Industry Requirements for Translators across China Before COVID-19: Analyzing 51job Listings through Web Scraping

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Abstract

Purpose of the study: The first purpose of this study is to present the detailed requirements from employers; the second is to share a powerful data collecting and visualization method with translation scholars and practitioners.

Method: We proposed a new method of data collection and data analyzation. The technology of web scraping, such as programs written in Python can retrieve the first-hand data in a faster and more convenient manner than traditional questionnaires or interviews; the technology of data visualization, such as Tableau Desktop, can show the results between graphic marks and data values in a graphic representation. With these technologies, we collected, cleaned, analyzed, mapped, and visualized 46144 listings from 51job, an online recruitment website, across China in terms of translators.

Results: After analyzation, we find: (1) employers value applicants' bilingual competences most; (2) employers require applicants should have some working experience; (3) employers require applicants should have relevant knowledge in specific fields; (4) office software and translation technologies are required.

Conclusion: Job listing is an important source to analyze industry requirements. With the help of web scraping and visualization technology, a new world will be opened to scholars and practitioners in translation studies.

Keywords: Industry requirements; Web scraping; Python; Data visualization

1. Introduction

The translation study is a relatively young but fast-growing discipline in China. From the year 2006 to 2018, 249 universities have established Master of Translation and Interpretation (MTI) programs, and 281 universities have established Bachelor of Translation and Interpretation (BTI) programs (China National Committee for BTI Education, 2019). In order to train professional translators, many studies have been done to help optimize pedagogy, curriculum, and textbooks. The purpose of translation training is to cultivate the talents needed by society(Yue, Tao, Wang, Cui, & Xu, 2019). Therefore, many scholars both at home and abroad think it is of great importance to investigate the social needs of translators (D. Li, 2000a).

Significance of the Study

Questionnaires and interviews are the primary methods used by scholars. Few scholars have resorted to big data technology to collect information. Compared with web scraping technology, questionnaries and interviews are "labour intensive and time consuming to access large samples (Mathers, Fox, & Hunn, 1998) ". In order to address the methodology gap in analyzing industry requirements for translators, we collected, preprocessed, and analyzed 46144 listings from 51job, an online recruitment website. The data reveal industry requirements for translators across China and provide much richer detail at much larger scales than those obtained from traditional methods.

Research Objectives
To collect recruitment information
To analyze recruitment information
Research Questions

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How to collect recruitment information in a large scale? What are the features of the employers? What are the requirements for translators and interpreters?

Purpose of the Study

The purposes of this study are twofold. The first is to present the detailed requirements from employers. The information analyzed in this study is much larger than those collected through questionnaires or interviews. The second is to share a powerful data collecting and visualization method with translation scholars and practitioners. Data can be divided into two categories: quantitative and qualitative. Quantitative data is numeric, and qualitative data is non-numeric(Angelone, Ehrensberger-Dow, & Massey, 2020). Questionnaires and interviews can collect both quantitative and qualitative data, so does web scraping. In this study, we used Tableau Desktop(Tableau) to analyze quantitative data, because they can be measured and counted; we used Jieba(J. Sun, 2020) to analyze qualitative data because they were only represented in words.

2. Literature Review

Translation competence is defiend as "language competence, textual competence, subject competence, cultural competence and transfer competence" (Schäffner & Adab, 2000). Many studies have been done to analyze industry requirements for translators. Defeng Li investigated professional translators in Hongkong through questionnaires to find out which competence they valued most(D. Li, 2000b). Jinyu Liu collected and analyzed statistics from fifteen universities and Translator and Interpreter (T&I) Institutions in the UK, Canada, Chinese mainland and Hongkong SAR through questionaries to find out whether the translation modules and courses address the market demands(Liu, 2013). Segun Afolabi undertook a survey and recommended that market needs should be incorporated into T&I training programs(Afolabi, 2019). In this survey, the semi-structured interview was used to identify the needs of twenty-three organization representatives in Nigerian, and a comparative analysis of nineteen T&I graduate programs was studied. Yan Yao conducted investigations of MTI students, teachers and administrators employing questionnaires and interview survey, and found some existing problems like unreasonable curriculum arrangement, professional textbook insufficient and lack of qualified teachers in existing MTI education model(Yao, 2018). Defeng Li thought

