Visual Data Analysis of "113" Talent Training

Huiyong Wu

She Yang University of Chemical technology, Department of mathematics and Physics
Email: wuhuiyong@126.com

Zexing Ning and Yanhong Xie

She Yang University of Chemical technology, Department of mathematics and Physics

Abstract—**The demand for talent and the wage situation directly affects the employment guidance work and the development direction of talent straining in colleges and universities. Analyzing data on employment and average wage in China 's National Data Center by visualization, compare the talent professional categories, demand and salary conditions in the provinces（Excepting Taiwan Province） to provide the visual analysis results for the professional development direction and employment guidance work of Shenyang University of Chemical Technology, promote the Shenyang Chemical Engineering University to improve the training objectives and the direction of discipline development. The data analysis method, such as correlation analysis and cluster analysis, was used in this study, data mining and visualization of sample data were realized by using R software.**

Index Terms—**Related analysis, Cluster analysis, Visualization**

I. INTRODUCTION

The connotation of "113" talents training system is one concepts - OBE (Outcome Based Education), Through the instructional design, implementation and evaluation of OBE, to Solve the problem of "do what" in the training system; a model—CDIO (Conceive-Design-Implement-Operate), Twelve criteria solve the "how to do" problem in the training system;Three initiatives-- Collaborative education, family training, personalized guidance to solve the culture system "who will do" problems. Under the "113" training system, Graduates of higher education institutions can be understood as higher education products, Then the OBE means that according to the employment situation of graduates to reverse the teaching reform of higher education, This kind of higher education supply side reform is the practical problem that colleges and universities must face and solve.

The good employment situation of college graduates is the main goal of personnel training in colleges and universities, The situation of talent demand and salary status of each region determines the direction of the development of disciplines in colleges and universities,

The employment guidance work of colleges and universities mainly relies on the situation of talent demand and salary in various regions. At this stage, when some colleges and universities planning in the recruitment of employment guidance and discipline development, Many times are subjective qualitative conceptual analysis, Lack of detailed objective analysis of large data as a basis, According to the employment area, the employment work is decided by the economic and trade development type and the talent demand condition of the region, And not only by the current economic development structure and the demand structure of talent, but also by the status of the situation and the expected situation and other factors, Therefore, we can assess the current situation through detailed data analysis, and predict the expected conditions.

The main objective of the study is to explore the employment and payroll data of the national data center, and the exploratory analysis of the statistics of 2014-2017 graduates from Shenyang chemical university, The data is cleaned and converted using the R software, and the data characteristics are analyzed by statistical analysis methods such as cluster analysis and correlation analysis, and the data analysis results are observed by data visualization.

II. THE INDUSTRY DISTRIBUTION OF EMPLOYMENT CLUSTER ANALYSIS

In order to study the geographical distribution of talent needs, we will be divided by the industry segment of the employment data and map data for accurate matching for each location to identify the correct employment data. Here we classify the industry according to the national data center, and study the statistics of employment in different industries, We use different colors representing different values and numerical ranges to fill the map area of each province(Excepting Taiwan Province), thereby visualizing the geographical distribution of employment conditions. In doing cluster analysis, we selected one overall indicators and nineteen industry indicators for cluster analysis, The clustering results are shown in Table one, and the four cluster groups are predefined.

TABLE1

CLUSTER ANALYSIS OF EMPLOYMENT DISTRIBUTION

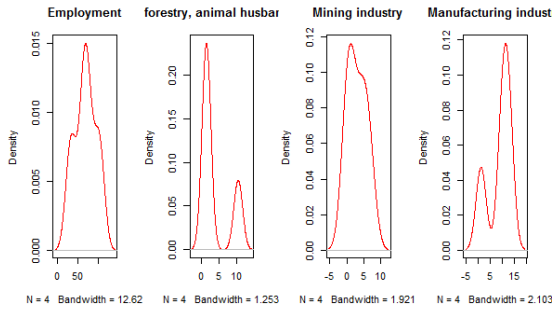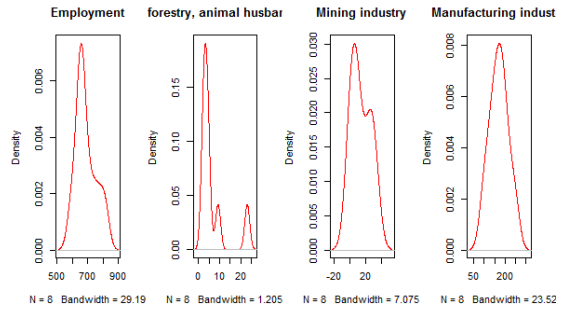| Group		Group 1	Group 2	Group 3	Group 4
Sample number		4	8	5	14
Proportion of samples		0.1290323	0.2580645	0.1612903	0.4526129
Cluster center (part)	Mining industry	2.95000	13.89125	28.62200	23.60500
	Manufacturing industry	8.7475	170.6813	548.1760	78.7000

