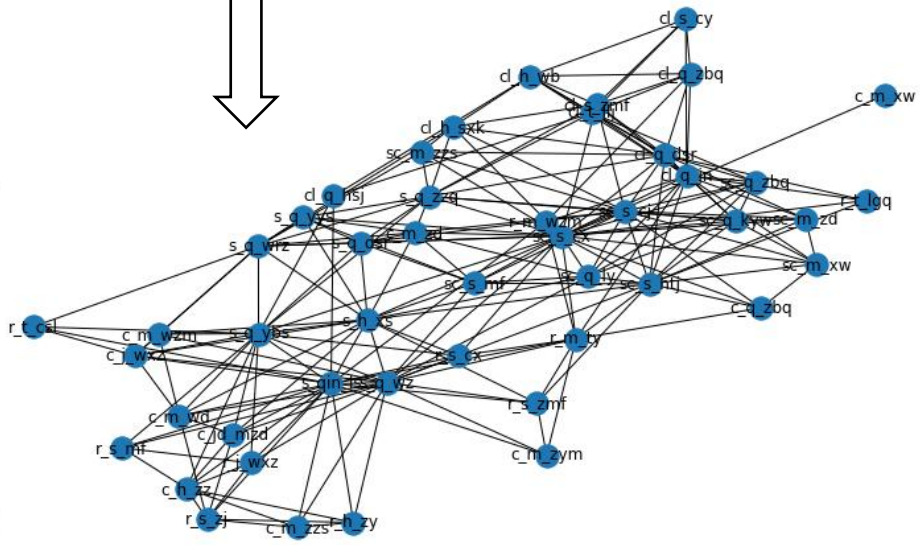
Build Graph and Network



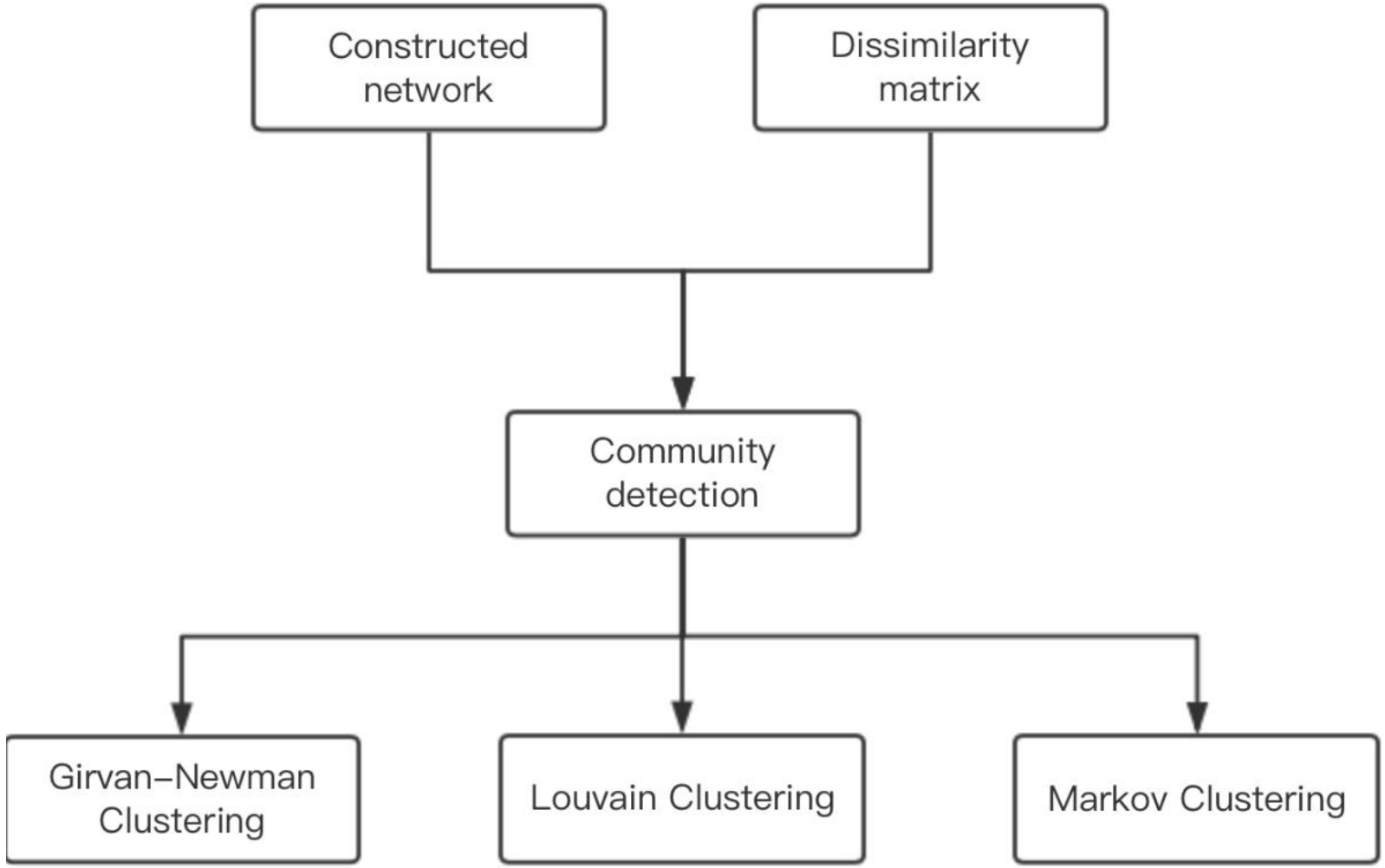
HOW

Load the dissimilarity matrix → Analyze distribution of dissimilarity score → Set a suitable threshold → Call library function to build graphy