needs assessment was very crucial to find our what translators' real needs were and to make sure translation courses were relevant to students' needs, and he summarized methods to conduct needs assessment including survey questionnaires, interviews, and focus group methods(D. Li, 2000a). Anna Zaretskaya, Gloria Corpas Pastor, and Miriam Seghiri carried out an online survey to find out professional translators' requirements in terms of translation technologies. In their study, they received 736 competed responses and in total 1304 responses(Zaretskaya, Corpas Pastor, & Seghiri, 2015). Shufen Yang investigated and analyzed the market demands of translation talents, and in the study 117 questionnaires of professional translators and 106 questionnaires of the employers were analyzed(Yang, 2016). Huashu Wang found that besides language skills, translators should meet many other requirements, such as information and technology, translation technologies, experience, and professional ethics through examining the job advertisements of 50 major language service providers from 3 major online recruitments in China(H. Wang, 2019). Therefore, he suggests that translation programs should have a macroscopic vision of this industry.

3. Method

The data we used in this study were retrieved from 51job (Zhan & Yan, 2011). In order to analyze the industry requirements for translators, firstly, we used the Python (The PSF) program to collect 46144 recruiting listings from 51job across China between May and August 2019. Secondly, we preprocessed the data: mainly, data cleaning and data reduction. After data preprocessing, we got 8596 listings. Thirdly, we imported the preprocessed data into Tableau Desktop to analyze the quantitative data such as "the salary", "the company location", "working experience requirement", "education requirement", "the number of recruitment", "the submitting date", "the company type", "the company size", and "the company industry" to find the numerical features. Fourthly, we analyzed the qualitative data by extracting the text features of "the job requirement" through Jieba, a Python module for Chinese text segmentation, and created lists of skill competencies and social competencies required by employers.

3.1 Web Scraping

In the era of Big Data, the ever-growing amount of information offers valuable opportunities for scholars. But how to get and use the information

remains a question. The development of web scraping technologies opens up a new world for researchers to get information from the web. Web scraping refers to the automatic extraction of information from the Internet (Wikipedia). With web scraping, we can get millions of data within hours. While traditionally, this would take some days or even months. The use of web scraping is to free humans from simple and repetitive work. However, the legality of web scraping (Krotov & Silva, 2018) must put into consideration. A common practice is to follow the rules in the Robots Exclusion Protocol (robots.txt) (Y. Sun, Zhuang, & Giles, 2007) from the target website. Therefore, before starting collecting data, we searched robots.txt from 51job by inputting https://www.51job.com/robots.txt into Google Chrome and found nothing. It indicated that scraping 51job is permitted. After checking web scraping legality, we started the data collection.

In this study, we used the Python program to scrape data from 51job. The data collecting process is as follows: (1) manually searching the web. In this step, we searched "translator (including translator and interpreter)" in 51job. Then, we analyzed the HTML structure(Sirisuriya, 2015) of the page and determined which information was needed. On the main page, we considered the information including "the job title", "the company name", and "the web link of the company" where the detailed information presented was useful. Then, we turned to the detailed information page of the company. On this page, the information including "the salary", "the company location", "working experience requirement", "education requirement", "the number of recruitments", "the submitting date", "the company type", "the company size", "the company industry", and "the job requirement" were to be retrieved. All the information would be helpful later; (2) writing the Python program. After determining which information was needed, we started writing the Python program. In the program, the Requests library (Reitz, 2020) and Xpath were adopted to parse the webpage and acquire the information needed. (3) storing the data. We ran this program and stored the information in CSV format. In total, we got 46144 listings.

Although Requests library and Xpath rule have reduced many special symbols, we still found there were much unstructured information and missing values. The raw data was messy. Therefore, the next step was data preprocessing.

3.2 Data Pre-processing

Data pre-processing includes data preparation, which consists of data integration, data cleaning, data normalization, data transformation; and data reduction (García, Luengo, & Herrera, 2014). While manually scanning the retrieved data, we found in the column "the job title", many titles did not contain "translator". Some were salesperson, assistant or teachers. Maybe in their jobs, they would do some translation work, but they are not translators in the real sense (Wikipedia). Therefore, non-translator related jobs needed to be filtered. The second problem was that 51job allows companies to resubmit their recruitment information after some days' internal. But a company would recruit more than one type of translator, for example, English-Chinese translators, and French-Chinese translators. If we defined a listing to be duplicated when the company name appeared more than once in the raw data, we would delete more listings. Henceforth in this study, we considered a listing to be duplicated if the job title and the company name at the same time appeared more than once in the raw data. Therefore, we got the unique data, 8596 listings.