Figure 1. Probability density function diagram of group 1

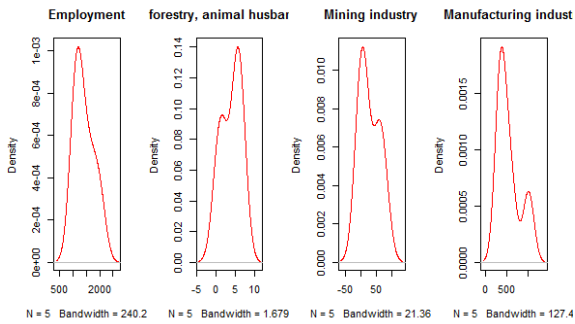

Figure 2. Probability density function diagram of group 2

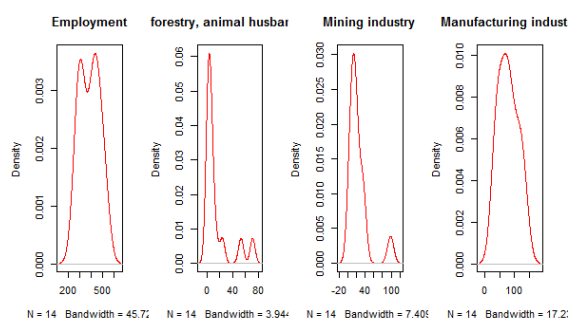

Figure 3. Probability density function diagram of group 3

Figure 4. Probability density function diagram of group 4

TABLE 2
CLUSTER ANALYSIS OF INDUSTRY EMPLOYMENT

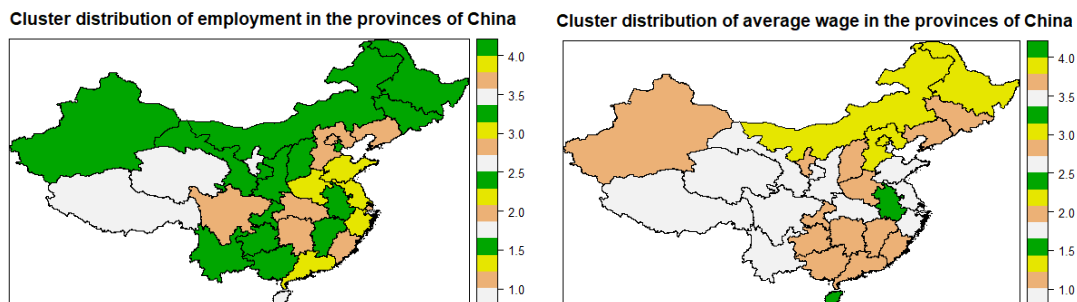| Group 1（4）	Hainan, Ningxia, Qinghai, Xizang
Group 2（8）	Beijing, Fujian, Hebei, Hubei, Hunan, Liaoning, Shanghai, Sichan
Group 3（5）	Guangdong, Henan, Jiangsu, Shandong, Zhejiang
Group 4（14）	Anhui, Chongqing, Gansu, Guangxi, Guizhou, Heilongjiang, Jiangxi, Jilin, Neimenggu, Shaanxi, Shanxi, Tianjin, Xinjiang, Yunnan

Figure 5. Employment and average wage clustering analysis geographical distribution map

Figure one to four shows the probability density function for the twenty index data of the four groups. (Limited by space, only the probability density function of the 4 index data is listed here), Through the graph of probability density function, the distribution characteristics of each industry's employment data can be obtained quickly. It is difficult to see the similarity of the geographical distribution of employment from the results of cluster analysis of employment status, Next, we look

for the similarity in the geographical region by comparing the industry's wage status.

III. THE INDUSTRY AVERAGE WAGE CLUSTERING ANALYSIS

After the results of the geographical distribution of employment in various industries, We analyze the geographical distribution of the average wage in different industries, Comparison of wage differences in the same industry in each region. First of all, we do the geographical distribution clustering analysis according to the average wage characteristics, The analysis results are shown in table three.

TABLE 3.
AVERAGE WAGE CLUSTERING RESULTS

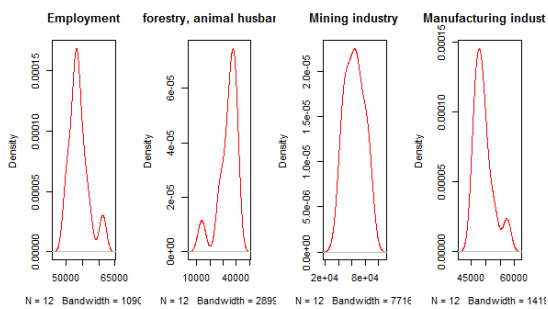| Group		Group1	Group2	Group3	Group4
Sample number		12	13	2	4
Proportion of samples		0.38709677	0.41935484	0.06451613	0.12903226
Cluster center (part)	Mining industry	64334.25	53725.00	102640.50	71767.50
	Manufacturing industry	49214.50	45185.77	80106.50	56719.00

Figure 6. Probability density function diagram of group1
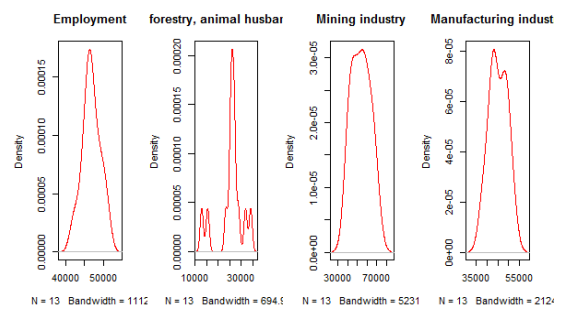

Figure 7. Probability density function diagram of group2
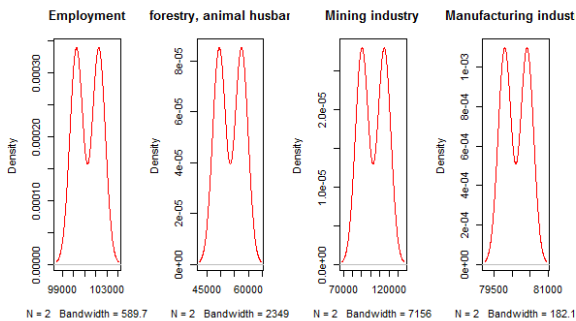

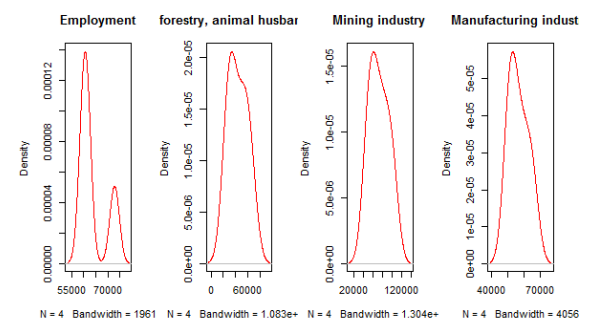Figure 8. Probability density function diagram of group3

Figure 9. Probability density function diagram of group4

TABLE 4.
CLUSTER ANALYSIS OF AVERAGE WAGE DISTRIBUTION

Group1（12）	Gansu, Hubei, Jiangsu, Qinghai, Shaanxi, Shandong, Shanghai, Sichuan, Tianjin, Xizang, Yunnan, Zhejiang
Group2（13）	Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hunan, Jiangxi, Jilin, Liaoning, Ningxia, Shanxi, Xinjiang
Group3（2）	Anhui, Hainan
Group4（4）	Beijing, Hebei, Heilongjiang, Neimenggu

"Fig. 6" to nine is the probability density function of the twenty index data in the cluster of the industry average wage(Limited by space, only the probability density function of the four index data is listed here), Through the graph of probability density function, the distribution characteristics of average wage data in each group can be quickly obtained.