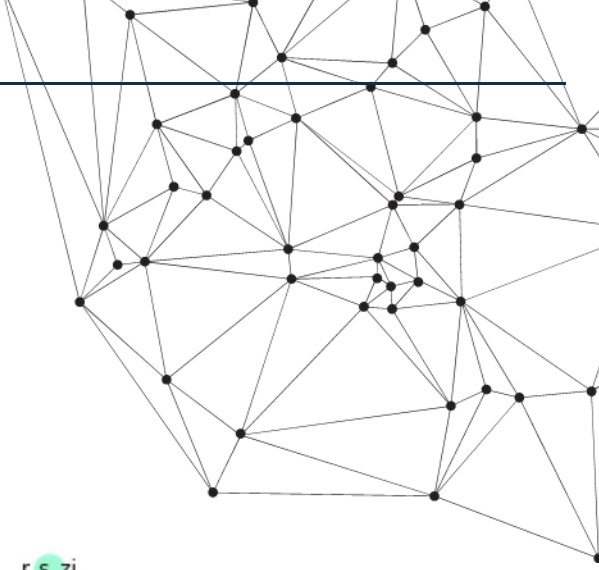




Community Detection

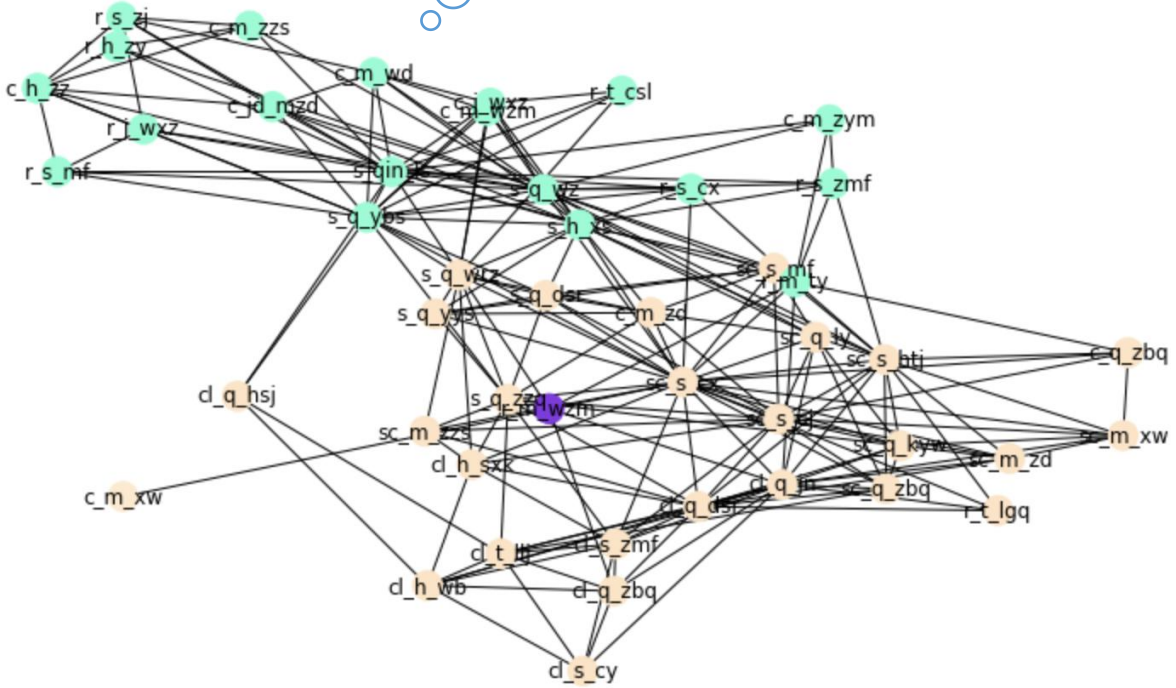


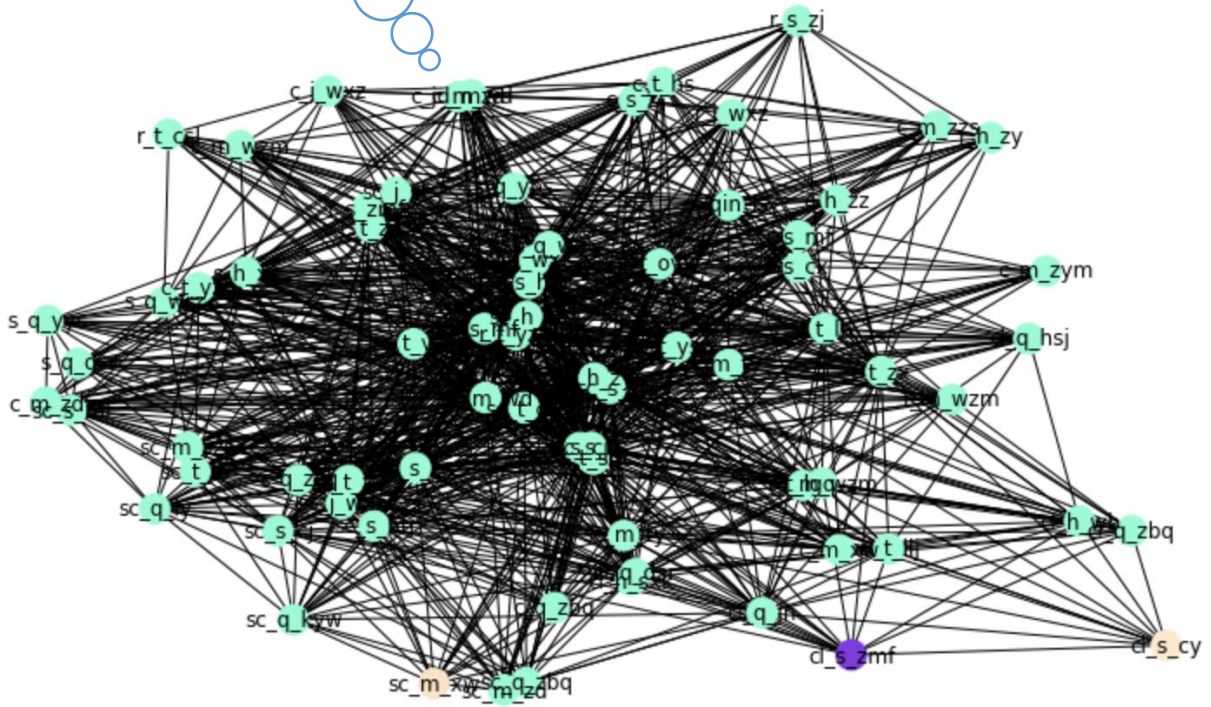
Girvan Newman



The number of community is very few

The core of the community is too dense



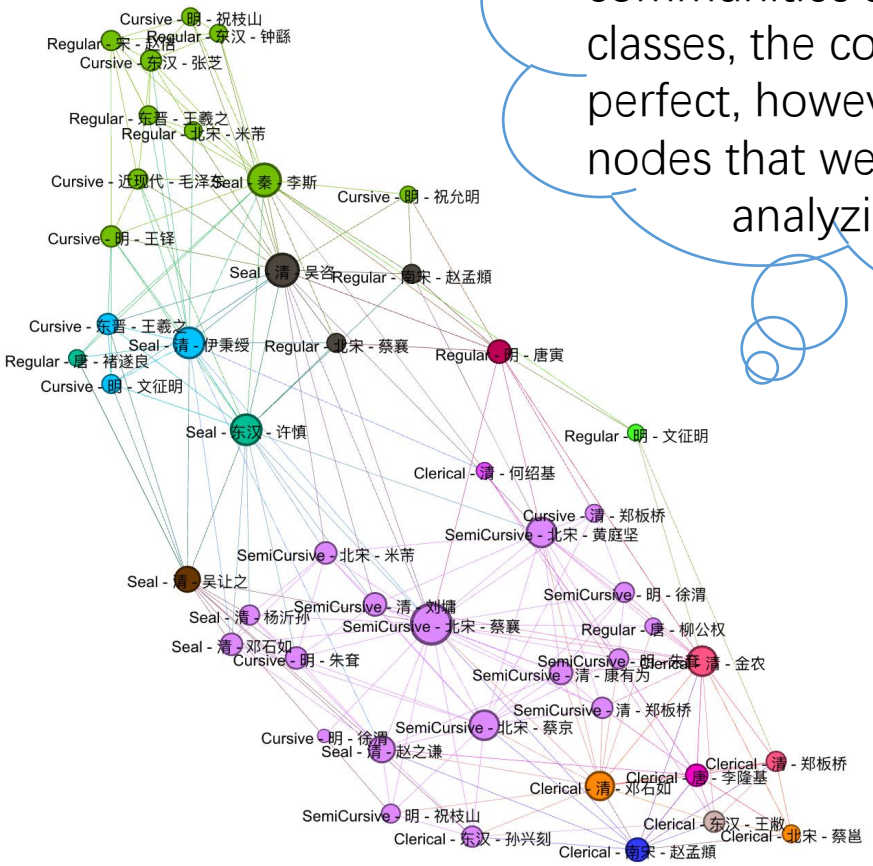


47 Classes images

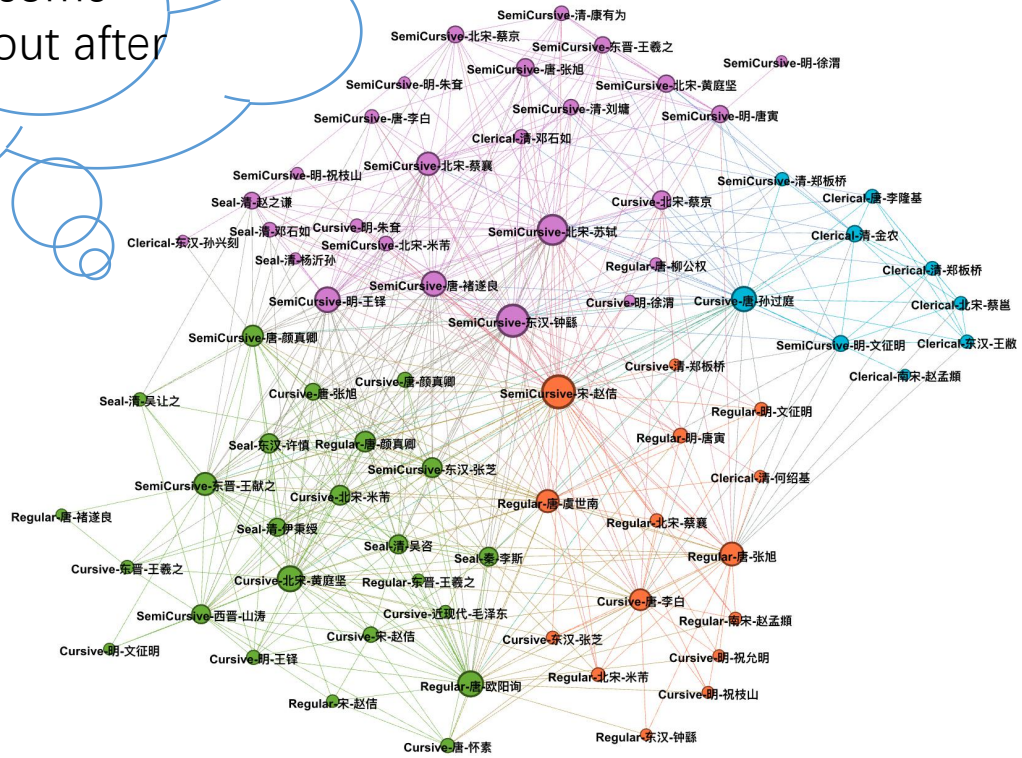
74 Classes images

Markov Clustering

Markov Clustering is much better than Girvan-Newman. but for 47 classes, communities are a little more, for 74 classes, the communities look like perfect, however there are some nodes that we can't figure out after analyzing