The third problem was that in the column "the company location", some companies submit provinces as company location, and some submit city + province, and others submit district + city + province as the location. Therefore, we would edit all the locations to the level of cities. The fourth problem was that in the column "the salary" the units of the salary were not the same. Some units were yuan per month, some were yuan per day, and some were yuan per year. We henceforth needed to convert all the units into a thousand yuan per month and convert the range of salary as minimum salary and maximum salary, in order to compare the salaries. This was data normalization (García et al., 2014). All these three steps can be done in the Python program. We wrote another Python program to preprocess the raw data. After preprocessing, we got only 8596 listings. From this, we could see that: translation, as a profession or industry, is not standardized (Biel, 2011). Many companies consider translators to be assistants, clerks or even salespersons. Many listings were deleted in the second step because they do not belong to the profession of translators.

3.3 Data Analysis

In this study, we used two methods to analyze the clean data. We used Tableau Desktop to analyze

numerical features of items like "the salary", "the company location", "working experience requirement", "education requirement", "the number of recruitment", "the submitting date", "the company type", "the company size", and "the company industry". We used Jieba to extract the text features of passages in "job requirement".

"Text feature extraction is an extraction to represent a text message; section from the document part can reflect the information on the content words (Liang, Sun, Sun, & Gao, 2017)." In this study, we used Jieba to find out words with the most significant frequency. In order to make the segmentation accurate, we built a stoplist containing words not relevant to job requirements and created a custom dictionary of vocabulary, helping the computer to understand Chinese phrases better. We wrote another Python program and stored the words with more than 500 frequencies. Then we analyzed these words. Because of the flexible expression of Chinese, many synonyms appeared on the list. Therefore, we chose one word to replace the synonyms. For example, companies required English translators must have a good command of English, Japanese translators must have a good command of Japanese. In the module of Jieba, English and Japanese are treated as two different words. However, in this study, we replaced them with foreign language, which is a critical skill competence. After revision, we put the revised words into different categories: skill competence, social competence, and education requirement.

4. Results
4.1 Salary and Opportunities

In Tableau Desktop, we got a comparative bar chart shown in Figure 1. The salary is not attractive. The average minimum salary is 5936 yuan/month, and the average maximum salary is 8660 yuan/month. There is not much room for salary increase. According to statistics, in 2018, top three industries with highest average annual salary are Information transmission, software, and information technology services, 147678 yuan/year (12306.5 yuan/month), the financial industry, 129837 yuan/year (10819.75 yuan/month), and Scientific research and technical services, 123343 yuan/year (10278.58 yuan/month) (National Bureau of Statistics, n.d.). Compared with the top three industries, the translators' salary is not attractive. Even in the first-tier cities, like Beijing, Shanghai, Guangzhou, and Shenzhen, the average minimum salary is not higher than that in other cities, as shown in Figure 2. In western China, central China, and northern China, there are employers offer salaries above the average level 5936 yuan/month. While in eastern China, where more big cities locate, the minimum salaries offered by employers are under the average level, which is not the same as we expected.
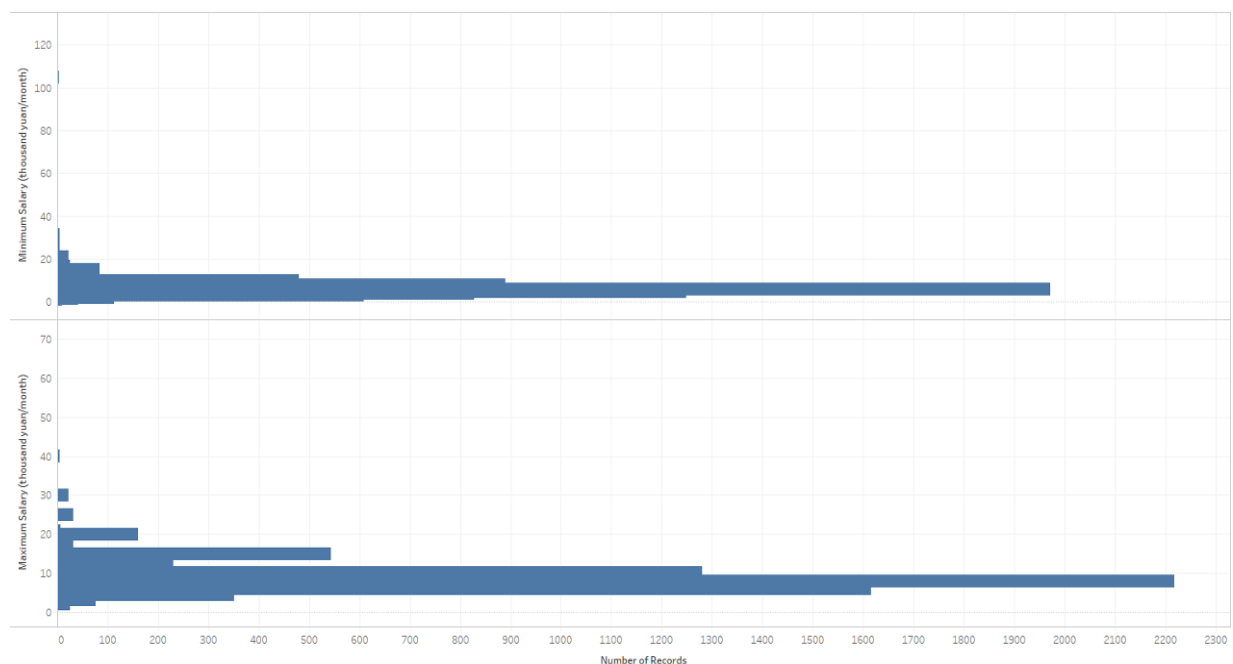