By comparing the results of job distribution, cluster analysis and average wage distribution, As shown in "Fig. 5", there is a big difference in the distribution of the groups, the grouping of the employment distribution and the grouping of the average wage, Here we should make clear that each job does not correspond to the average wage group, For example, there is no correspondence between group one and average wage.

Group 1. Through sorting, we find that the difference between the four groups is obvious, But through comparative analysis, we find that the provinces also have greater similarity, The similarity between the re employment status and the average wage geographical distribution, Qinghai and Tibet are similar, Beijing and Hebei are similar, Fujian, Hunan and Liaoning are

similar, Hubei, Shanghai and Sichuan are similar, Guangdong and Henan are similar, Jiangsu, Shandong and Zhejiang are similar, Chongqing, Guangxi, Guizhou, Jiangxi, Jilin, Shanxi and Xinjiang are similar, Gansu, Shaanxi, and Tianjin Yunnan is close to Heilongjiang and Inner Mongolia is similar, That is to say, these regions are similar in employment demand and salary levels.In guiding the students' employment, we can effectively guide the regional mobility of graduates according to the similarity of regional development.

Such as Beijing and Hebei, in the employment structure and pay structure has a similar characteristics of the industry structure, But the level of economic development and the cost of living are different, Colleges and universities can effectively guide students to Hebei with similar development prospects and relatively low cost of living, When you have a certain work experience, then choose the best.

The results of employment clustering and average wage clustering in Hainan, Ningxia and Anhui provinces are similar to those in other provinces, Ningxia is located in the western region, Anhui is located in the central region, Hainan is located in the south, and the surrounding provinces are relatively low correlation, It shows that its economic development is relatively unique.

IV. THE INDUSTRY EMPLOYMENT AND INDUSTRY AVERAGE WAGE GEOGRAPHICAL DISTRIBUTION COMPARATIVE ANALYSIS

In front of us we have the industry employment and the average wage similar to the provincial and municipal clustering analysis results, Below we compare the specific industry data.Here we followed the national data center 20 industry classification for comparative analysis.By comparing the visualization results of the two sets of data analysis, We can according to the actual needs of students to guide students to choose the employment and personnel training direction of the adjustment.

Agriculture and forestry, animal husbandry and fishery data comparison and analysis shown in "Fig. 10", Heilongjiang, Xinjiang agriculture, forestry, animal husbandry and fishery employment number is relatively large, But also that agriculture, forestry, animal husbandry and fishery and other traditional industries in the region's economic development accounted for relatively large. The provinces with higher average wages in agriculture, forestry, animal husbandry and fishery are economically developed areas such as Beijing, Tianjin, Shanghai and Zhejiang, Its labor costs are relatively high, Liaoning is the province with the lowest average wage of agriculture, forestry, animal husbandry and fishery. Heilongjiang and Xinjiang provinces, such as agriculture, forestry, animal husbandry and fishery employment needs of the province's average wage is relatively low, The main reason is the regional economic development situation. Heilongjiang as a big agricultural province, Arable land and forest land is relatively large, While a higher degree of mechanization, This should be the average wage is relatively high provinces, But the average wage is relatively low due to the relatively low level of economic development. The comparison of other provinces can also be seen from the figure).
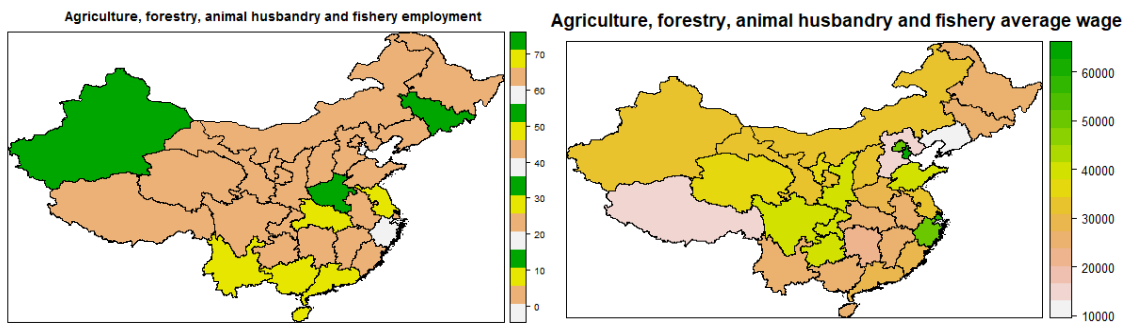

Figure 10. Comparison of Employment and Average Wages in Agriculture, Forestry, Animal Husbandry and Fishery
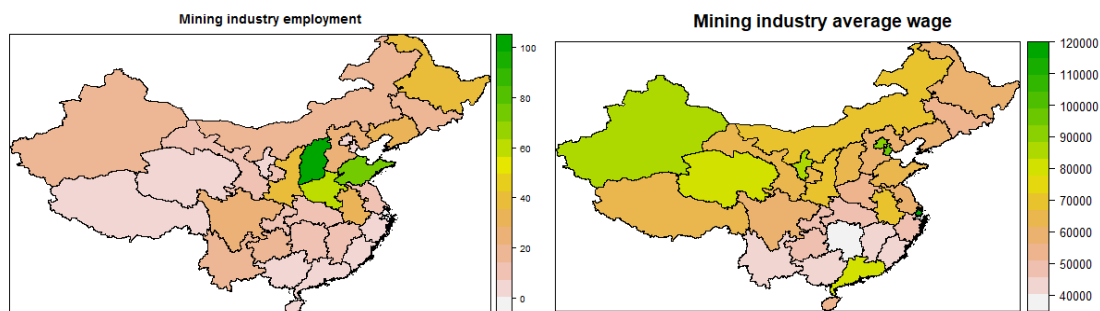

Figure 11. Comparison of Employment and Average Wage in Mining Industry

The comparative analysis of mining data is shown in "Fig. 11", Shanxi, Shandong and Henan provinces of the mining industry demand is larger, While the provinces with relatively high average wages are in Beijing, Tianjin

and Shanghai, Shanghai is indeed the least employed in the mining industry, The main cause of this phenomenon is: On the one hand because the regional economic development is different, Resulting in differences in employment costs; On the other hand, Shanxi, Shandong and Henan and other places the main needs of talent type

is engaged in front-line technical staff, While Beijing, Tianjin and Shanghai and other places the main demand is the mining industry upstream and downstream industries of high value-added professional and technical personnel.