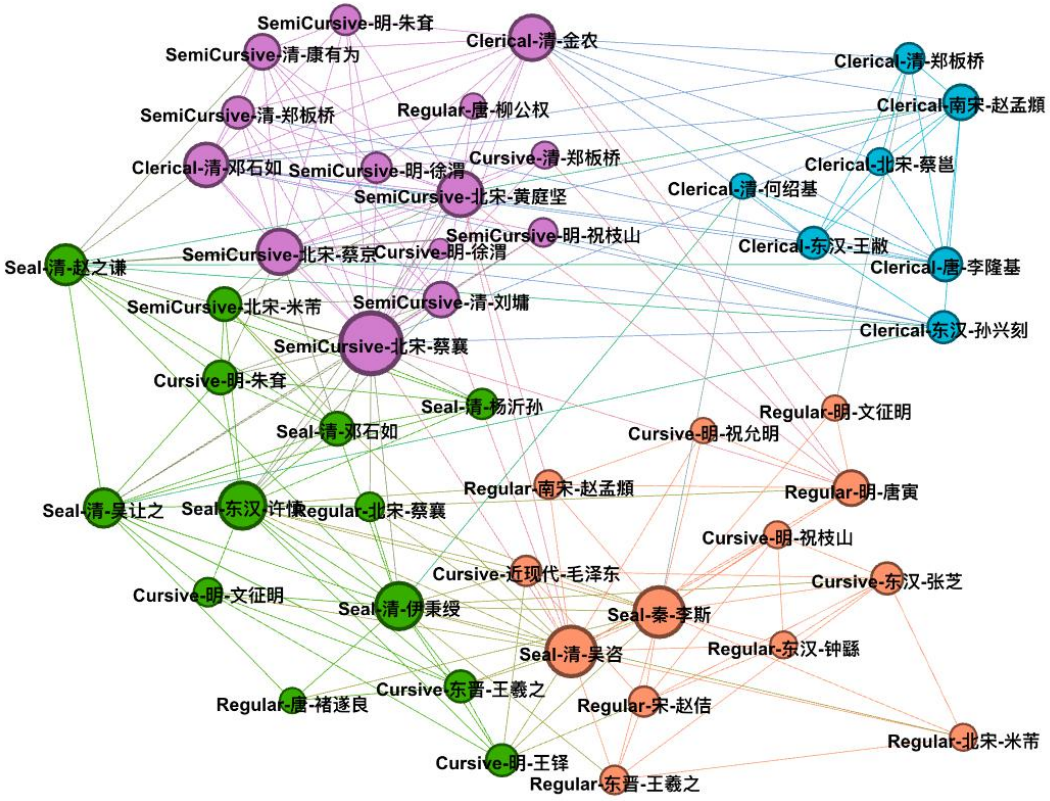
47 Classes images



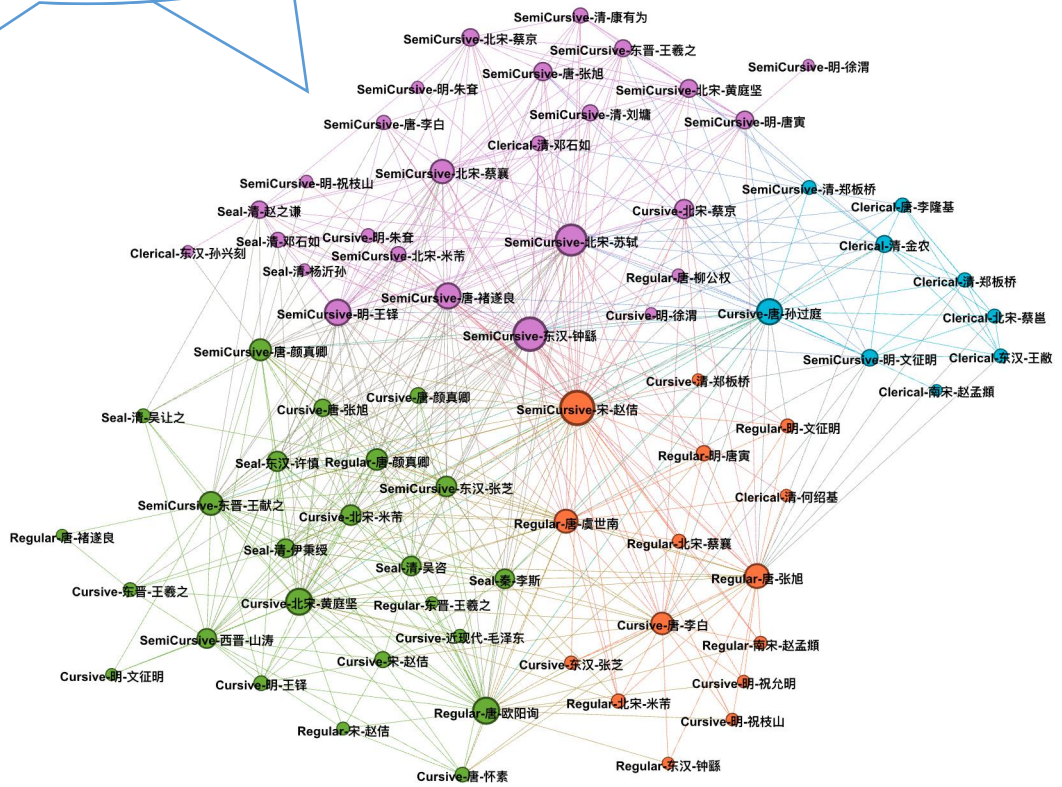
74 Classes images

Louvain Clustering

About clustring,Louvain clustering works as good as Markov Clustering, on the other hand, there are better relationships between nodes in below two graphs



47 Classes images



74 Classes images

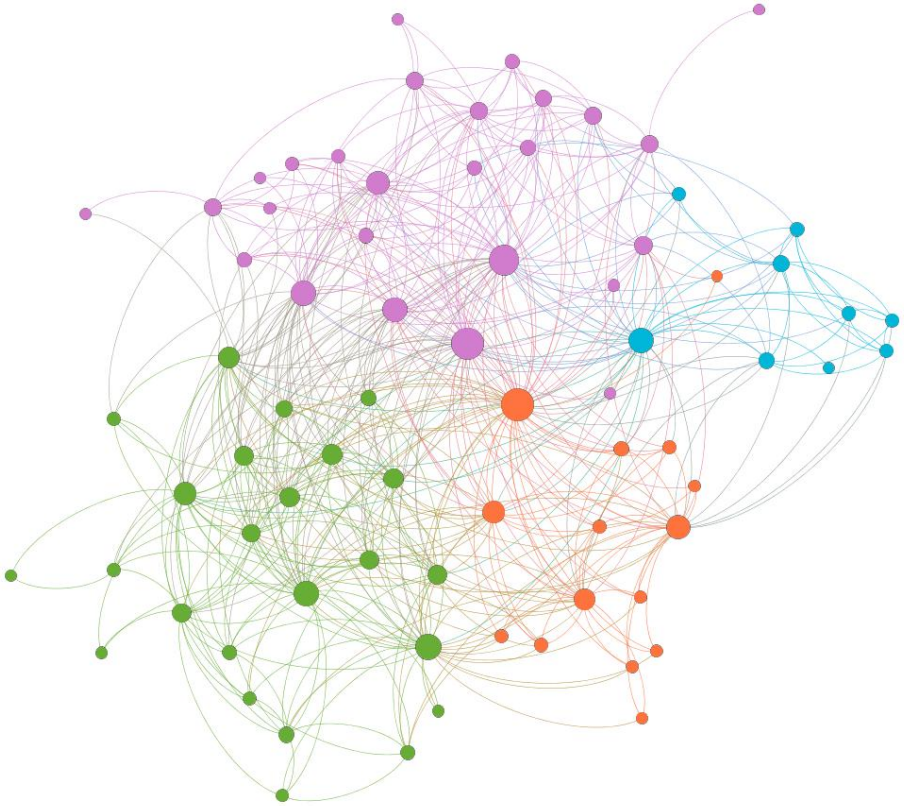
Part
Four

ANALYSIS OF THE RESULT

The visualization of the clustering results

Use gephi to realize the visualization.

the result of 47 categories



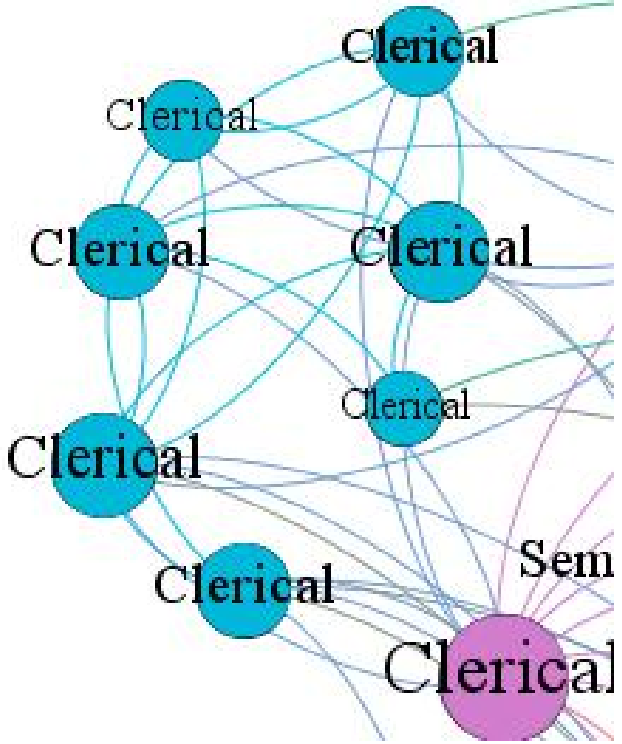
the result of 74 categories

What we expected from the old data set

Nodes of the same style tend to be in the same community.

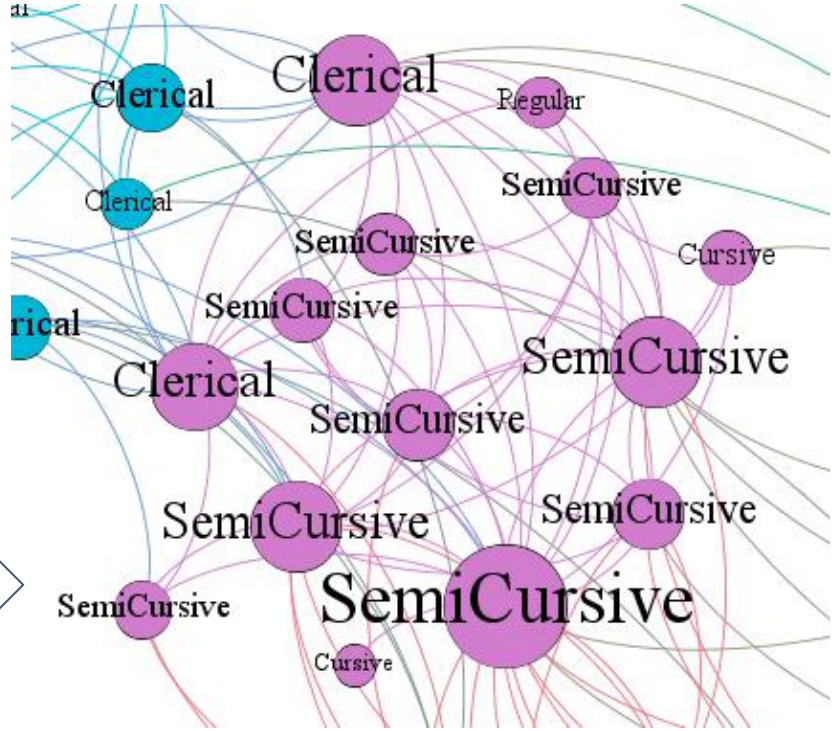
In this community:

- Only has clerical script
- Most clerical scripts are in it



What we expected from the old data set

Nodes of the same style tend to be in the same community.