Figure 1. **Minimum and Maximum Salary (thousand yuan/month).**
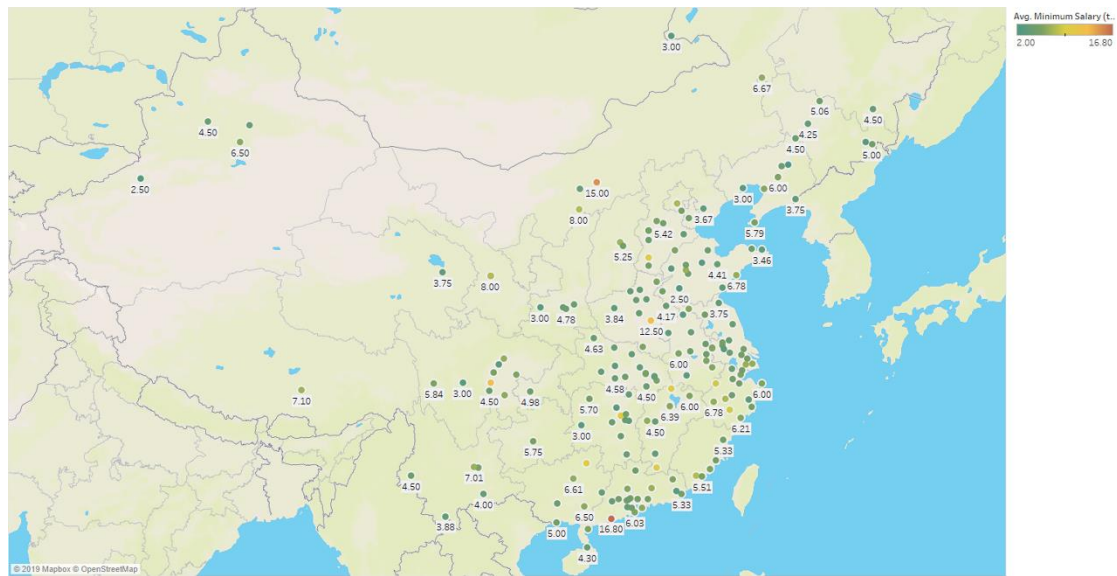
Figure 2. **The average minimum salary in different cities.**

But in big cities there are more opportunities. As shown in Figure 3, Shanghai, Guangzhou, Shenzhen, and Beijing are the top four cities where companies locate, followed by Wuhan, Suzhou, Chengdu, and Hangzhou. All these cities are among China's first-tier or new first-tier cities (Wikipedia). This is the same as perceived. Translation involves the transfer of one language into another. Only companies have to exchange with people in other countries and regions, do they need a translator. In first-tier and new first-tier cities, there are more international companies. Moreover, there are more international exchanges.