Manufacturing employment

Manufacturing industry average wage
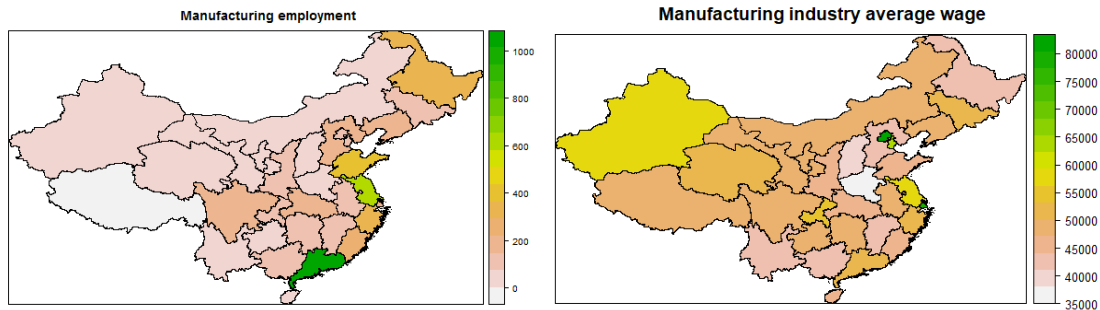
Figure 12. Comparison of Employment Employee and Average Wage

Electricity, gas and water employment

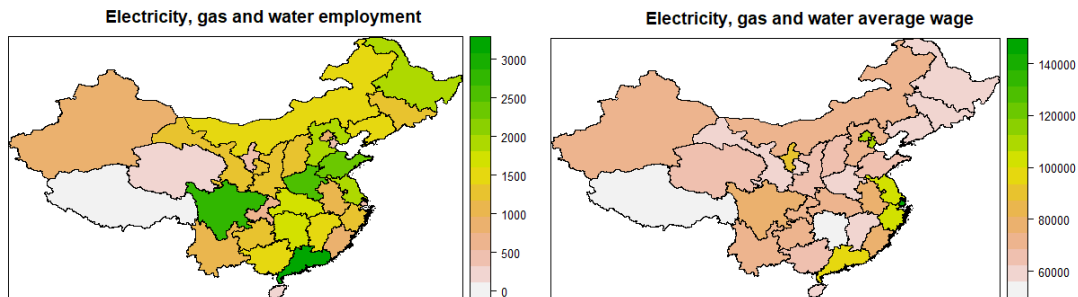**Electricity, gas and water average wage**

Figure 13. Comparison of Employment and Average Wage in Electricity, Gas, Water Production and Supply Industry

The comparative analysis of manufacturing data is shown in "Fig. 12", Guangdong and Jiangsu are the provinces with the greatest demand for manufacturing employment, But the provinces with the highest average wages are Beijing, Tianjin and Shanghai, The cause of this phenomenon has nothing to do with the regional economic development imbalance, Mainly different types of talent needs, Guangdong and Jiangsu mainly demand low value-added industrial workers, And Beijing and

Shanghai and other places is engaged in manufacturing and related high value-added technical personnel.

Comparison of production and supply of electricity, gas and water is shown in "Fig. 13", Sichuan, Guangdong, Henan, Shandong, Jiangsu, Hebei and Heilongjiang are the provinces with relatively few jobs in the industry, The higher average wage areas are Beijing, Tianjin, Shanghai, Jiangsu, Zhejiang and Guangdong.

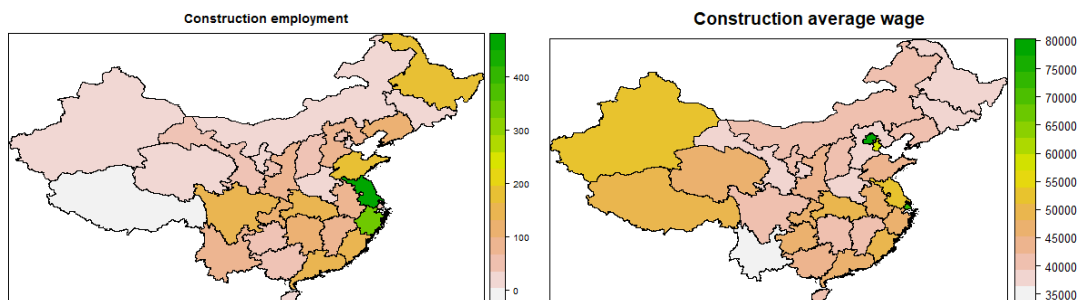**Construction employment**

Construction average wage

Figure 14. Comparison of Employment and Average Wage in Construction industry
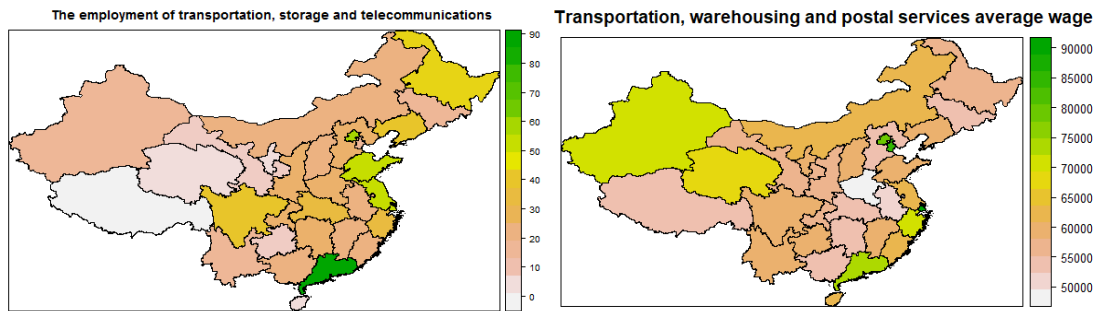
Figure 15. Comparison of Employment and Average Wage in Transportation, warehousing and post and telecommunications

The comparative analysis of construction data is shown in "Fig. 14", Jiangsu and Zhejiang are the provinces with a large number of construction workers, Beijing and Shanghai are the provinces with higher average wages in the construction industry, Yunnan is the province with the lowest average wage.