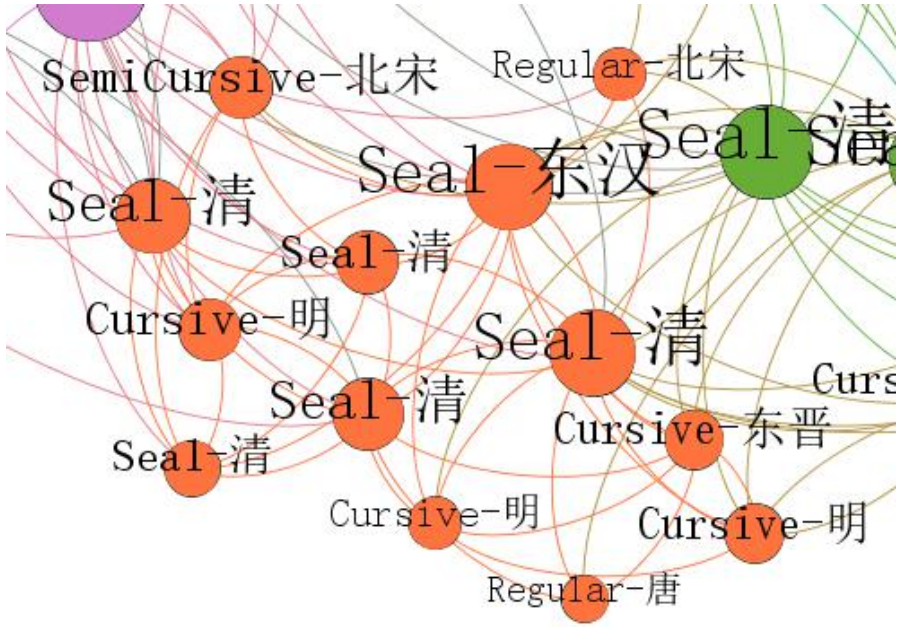


In this community:

- Mainly consist of semi-cursive script
- Most semi-cursive scripts are in it

New insights we get from the old data set

Many seal script fonts in Qing dynasty are clustered with cursive script fonts



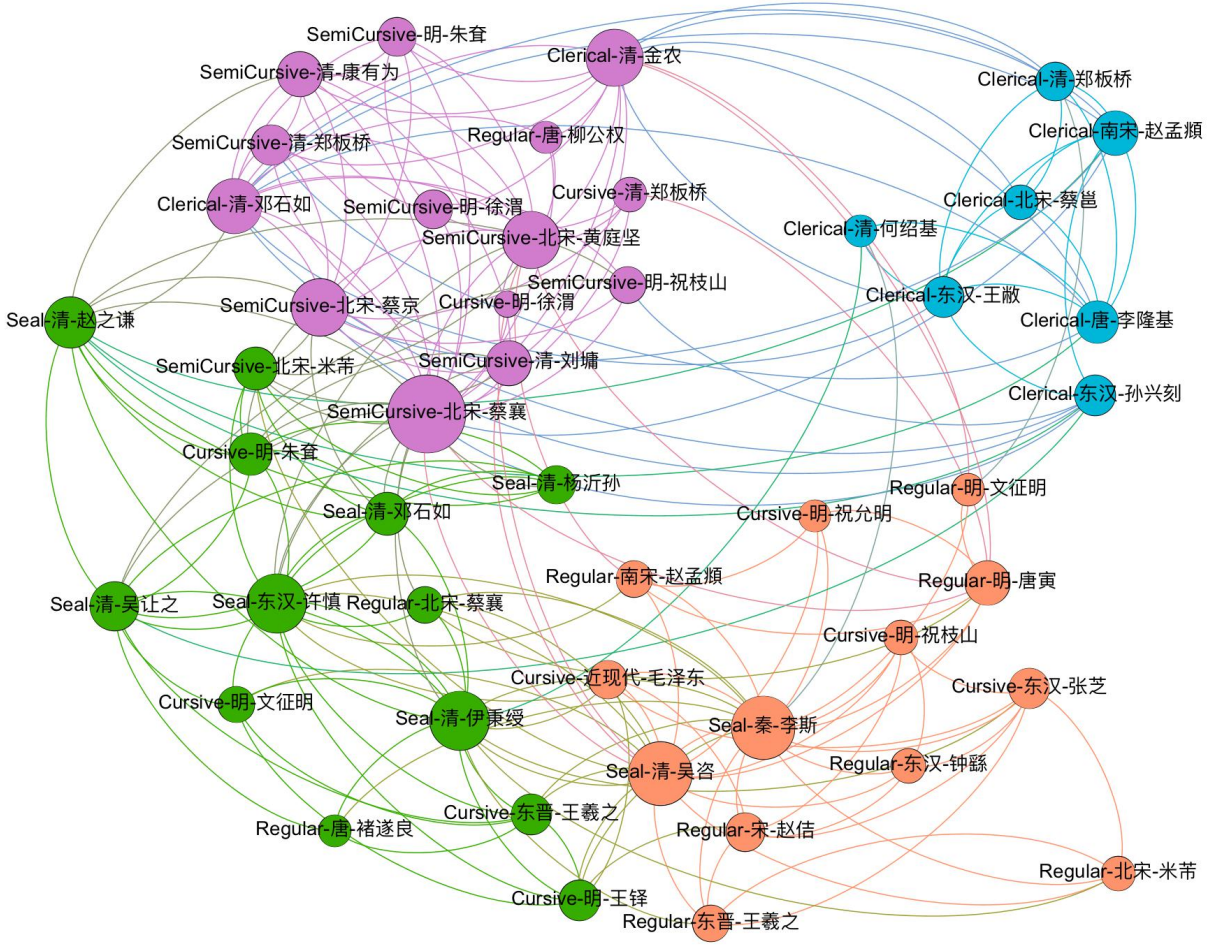
The evolution of seal script in Qing dynasty made it more similar to the characteristics of cursive script

Old data set
(47categories)

New data set
(74 categories)