Figure 3. **The number of jobs offered in different cities.**

4.2 Education Requirement

In Figure 4, we can see that the lowest level of education required is an Associate degree, accounting for 42.0%. However,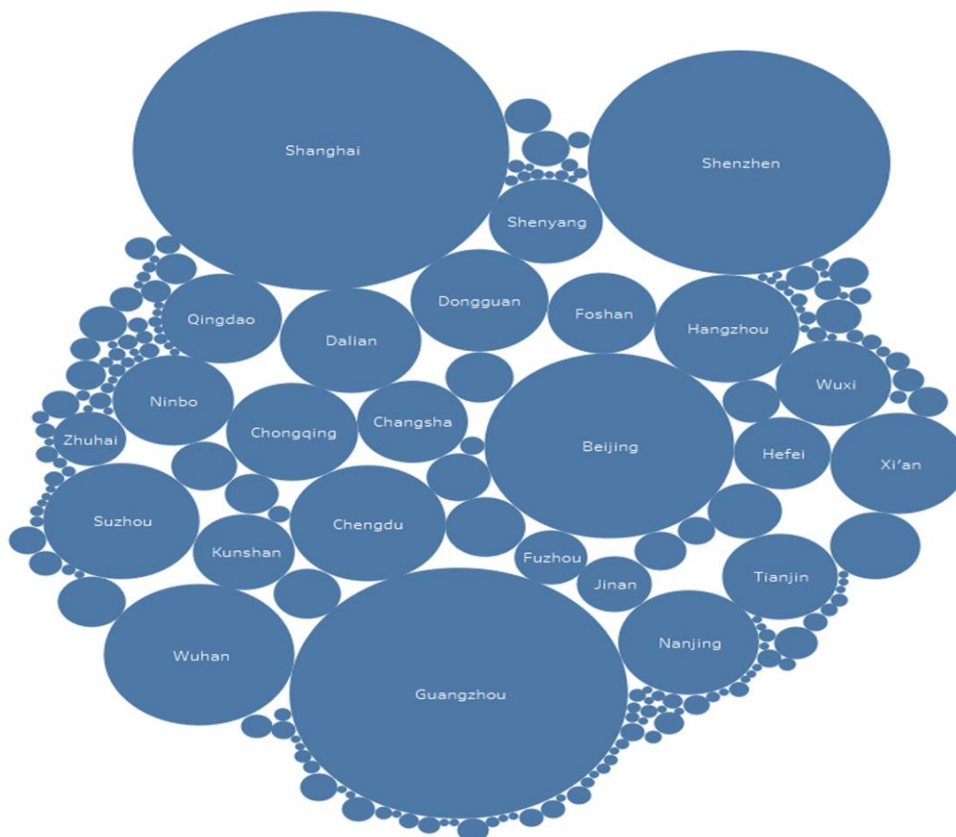 more companies are willing to hire translators with a Bachelor's degree, accounting for 53.9%. In Li's survey, the participants' education background was like this: 52.7% with Bachelor's degrees, 19.0% with an Associate degree, and 28.6% with Master's degree (D. Li, 2000b). According to official statistics, by the end of 2017, there are 215 universities with MTI programs (China National Committee for BTI Education, 2017). By the end of 2018, there are 281 universities with BTI programs (China National Committee for BTI Education, 2019). Colleges with translation majors are not counted in. Adding