Transportation, storage and postal telecommunications industry data analysis shown in "Fig. 15", Guangdong,

Shanghai, Beijing, Jiangsu and Shandong are the provinces with a large number of employed persons, The provinces with higher average wages are Beijing, Shanghai, Tianjin, Guangdong and Zhejiang, Comparative analysis shows that the number of employed persons in the sector is basically the same as the average wage, Match each other.
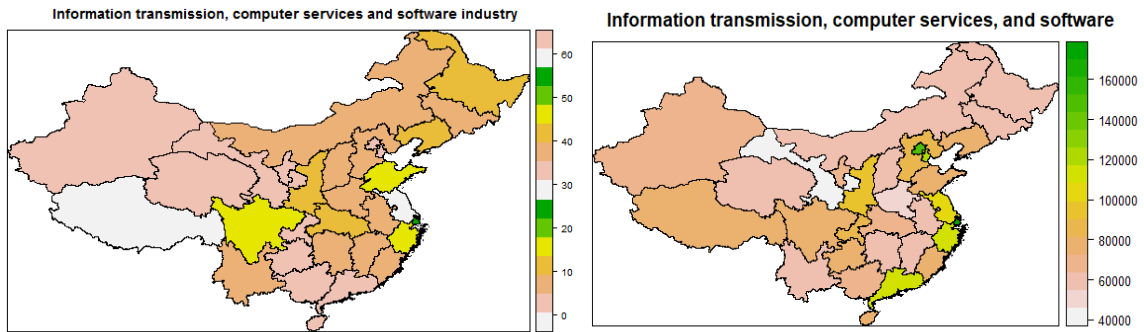

Figure 16. Comparison of Employment and Average Wage in Information transmission, computer services and software industry

Figure 17. Comparison of Employment and Average Wage in Wholesale and retail

Information transmission, computer services and software industry data analysis as shown in "Fig. 16", Beijing, Guangdong and Jiangsu are the provinces with a large number of employed persons, The provinces with higher average wages are Beijing, Shanghai, Guangdong, Tianjin and Zhejiang.

The comparative analysis of wholesale and retail data is shown in "Fig. 17", Guangdong, Shanghai, Beijing, Shandong and Jiangsu are the provinces with relatively large numbers of employed persons, he provinces with higher average wages are Beijing and Shanghai. Wholesale retail center in Beijing and Shanghai.
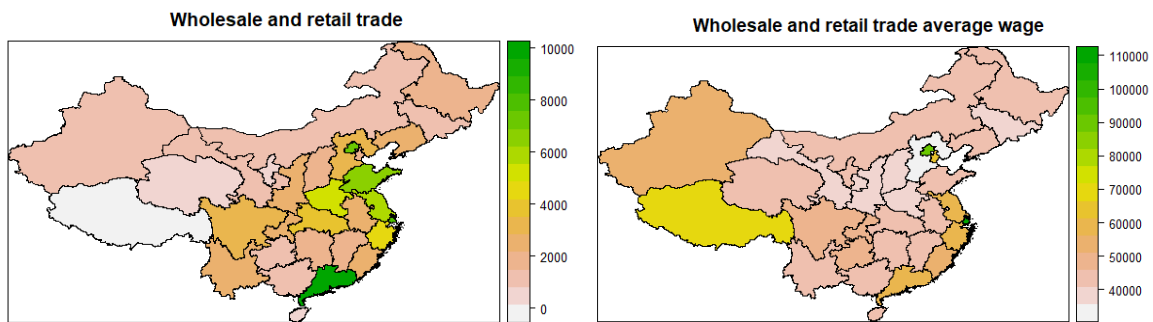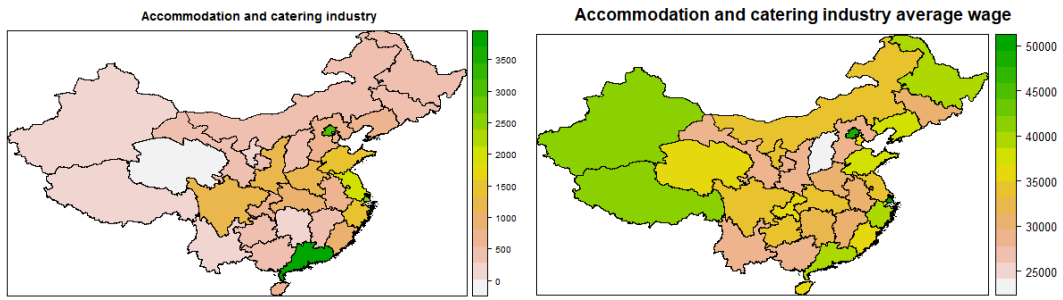
Accommodation and catering industry　　　**Accommodation and catering industry average wage**

Figure 18. Comparison of Employment and Average Wage in Accommodation catering industry
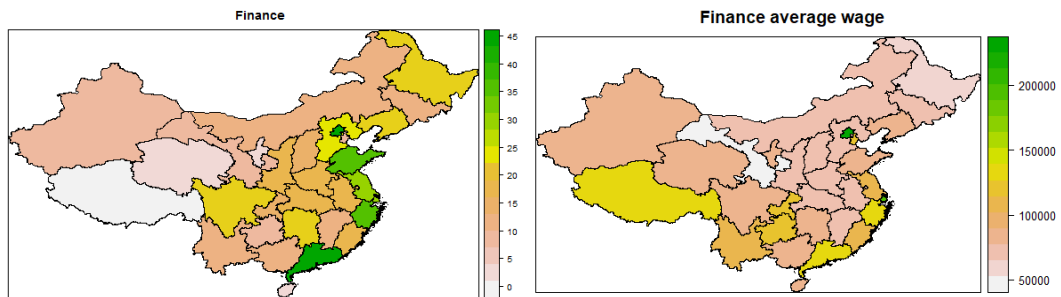
Finance　　　**Finance average wage**

Figure 19. Comparison of Employment and Average Wage in Financial industry

The comparative analysis of accommodation data is shown in "Fig. 18", Guangdong, Beijing, Shanghai and Jiangsu are the provinces with a large number of employed persons, The provinces with higher average wages are Beijing, Shanghai, Tibet and Xinjiang.