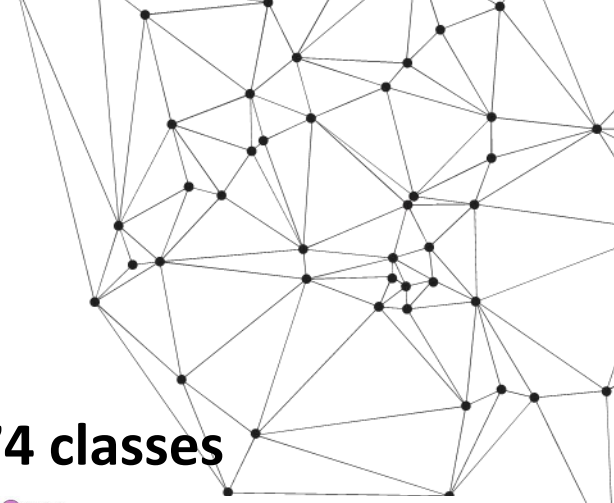
Expand

Connection and
Difference



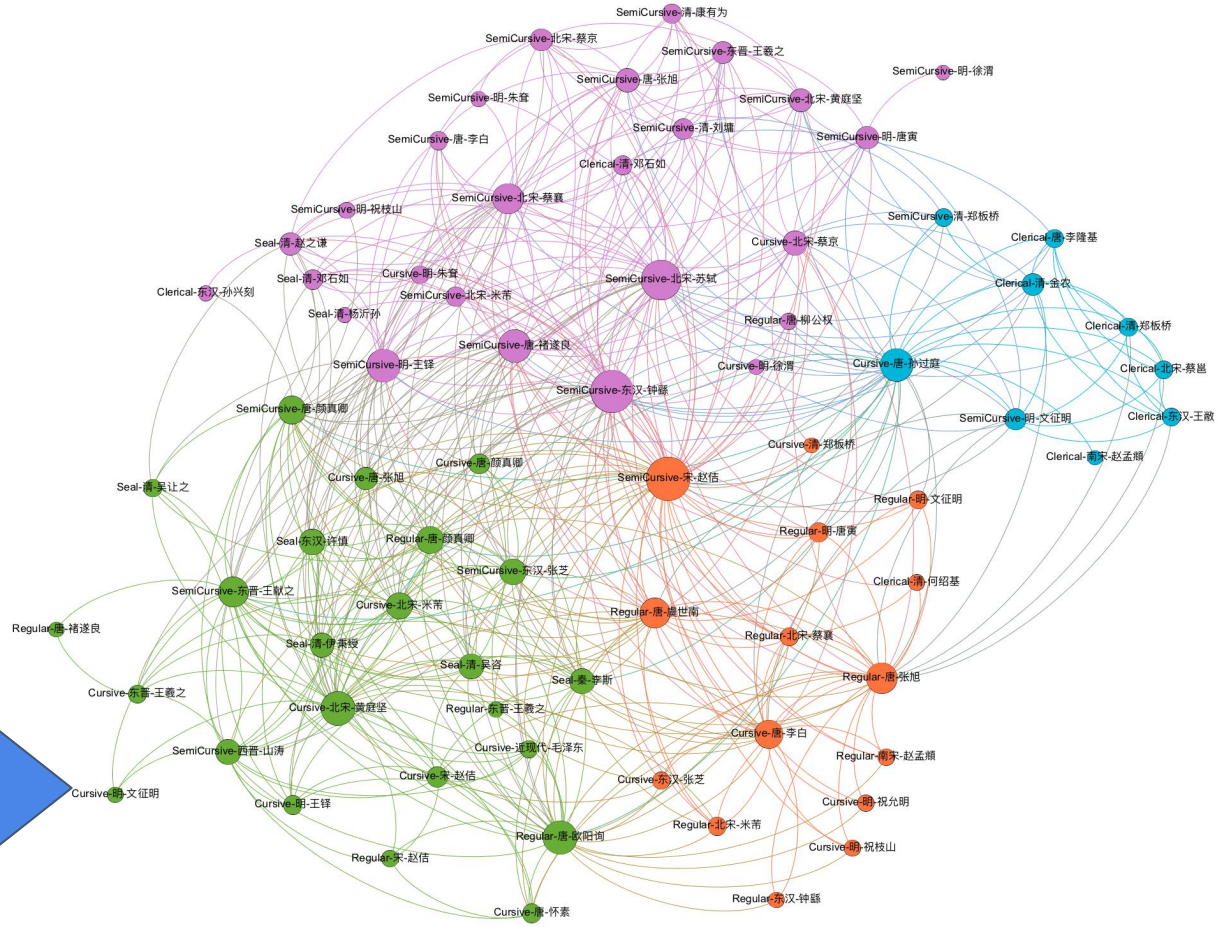
Graph of 47 classes

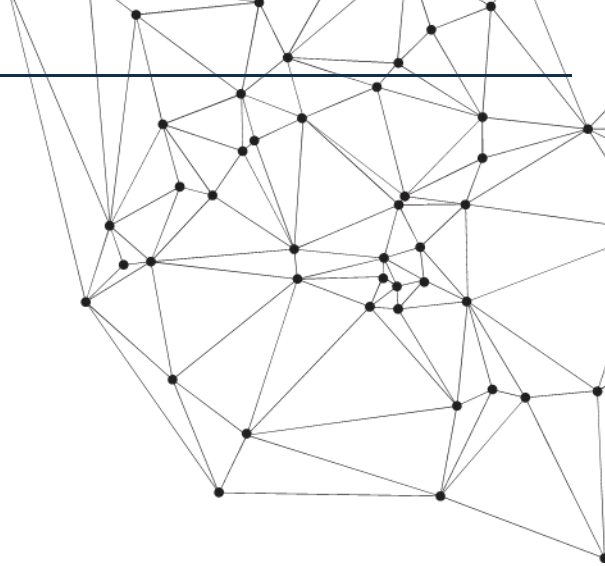
Communities of the same colour nearly have the same core.



Graph of 74 classes

enlarge the data set



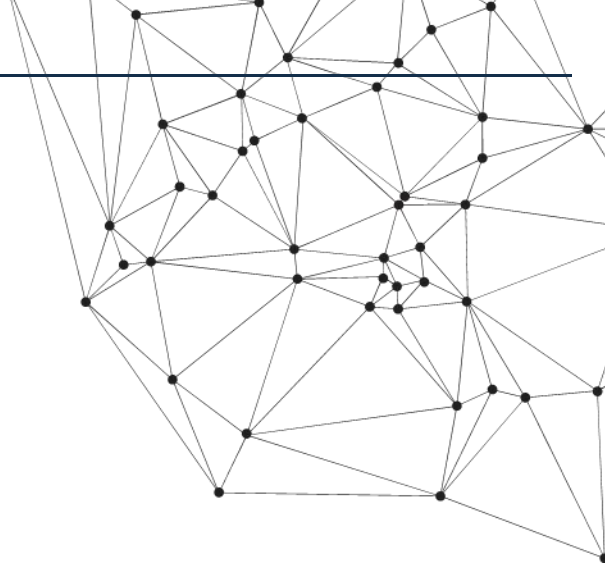


Connection

- Both data sets are clustered into four communities.
- The core of each community changes little.

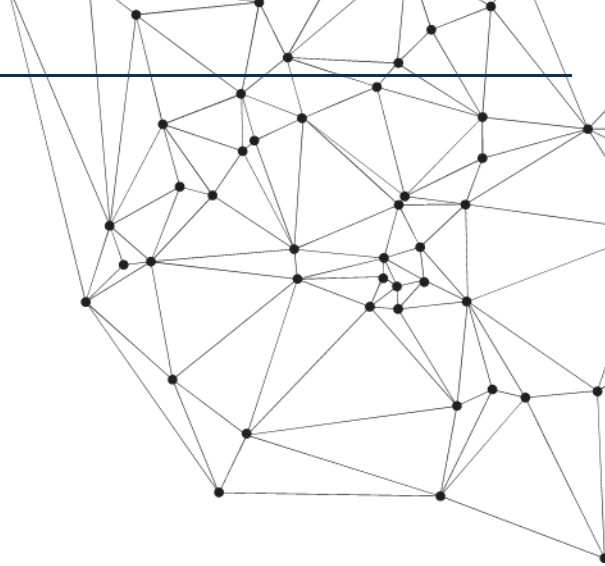
Difference

Some nodes move into other communities!



Nodes move

- Why they move
- Why some of them move together



Why they move

Some new nodes which have more connections with some old nodes are added

Such old nodes tend to move into a more corresponding community together with those new nodes

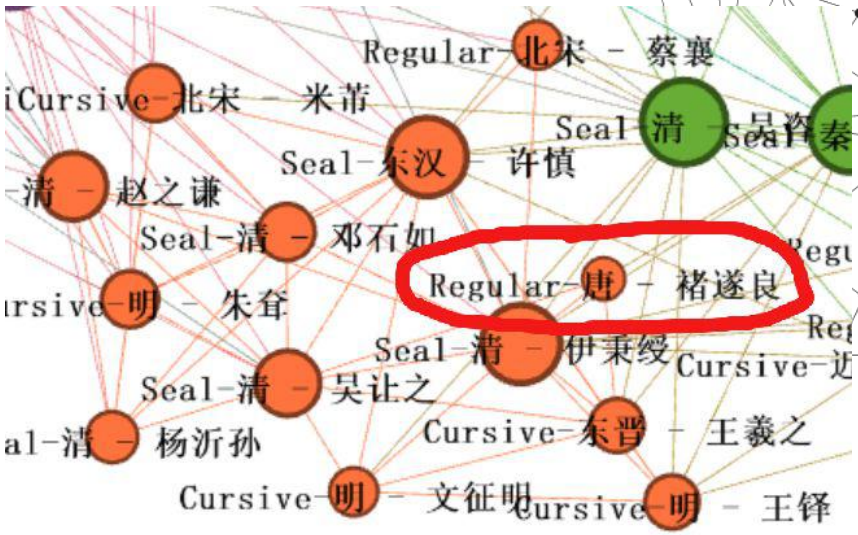
Examples

Each color means one community

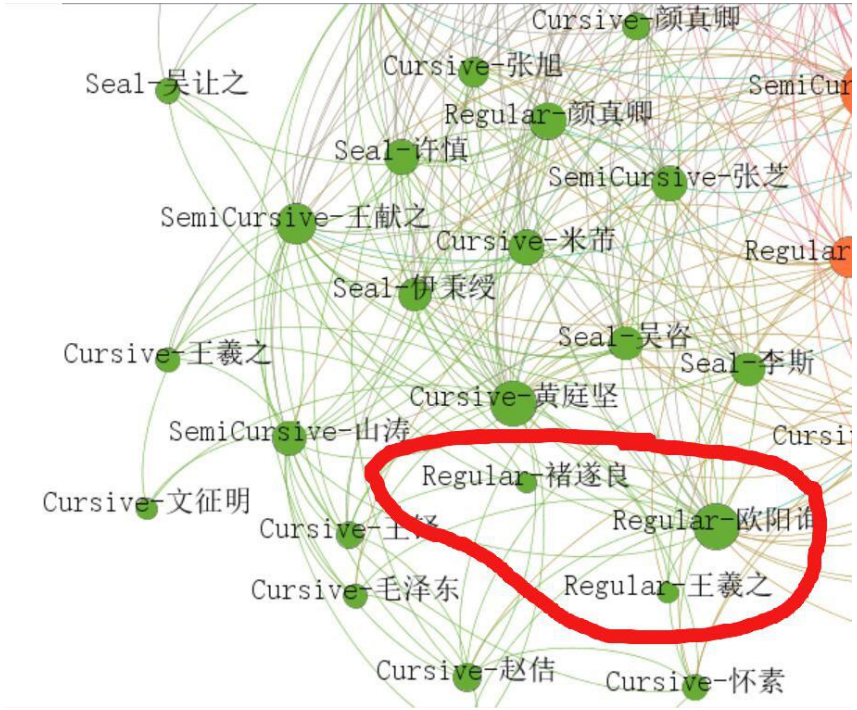
Chu Suiliang studied the calligraphy of Ouyang Xun and Wang Xizhi