together, the number of translation majors is very big. Every year, many translation-major undergraduates and graduates leave their universities to find jobs. Why are some companies willing to hire students with Associate degrees other than Bachelor's degrees? There are maybe two reasons. The first one, employers think knowing another kind of language can do translation, and translation work does not include any difficult skills (Y. Wang, 2008). The second one, employers could pay less for an employee with an Associate degree than a Bachelor's degree (Baum, Ma, & Payea, 2013). We can see from Figure 5, most companies belong to private-owned enterprises. Moreover, most companies are small with employees less than 150 as shown in Figure 6.
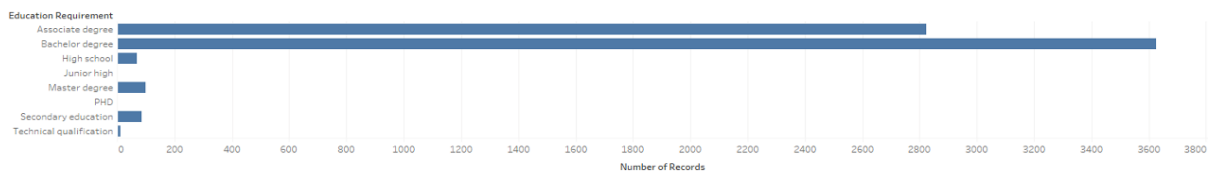
Figure 4. **Education requirement.**
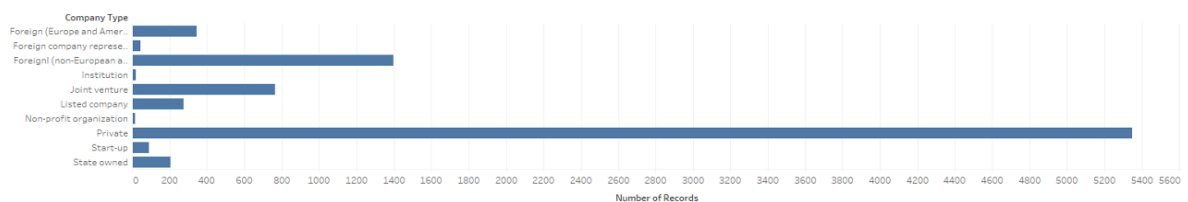
Figure 5. **Company type.**
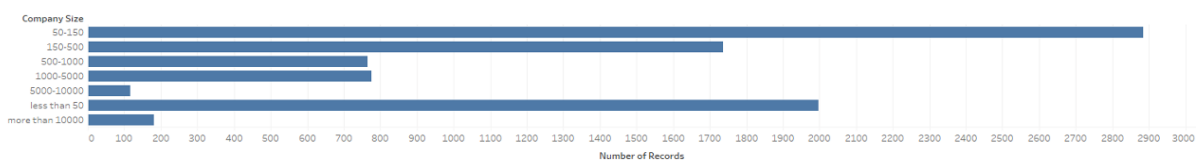
Figure 6. **Company size.**

In Figure 4, some employers only needed applicants with a High school diploma, which was very strange. Then we traced back to these companies. There were 167 listings. It only accounted for 1.9%. However, it still needed attention. We analyzed the job requirement description and found 149 listings had an explicit requirement of above high school or secondary education diploma. In terms of foreign language, most of these jobs were non-English translators. However, all of these jobs were not translators in real sense. Some were like assistants, salesperson or even customer services. Maybe in their work,

they need to transfer from one language to another one. But this is not the whole of their work. We could infer from this that the industry of translation is not standardized to some extent. Employers should clarify whether they need a translator or a salesperson.

In the job requirement description, many employers clearly stated that they would prefer an applicant with an overseas education background. The term "overseas education" appeared 1336 times after we finished text feature extraction. It is not difficult to guess why. They think if an applicant has studied abroad, then he/she must be able to

communicate well in this country's language. Can employees with overseas education backgrounds do better translation work than those without overseas education backgrounds? We need to do more research to answer this question.

4.3 Competencies

Competences, in this study, are categorized as skill competences and social competences (Krajcso, 2011). In order to find out the competence required by companies, we used Jieba to extract text features from the job requirement description. We got a list of words with frequencies. Then we analyzed the words and put them into skill competences, social competences, and other requirements in Table1 and Table 3.

4.1.1 Skill competences

From Table 1, we can see that companies regard foreign language competence to be the most crucial competency with 24193 frequencies. Previous studies also show that bilingual competence is a crucial competency to translators (Albir, 2007; D. Li, 2000b; Muoz, 2012; Xu, 2005). In this study,

companies also require Chinese competence, with 1673 frequencies. However, even professional translators consider language competence as a challenge. Students have to improve their bilingual competence significantly before they begin to learn translation skills (D. Li, 2000b). How to improve students' language competency? "Reading and recitation of classics,contrastive reading of beautiful bilingual writings, and translation combined with writing (A. Wang & Ren, 2016)" can enhance students' language competency.

Table 1. **Words for skill competences.**

Skill competence	Frequency
Foreign language competence	24193
Translation ability	23120
Working experience	10723
Relevant knowledge	9286
Technology & software	5496
Certificate	3660
Learning ability	1872
Chinese competence	1673
Expressing ability	1253

Table 2. **Professional competences of translators and interpreters (GB/T 19363.1-2008, GB/T 19363.2-2006).**

	Translator	Interpreter
Certificate	foreign language level certificate / equivalent certificate	interpreting qualification certificate / corresponding ability
Experience	General or professional working experience	None
Others	Professional ability; Able to receive retraining or continuous education	Professional ethics; Able to receive retraining or continuous education

Professional competencies of translators and interpreters are shown in Table 2. A translator should have recognized foreign language level certificate or an equivalent certificate (Standardization Administration). An interpreter should have an interpreting qualification certificate issued by the relevant department recognized by the state or corresponding ability (Standardization Administration). What is an equivalent certificate? How to measure the corresponding ability? It is not

mentioned. Specified in ISO 17100 quality standard – requirements for translation services (ISO 17100:2015) (International Standard for Language Service Providers), translators should have professional competence as Table 1. It seems that ISO 17100:2015 is more clearly expressed than GB/T 19363.1-2008, GB/T 19363.2-2006. Maybe employers in China can learn from this international standard while recruiting to get the translation industry more standardized.