The comparative analysis of financial data is shown in "Fig. 19", Beijing, Guangdong, Shandong, Zhejiang, Jiangsu and Shanghai are the provinces with a large number of employed persons, The provinces with higher average wages are Beijing and Shanghai. This shows that Beijing, Shanghai is the center of the financial industry.
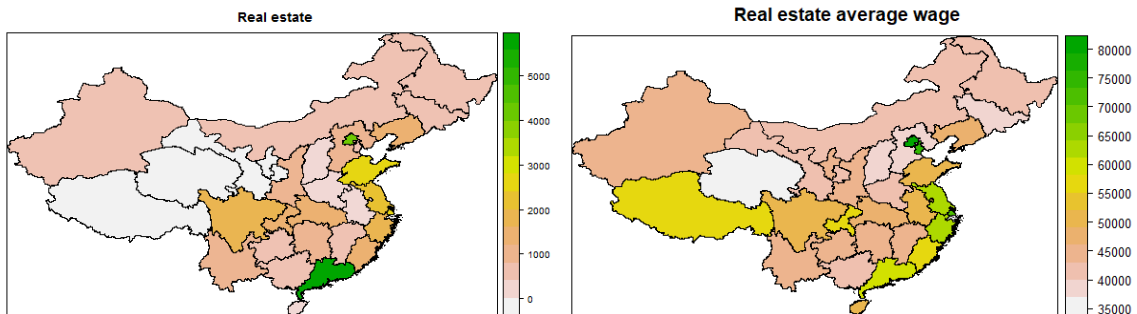
Real estate　　　**Real estate average wage**

Figure 20. Comparison of Employment and Average Wage in Real estate

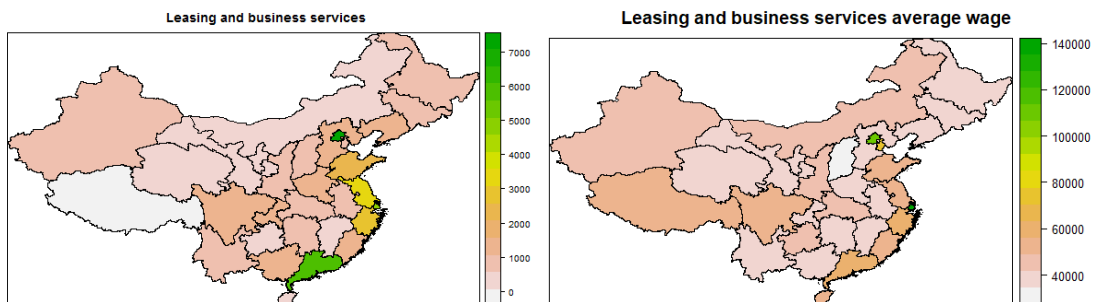**Leasing and business services**　　　**Leasing and business services average wage**

Figure 21. Comparison of Employment and Average Wage in Leasing and business services

The comparative analysis of real estate data is shown in "Fig. 20", More provinces are Beijing, Shanghai and Guangdong, The provinces with higher average wages are Beijing, Shanghai, Tianjin, Jiangsu and Zhejiang. The

results of the comparative analysis of employment data and average wage data are basically the same.

The comparative analysis of rental and business services is shown in "Fig. 21", More provinces are

employed in Beijing, Shanghai and Guangdong, the provinces with higher average wages are Beijing and
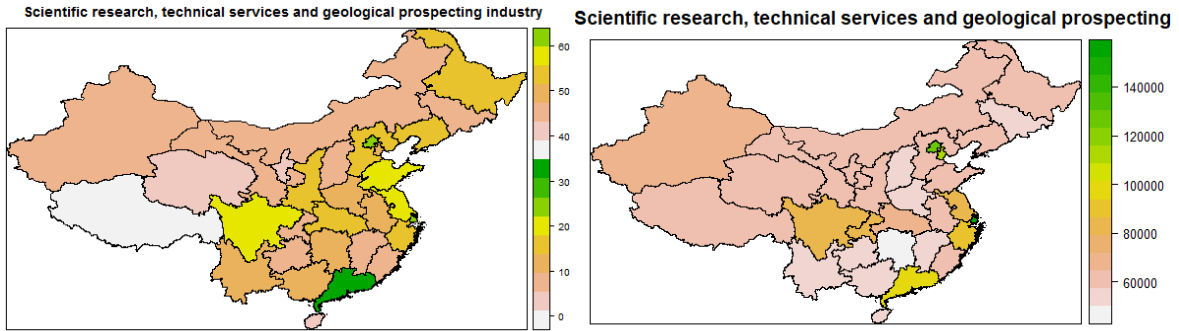
Shanghai.

Figure 22. Comparison of Employment and Average Wage in Scientific research, technical services and geological prospecting
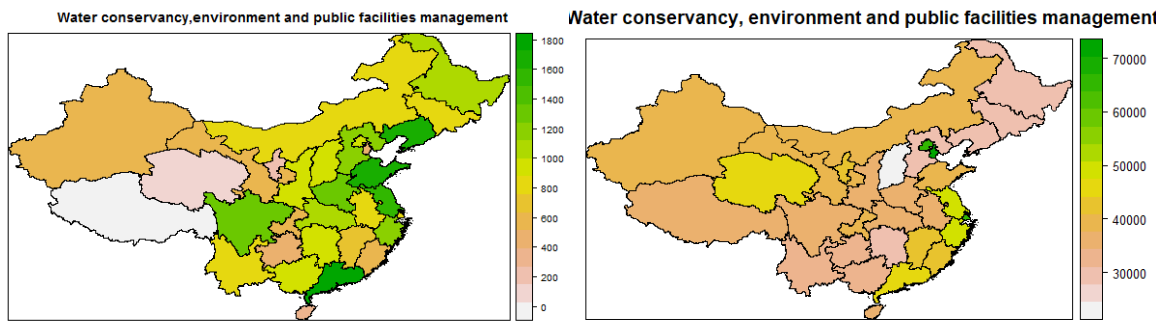

Figure 23. Comparison of Employment and Average Wage in Water conservancy, environment and public facilities management

Scientific research, technical services and geological prospecting data are shown in "Fig. 22", The results of employment data and average wage data are basically the same, The provinces with higher average wages are Beijing and Shanghai.