the regular script of Ou Yangxun was added

The same script of Chu Suiliang moved to the same community with those two



old



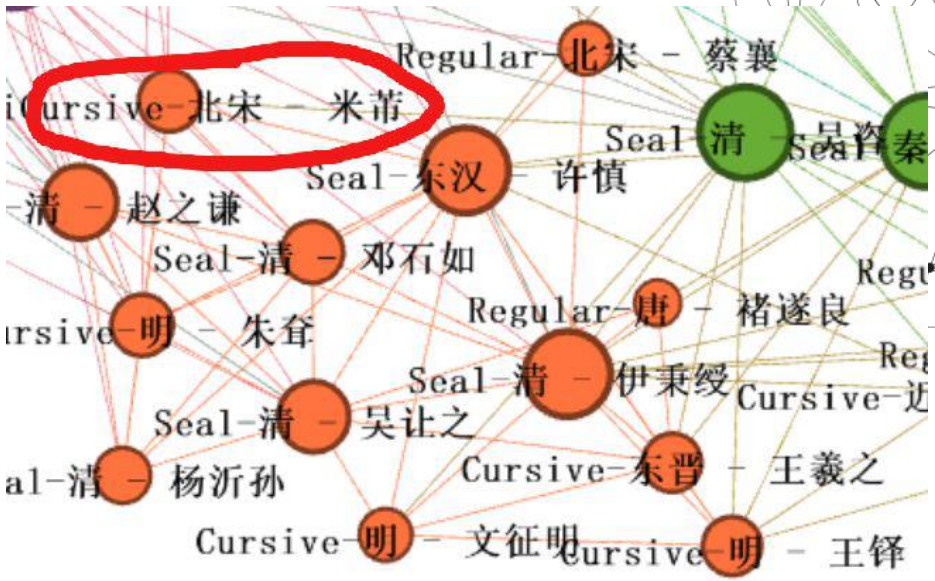
new

Examples

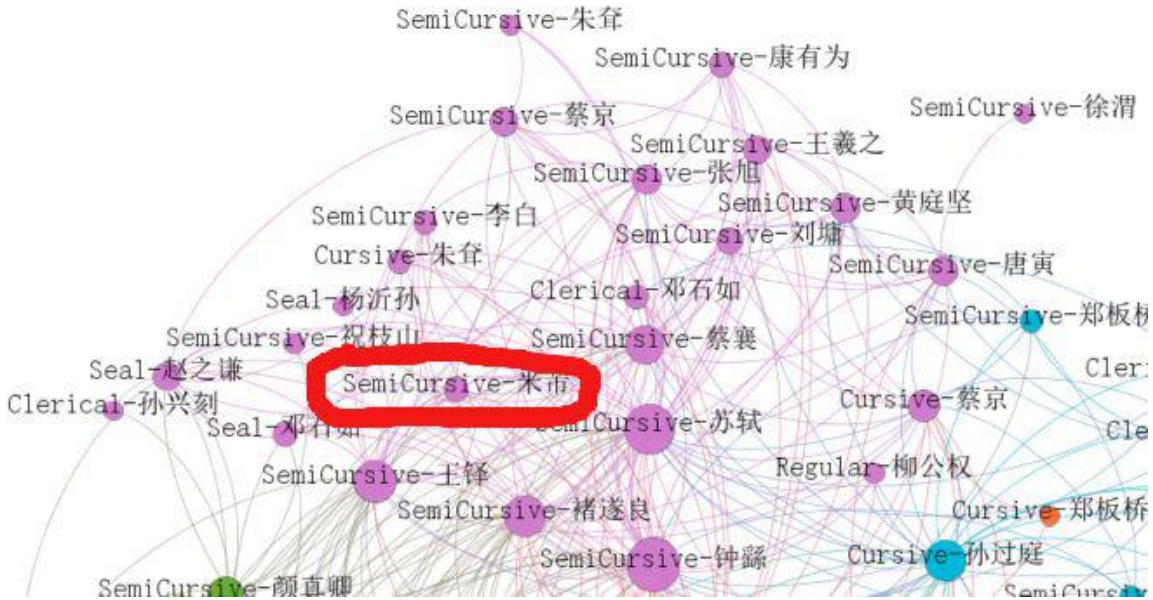
It’s difficult to explain why Mi Fu’s semi-cursive script were clustered into the orange community before

more semi-cursive scripts are added

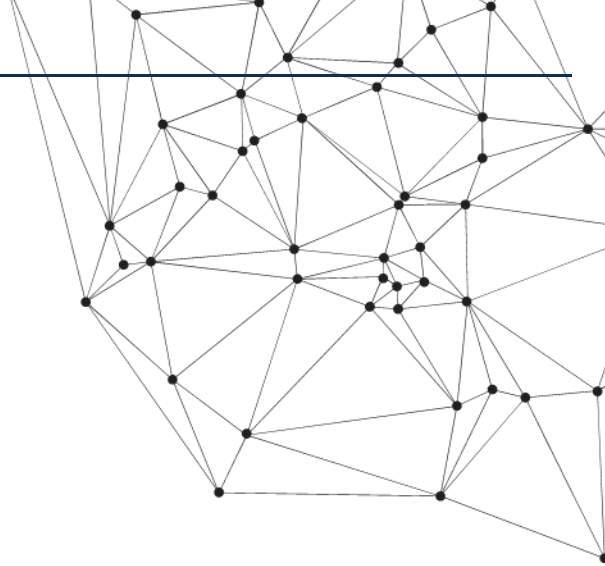
It moved into the purple community which contains most semi-cursive scripts



old



new

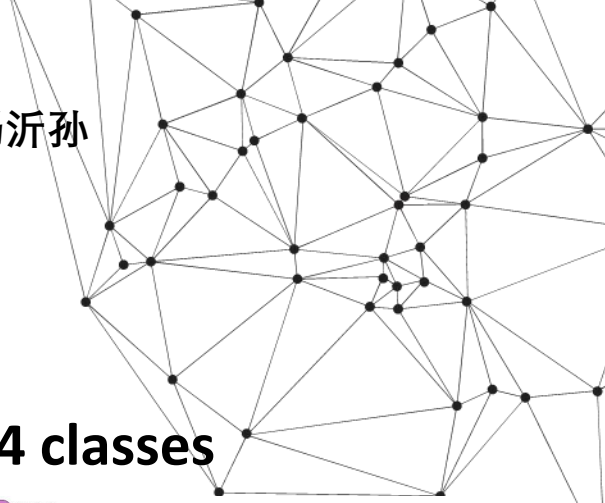


Why they move together

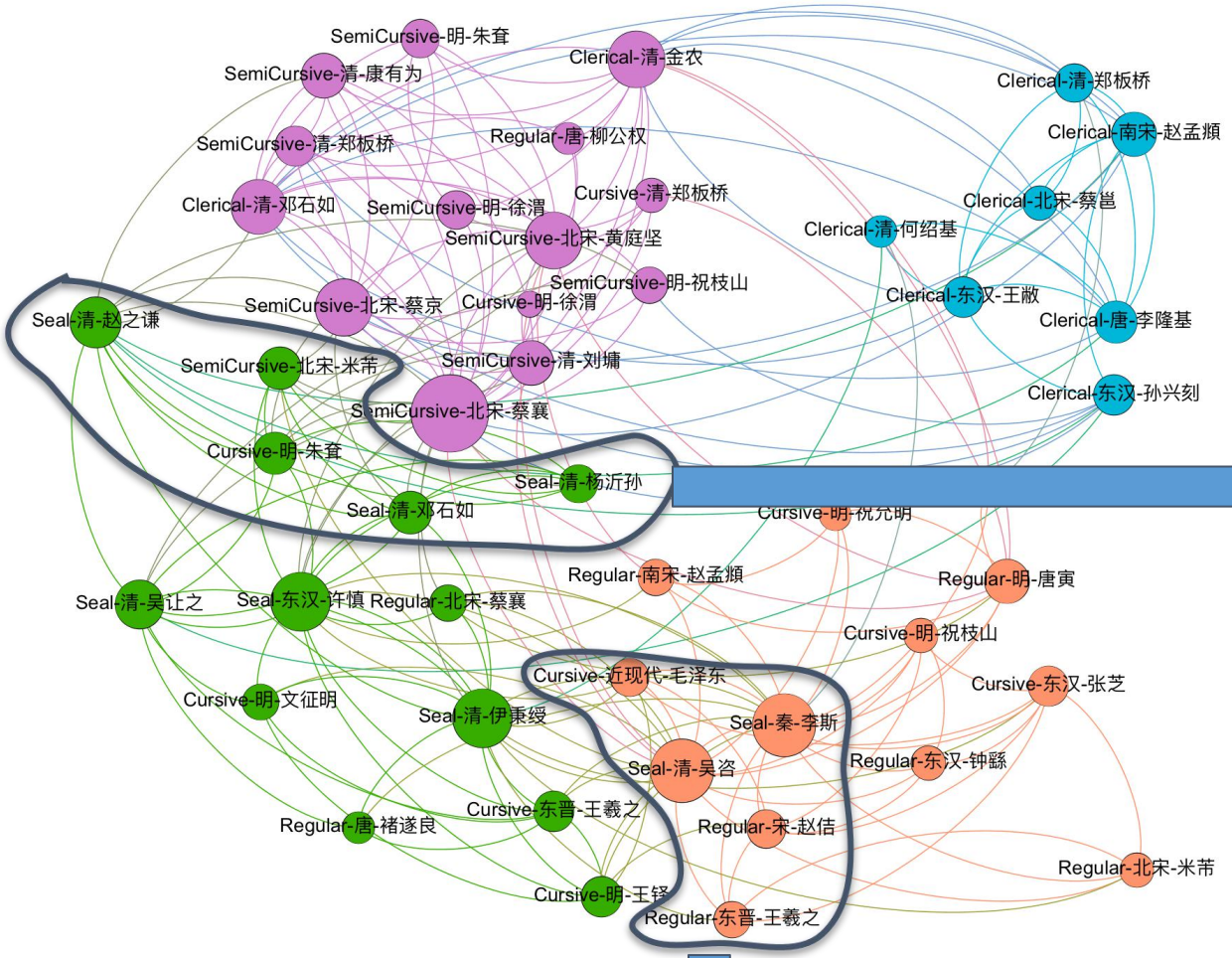
Most moving nodes in the same community move to the same other community