Table 3. **Professional competences of translators (ISO 17100:2015).**

	Option 1	Option 2	Option 3
Education requirement	Graduate qualification in translation	Graduate qualification in other fields	None
Experience requirement	None	Two years of full-time professional experience in translating	Five years of full-time professional experience in translating

Another question arises here. 57.1% of the companies claim no working experience requirement or do not mention that in the column of "working experience requirement", while in the job requirement description, the term "working experience" is mentioned 10723 times. Companies are more willing to hire translators with at least one-year experience. In GB/T 19363.1-2008, as a professional competence for translators, working experience is also mentioned. As for undergraduates or postgraduates, how to gain working experience is a question. In order to narrow down the gap between class teaching and actual practice, many universities have

incorporated translation internship into the curriculum. As Figure 2 shows, many translator job recruitments are in the coastal cities or first-tier cities. It is more convenient for students in those areas to find an internship. But for students in central China or western China, how to gain translation experience? One solution to this could be to set up practice-involved curriculum. Teachers or school officials can contact with enterprises in need of translation, setting school-enterprise cooperation projects (Shi, 2018), lowering the difficulties for students to find internships by themselves.

Figure 7. **Company industry**

The fourth competence mentioned in Table 1 is relevant knowledge with 9286 frequencies. Many companies require translators should have relevant background knowledge of some certain industries. As shown in Figure 7, many companies belong to the industry of professional services, including consultation, human resources, and accounting. In these companies, they require applicants should have something knowledge related to business. Companies belonging to the industry of electronic technology, semiconductor, or integrated circuit require electronic technology-related knowledge. These requirements pose a significant challenge to applicants. Translation studies belong to the category of Foreign Language and Literature. Students would learn the courses like translation history, translation practice, linguistics, etc.

Business-related courses or technology related courses are seldom incorporated in their curriculum. Even professional translators report that they find a lack of related knowledge is the biggest challenge (D. Li, 2000b). How can students require relevant knowledge? Some universities raise the term "compound personnel" (Y. Li, 2017; Zhang, 2014), "practice-oriented talents" (Calvo, 2011), "practice-oriented teaching" (Wu & Mu, 2015) or "application-oriented talents" , and "task-based projects" (D. Li, 2013) or "project-based learning" (D. Li, Zhang, & He, 2015) to meet the needs. All these approaches can enlarge students' knowledge. Maybe universities and colleges can provide some optional courses to students if available. Then students can select courses useful to their future career.

The fifth competence mentioned in Table 1 is technology and software. Most companies require applicants should have a primary mastery of software like Microsoft Office, including Word, PPT, Excel, and Access. Other companies require applicants should know how to use translation software like SDL Trados, or any other translation memory management software. With the development of information technology, natural language processing, artificial intelligence, etc, translation technology has significantly advanced. Translation technologies include technical writing tools, terminology management tools, project management tools, machine translation tools, etc (Yue et al., 2019). The use of these translation tools dramatically changes the whole translation industry. Universities with translation majors should consider incorporating the teaching of these technologies into the translation curriculum.

An interesting finding is that many employers had a definite requirement for Chinese competence. The term "Chinese competence" appeared 1673 in Table 1. Most employers emphasized only foreign language competence, while some employers realized that as a translator in China, Chinese competence or Mandarin competence is of the same importance as foreign language competence. Bilingual competence is so-called. In Li's survey in 2005 (D. Li, 2000b), respondents valued "language skills more than translation skills", and they thought "bilingual competence was most important to translators". Therefore, translation majored students in universities or colleges should strength the training of both foreign languages and Chinese.

The expressing ability is closely associated with language competence. Employers required both oral and written expressing ability. Students should raise the awareness of training expressing ability while on campus.