Water conservancy, environment and public facilities management industry comparative analysis of the data

shown in "Fig. 23", The provinces where there are more jobs are Guangdong, Shandong, Liaoning, Jiangsu, Henan, Sichuan, Zhejiang and Hebei provinces, The provinces with higher average wages are provinces in Beijing, Tianjin and Shanghai. ountries with larger employment needs are not consistent with the regions with higher average wages.
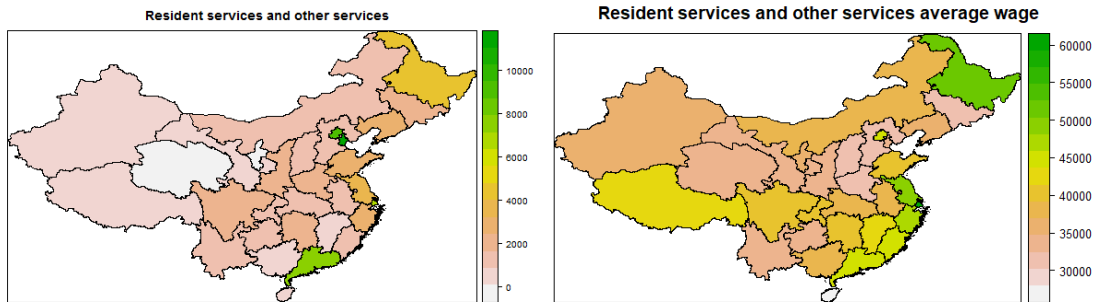

Figure 24. Comparison of Employment and Average Wage in Resident services and other services
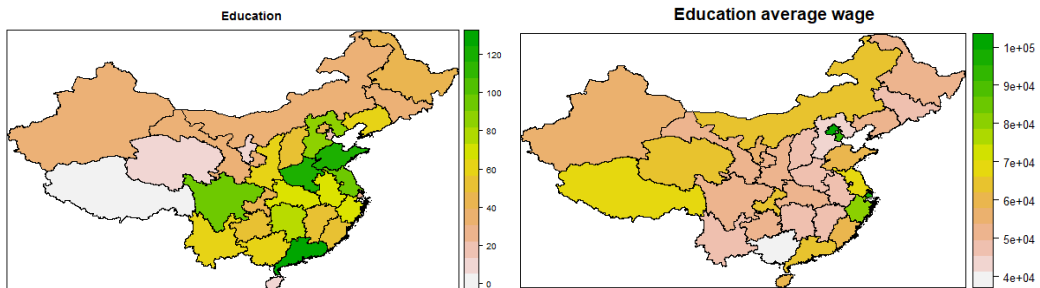

Figure 25. Comparison of Employment and Average Wage in Education industry

The comparative analysis of resident services and other services is shown in "Fig. 24", More provinces are Beijing, Tianjin, Guangdong and Shanghai, The provinces with higher average wages are Shanghai, Heilongjiang, Jiangsu and Zhejiang.

The comparative analysis of educational data is shown in "Fig. 25", More provinces are employed in Guangdong, Shandong, Henan, Jiangsu and Sichuan, The provinces with higher average wages are Beijing, Shanghai, Tianjin and Zhejiang.
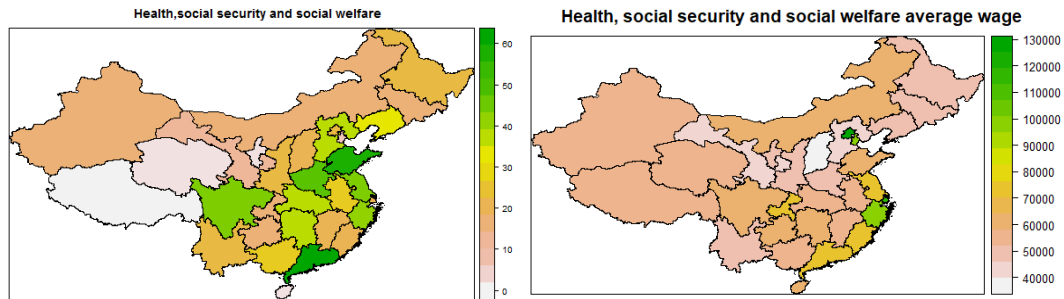

Figure 26. Comparison of Employment and Average Wage in Health, social security and social welfare
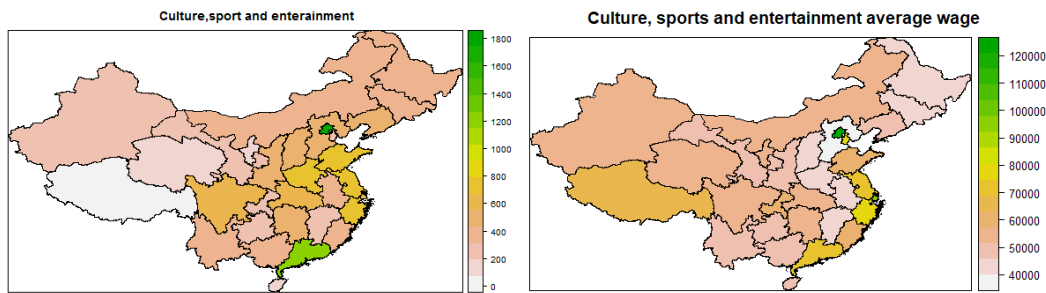

Figure 27. Comparison of Employment and Average Wage in Culture, sports and entertainment

Health, social security and social welfare comparative analysis of the data shown in "Fig. 26", The provinces with more demand for employment are Guangdong, Shandong, Henan and Jiangsu, The provinces with higher average wages are Beijing, Shanghai, Tianjin and Zhejiang, Regional talent needs do not match the average wage.