1.cursive-朱耷 seal-邓石如 seal-杨沂孙 seal-赵之谦 semicursive-米芾

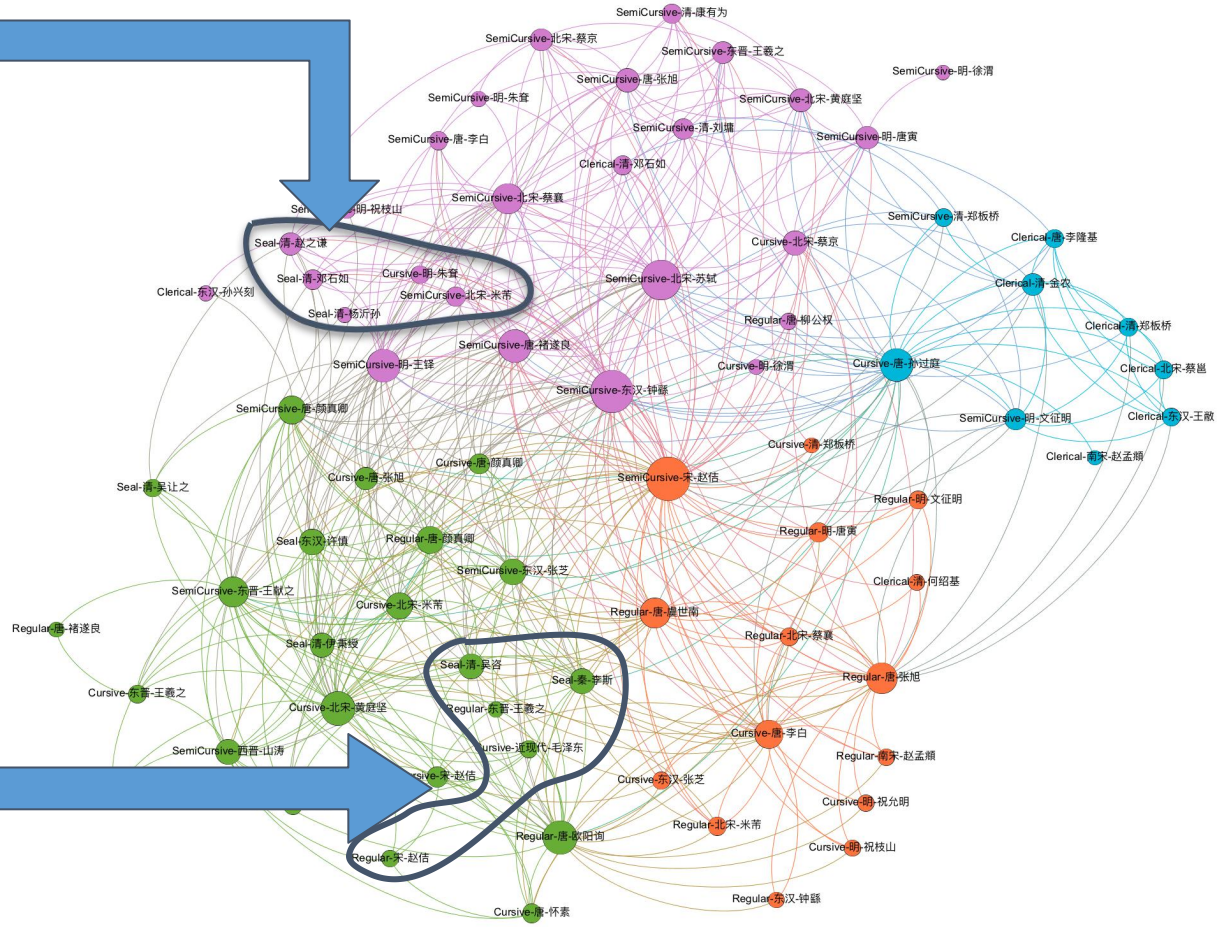
2.seal-吴咨 seal-李斯 regular-赵佶 cursive-毛泽东 regualr-王羲之

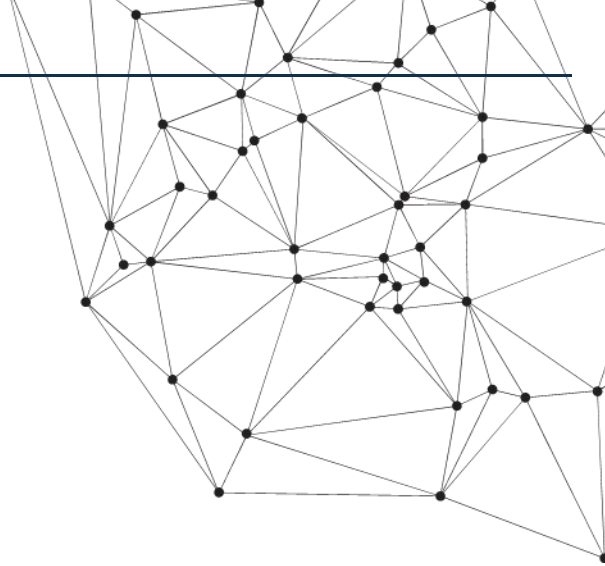


Graph of 74 classes



Graph of 47 classes



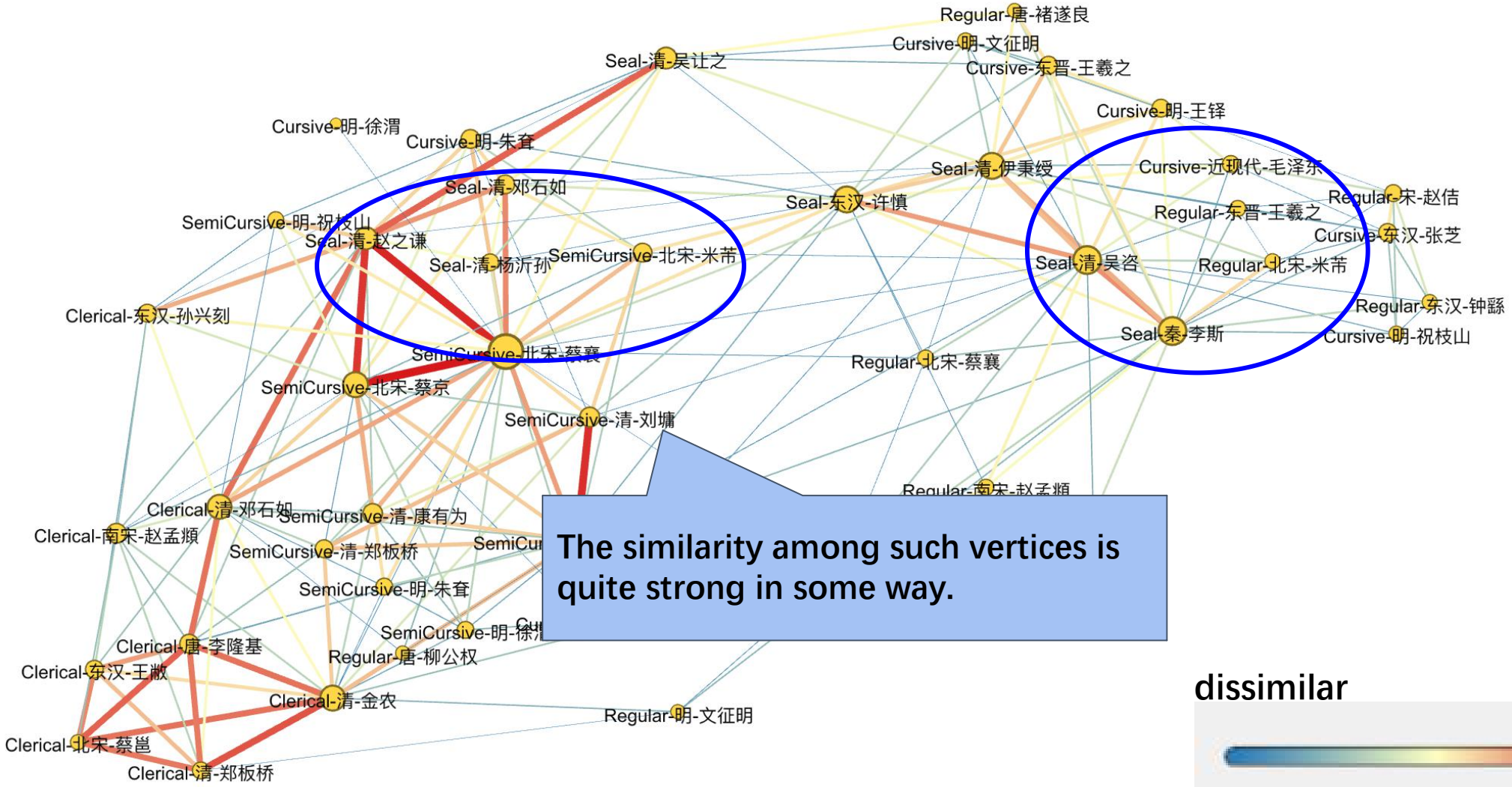


Why they move together

Most moving nodes in the same community move to the same other community

They connect with each other strongly

Weighted Graph



The similarity among such vertices is quite strong in some way.