4.1.2 Social competencies

Social competence, or social skill, is the combination "of social, emotional cognitive and behavioral skills needed to adapt successfully with the society" (Wikipedia). Besides skill competencies, companies also asked that applicants should have particular social competence as shown in Table 4. The term "communication", "teamwork", and "work attitude" are the top three. With the rapid social and economic development, translators sitting alone at the desk to do translation work have long gone. Teamwork has gradually become the norm (Krajcso, 2011). Therefore, it is vital for students

learn how to communicate with others and cooperate with others. Other social competencies like "responsibility", "characteristic", "professional ethics", "pressure-resistant", and "service awareness" were also required by employers.

Table 4. **Words for social competency.**

Social competency	Frequency
Communication	6438
Teamwork	6108
Work attitude	5795
Responsibility	3088
Characteristic	2626
Professional ethics	2231
Pressure resistant	1563
Service awareness	1562

4.1.3 Other requirement

Besides skill competences and social competences, some companies mentioned that their job would need frequent travel or work overtime, as shown in Table 5. Therefore, before applying, students need to clarify whether they can meet such kind of requirements.

Table 5. **Words for other requirements.**

Social competence	Frequency
Business trip	1073
Work overtime	517

5. Discussion

Job listings contain an enormous volume of information, including employers' requirements for education, working experience, skill competencies, and social competences, to discover new questions as we study industry requiremnts for translators. Web scraping, data preprocessing and data analyzing reveal employers' quantitative and qualitative requirements that researchers can use to tailor translation programs.

Big data has 3Vs, variety, volume, and velocity, over traditional research methods (Sagiroglu & Sinanc, 2013). The variety of the data, consisting of companies from different cities in China, create a nationwide tapestry of translator recruitment information. As for the volume of the data, we collected 46144 listings of translators. As for the velocity, we can have access to daily data. However, this requires the web scraper should run constantly, which would overburden 51job's sever. Therefore, the use of web scraper should in a less frequent process.

In January 2020, COVID-19 broke out in China. Later, it became a pandemic. What is it like in the

translation industry after the outbreak? We scraped the website of 51job. After data processing, (1) we got 5337 listings compared with 8596 listings in the present study. Occupations are far less than those before COVID-19; (2) in the present study, listings of companies belonging to the medical/nursing/hygiene, medical equipment/instrument, or pharmaceutical/bioengineering industry only accounted for 2.05% of the total listings. Whereas, according to the data we retrieved after the pandemic, the number increases to 3.34%; (3) the oldest listing was on August 8th. No occupations were released during January to July, although the Chinese Central Committee issued "Guiding Opinions on Actively and Orderly Promoting the Resumption of Work and Production while Effectively Preventing and Controlling the Pandemic" on April 9th (Xinhuanet, 2020). In the future, a comparative study can be done to analyze the industry requirements before and after COVID-19 to see how this pandemic impacts the translation industry.

Future studies can also explore longer time slices of the job listings, for example, analyzing several years of the listings would show how employers' requirements are changed, and cover more websites. Future research can also expand to international level, collecting listings from overseas recruitment websites, and comparative analyses may provide new insights into the differences between domestic and international requirements. For the text features extraction techniques, in this study, we only used Jieba, to segment the text and counted the frequency. In later studies, researchers can try other techniques like TF-IDF, Word2Vec, and CountVectorizer, and choose the best way suitable for job requirements analysis.

6. Conclusions

Job listing is an important source to analyze industry requirements. In this study, we collected, preprocessed, and analyzed 46144 listings from 51job, and we visualized the quantitative data, including salary, education requirement, and company location. We find that the average minimum salaries of big cities are not attractive. They are not higher than those of cities in western, central, and northern China as percieved. However, many of the companies locate in Guangzhou, Shanghai, Shenzhen, and Beijing. Therefore, many postgraduates and graduates rush to these cities to seek jobs in spite of the high living cost. In terms of education, 53.9% of the employers require Bachelor's degrees, and 42% Associate's degrees.

What's more, many employers prefer applicants with overseas education backgrounds. In terms of job requirements, we used Jieba, to get the key compentencies required by employers. Bilingual competencies, translation ability, working experience, technology & software are the top skill competencies required by employers. Commnication, teamwork, work attitude, and responsibilities are the top social competencies required. We hope this study could first present more detailed requirements of employers, hencefoth providing references to teachers and admiinistrators; second share a powerful data collecting and visulization method with translation scholars and practitioners. Web scraping and large-scale data science will open up a new world for scholars and practitioners in translation studies.

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