The comparative analysis of cultural, sports and entertainment data is shown in "Fig. 27", More provinces are Beijing and Guangdong, The provinces with higher average wages are Beijing and Shanghai.
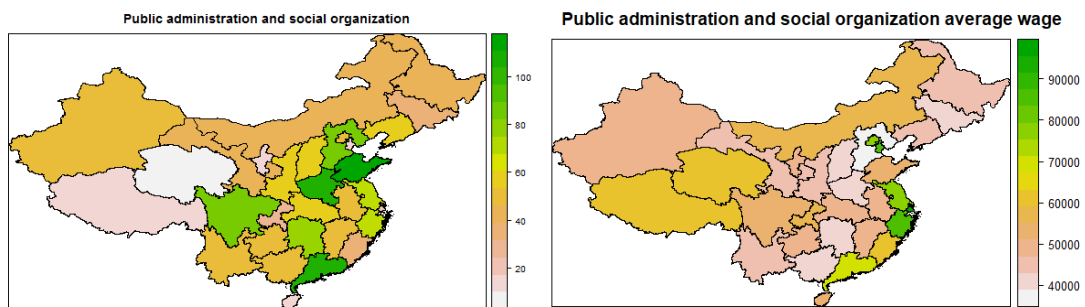

Figure 28. Comparison of Employment and Average Wage in Public administration and social organization

Public management and social organization data comparison analysis shown in "Fig. 28", More employment in the provinces of Shandong, Henan, Guangdong and Hebei), The provinces with higher average wages are Shanghai, Zhejiang, Tianjin and Beijing).

V. TERRITORY INDUSTRY EMPLOYMENT AND THE AVERAGE WAGE COMPARATIVE ANALYSIS

Here you can also be converted from the industry perspective to a regional perspective analysis, Beijing, Shanghai, Guangdong and other industries in the average wage is relatively high in the region, But the demand for employment is not the same high area. Career development prospects, education and health care, and so the obvious advantages of resources is to attract a large number of outstanding talent gathering the main reason, but at the same time competition is quite intense.

From a geographical point of view, take Anhui as an example, its data analysis chart in each industry we can find very clearly that Anhui in all sectors of demand, employment and industry average wages are in the middle reaches of 31 provinces and cities, Relatively balanced economic development conditions, it have a good prospect, The influx of immigrants and the rapid

pace of economic development are consistent with the appearance of housing prices in Hefei, the capital of Anhui Province in recent years, In this way, we can guide students to move towards areas with better future prospects, the Institutions of higher learning in the region can also adjust the target of professional training and the number of students in accordance with the actual needs.

VI. FROM JOB HUNTING, JOB SEARCH BEHAVIOR, JOB SEARCH RESULT ANALYSIS GRADUATES EMPLOYMENT STATUS.

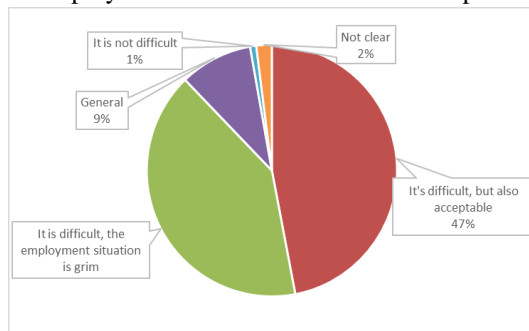On the whole, the 2017 graduates are not optimistic about the employment situation in China.The specific situation as shown in "Fig. 29" (data from Zhaopin), through the statistics of Shenyang chemical university graduates of 2017 data analysis results show that the graduates employment intention is still to continue to study in the domestic employment, The proportion of students who choose to continue studying in China is 27.4% which is far higher than the national average survey data released by Zhaopin 6.3%,The rate of choosing to continue studying abroad is 1.2% , which is lower than the recruitment of the release of 3.4%.The rate of choice for delayed employment (slow employment) was as high as 12.4%,higher than that of Zhaopin 9.8%.

Figure 29. Evaluation of the employment situation

Figure 30. The ideal job in college students' minds

The data analysis shows, as shown in "Fig. 30", different from the previous survey results, "the treatment of salary" is behind the "learning new things and growing "for the first time, the 2017 graduates are more likely to growth themself, occupation planning of 90 young people is not a single pursuit of high income and high welfare, they will pay more attention to the cultivation of young people's sense of identity and value orientation of individual ability," enterprise harmonious atmosphere "and" work with personal interest "is the high concern of 2017 graduates .

The professional rate of graduates' employment is decreasing, and the influence of major on work is further reduced.In 2017, there are 38.5% of the graduates chose jobs that were not in line with their majors, which up 5.7% from the same period last year. The decline of professional counterpart rate reflects the structural contradiction between the professional setup of Chinese universities and the actual needs of the community and the employing units. In addition, the rapid development of modern society, "Internet plus" and "sharing economy" and "economic community" and other new industries and jobs, produced a large number of occupation needs new, such as red net, micro business, self media, and so on, The employment channel diversification brought more choices and opportunities for college students, And the idea that what we do not necessarily do is recognized by more and more people.

Figure 31. 2014-2017 Graduates expected monthly salary compared with the actual monthly salary (yuan)

Data analysis shows that the actual signing of the 2017 graduates average monthly salary of 3314 yuan. As shown in "Fig. 31", from 2014 to 2017, expected salary and monthly salary of graduates of the actual contract showed increasing trend, the difference between the two also showed an increasing trend, the average monthly salary of the average monthly salary expectations and the actual difference between signing graduates in 2017 reached 1251 yuan, compared to last year, the gap widened further.

Overall, the employment intention of graduates in 2017 showed a downward trend, "Further study" has

risen enthusiastically, which is related to the guidance of family education for students to continue their studies and further studies, In addition, a large proportion of students choose "slow employment". Facing a more severe and complex employment environment in 2017, more college students also expressed concern about employment.

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