dissimilar similar

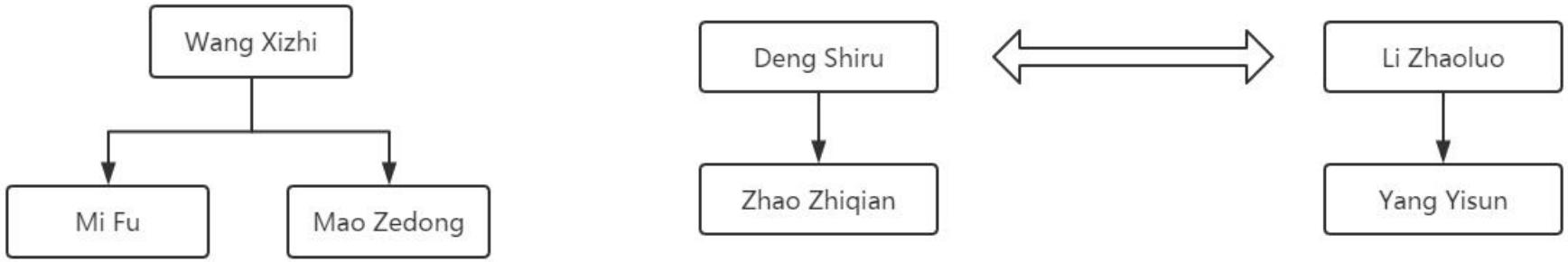
Possible reasons

- Similar characteristics

Seal of Li Si

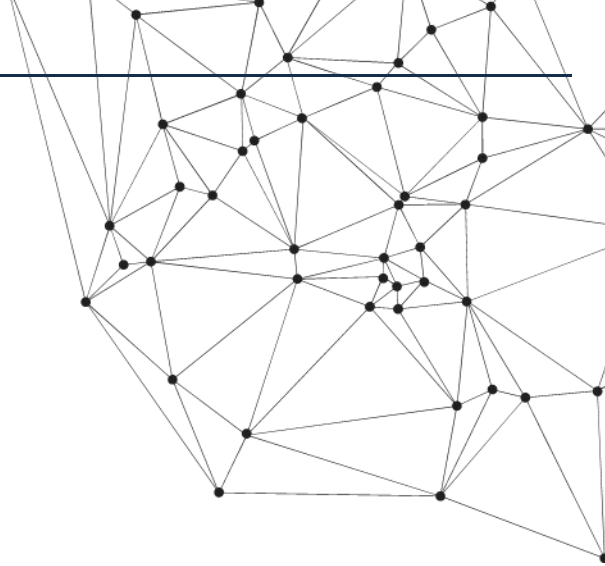
Seal of Wu Zi

- The learning relationship between calligraphers



Part Five

CONCLUSIONS



Conclusions

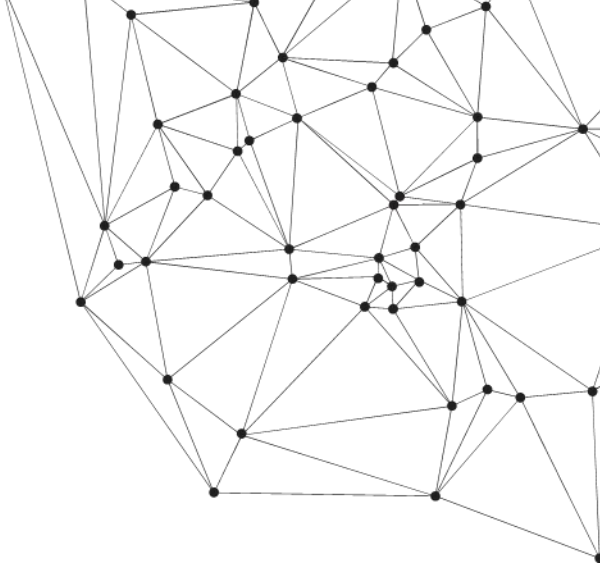
❖ What we expected

- Nodes of the same style tend to be in the same community.

❖ Interesting findings

- Even the same style of calligraphy works may be clustered into different communities because of historical factors， such as evolution or revolution of calligraphy, and so on.
- On the contrary, different styles may be clustered into the same community.
- As the expanding of data set, even the core of each community changes little, some vertices are clustered to other communities. Moving nodes in one community always move together.

How can the findings be used?

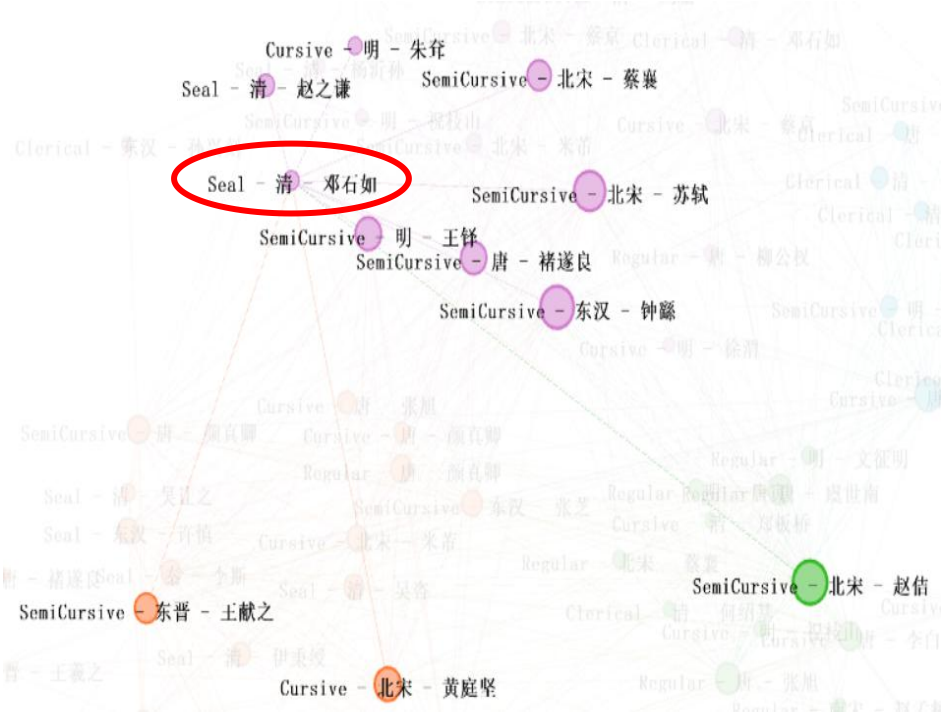


- Study calligraphy history or validate calligraphy knowledge.
- Find relationships among calligraphy or calligraphers which are rarely paid attention to.
- Gain new perspectives to classify calligraphy instead of traditional classification (types of style).


Thanks

Seal-邓石如

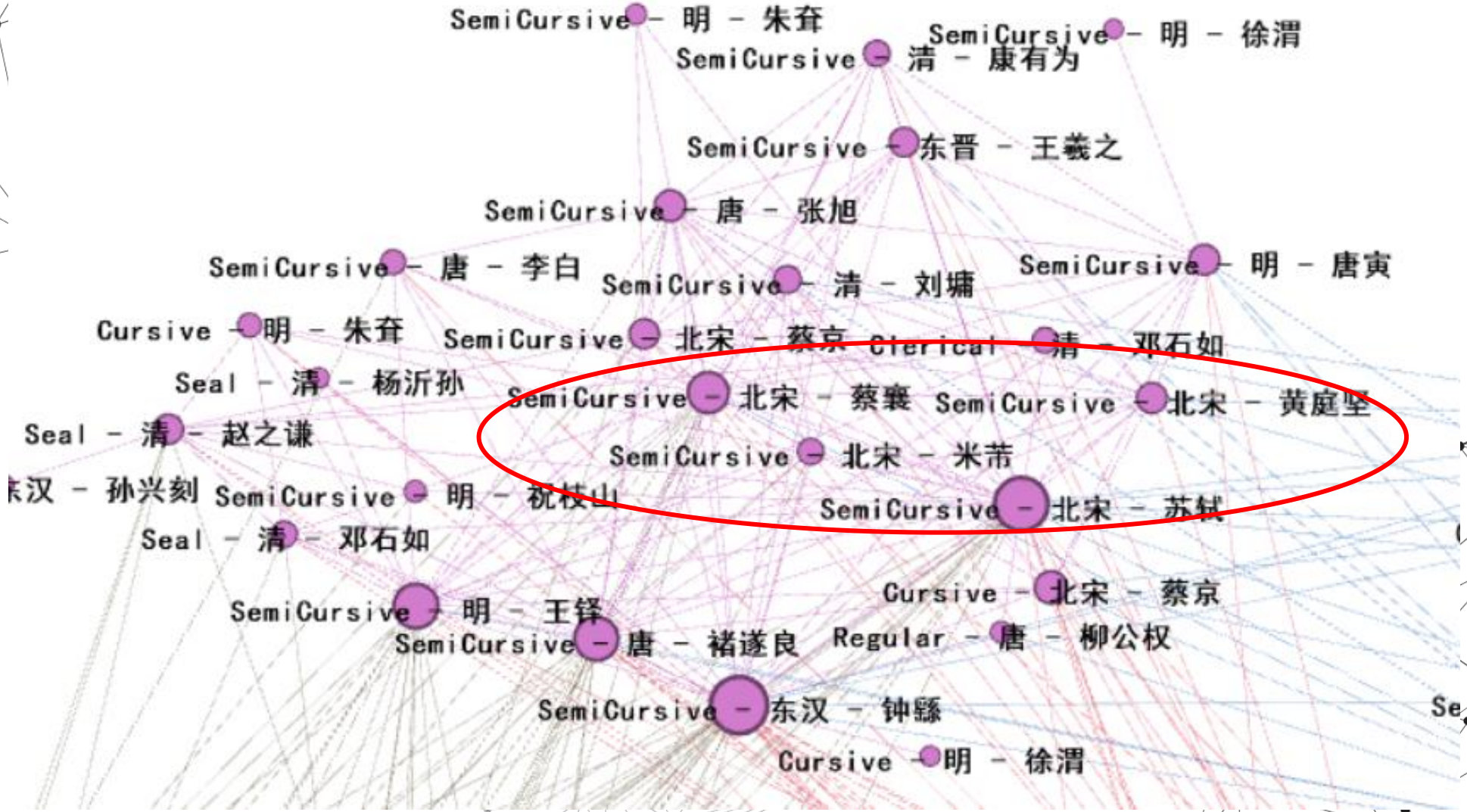
Communities of the same colour nearly have the same core.



semicursive-米芾

Communities of the same colour nearly have the same core.

the Four Masters of the Song Dynasty (Chinese: 宋四家)



Four Talents of Wu (Suzhou) (Chinese: 吴中四才子)