Opportunities and Coping Strategies for Opening Big Data Majors in Colleges and Universities

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Abstract. The era of big data, the training of big data professionals has become a fashion topic. This paper introduces the development status of big data majors at home and abroad, discusses the opportunities of opening big data majors, and puts forward the strategies for setting up big data majors in colleges and universities. It also points out that the opening of big data majors should be timely and appropriate, not only considering the capabilities of universities themselves. Conditions should also consider external needs.

Introduction

The era of big data has arrived. Big data does not specifically refer to specific quantities, but usually refers to multidimensional data ranging from PB (petabyte) to EB (exabyte). In other words, it is ten from different data sources. Billions to hundreds of billions of records. The data capacity of PB and EB is as follows: 2PB is equivalent to all scientific research libraries in the United States, 2EB is equivalent to the total amount of information produced in 1999, and 5EB is equivalent to all vocabulary that humans have expressed through language. It can be seen that the data volume of PB level and EB level is quite amazing. Moreover, the growth rate of today's data volume is exploding: at the end of 2015, "Internet Weekly" reported that the amount of data generated by China's projects related to smart cities has exceeded 200PB; "LSST Data Management" reports: US large-caliber summary survey The data volume of the telescope will reach about 5.7PB per year; the National Meteorological Information Center of the China Meteorological Administration reports that the global meteorological data has exceeded 10PB, with an annual growth rate of 50%; the mass biological information data storage of the domestic Huada gene has reached 17PB; Beijing 50,000 Road camera stores 30PB of data in 15 days.

How to manage such a large amount of big data with rapid growth? How to store? How to retrieve quickly? How to analyze and apply? ...etc. are all issues that we must face positively. The solution of these problems depends on talents. Therefore, the cultivation of talents is a top priority.

The Status Quo of Big Data Majors Development

In recent years, with the increasing demand for talents in data mining, analysis and application in the Internet era, under the dual drive of scientific research needs and government policies, major universities at home and abroad have also ushered in the enthusiasm for opening big data-related majors.

Development of Foreign Big Data Majors

Take the earliest US and UK as examples.

1. The United States. The first university in the United States to open a data science major was North Carolina State University, which developed the well-known decision support large-scale integrated information system SAS (Statistics Analysis System). [1] In February 2007, North Carolina State University established the Institute for Advanced Analytics (IAA), becoming the first official degree in data analysis in the United States. In March 2012, when the US President Barack
Obama announced the launch of the "Big Data Research and Development Initiative", the field of big data has been continuously developed, and now, including Harvard University, MIT, Stanford, Nearly 50 US universities, including the University and Carnegie Mellon University, have opened majors in data science. Among these schools, data science related majors mainly correspond to three types of research directions: business data analysis direction (usually located in business schools); computer science majors in data analysis direction (usually located in engineering colleges or information colleges); business management Major in data analysis direction (usually located within the School of Management).

2. Britain. The UK has also quietly paved the way for the development of the big data industry. As of 2014, the UK government has invested 260 million pounds in big data, including the application of big data technology in 55 government data analysis projects, and invested in the establishment of big data research centers based on higher education institutions; driving Oxford University, University of London Such famous universities offer majors with big data as their core business. [2] In 2017, the number of Big Data (Big Data) keywords in UK universities is close to 30. There are big data majors in science and engineering backgrounds, and big data majors based on liberal arts and business backgrounds. Such as: in the direction of computer science and electronic and electrical: "Integrated Data Analysis" of St. Andrews University, "Data Science" of Lancaster University, etc.; in the direction of mathematics and statistics, such as: University of Glasgow “Data Analysis”, “Operational Research in Data Science” at the University of Edinburgh, etc.; in the direction of economics and business school: “Applied Economics and Data Analysis”, “Financial and Data Analysis” at the University of Essex, The University of Liverpool's "Business Analysis and Big Data", etc.; opened in biomedical and health such as: "Health Data Science" at the University of Manchester; opened in the science (astronomy/geography/physics) direction: Cardiff University "Data-intensive astrophysics", "data-intensive physics", etc.; in the direction of the news media, such as: "Computer and Data News" at Cardiff University.

Development of Big Data Majors in China

On August 31, 2015, the State Council issued the “Outline for the Promotion of Big Data Development” and systematically deployed big data development work. In February 2016, Peking University, University of International Business and Economics and Central South University became the first universities to successfully establish a new undergraduate course in "Data Science and Big Data Technology". In March 2017, with the approval of the Ministry of Education, a total of 32 universities in the second batch successfully applied for undergraduate majors in “Data Science and Big Data Technology”. In March 2018, the universities that opened big data majors grew rapidly. The third batch of 247 colleges and universities were approved for “data science and big data technology”, distributed in 29 provinces, including 182 engineering schools and 68 science schools. Judging from the list of three colleges and universities that have been awarded the “Data Science and Big Data Technology” undergraduate majors, the professional academic system is undergraduate for 4 years, with a bachelor's degree in engineering or science.[3]

In addition, similar to American universities, the universities that open data science-related majors in China are mostly information engineering or financial and commercial colleges with academic advantages. These universities rely on their own computer science, statistics, management and other disciplines. Research foundation and resource advantages should better promote the development of this new profession.

The Opportunity to Set Up a Big Data Majors

Although domestic and foreign experts are very optimistic about the prospects of data science-related disciplines, if they do not carefully think about and weigh, blindly follow the trend
of developing data science-related majors, it is easy to lead to new professions rushing online, and the students trained cannot meet the colleges. With the needs of the employer. The opportunity to establish a big data profession is stated below.

**Local Governments at All Levels Have Introduced Policies to Attract Big Data Talents**

The seven-party policy mechanism was clarified in the "Outline for the Promotion of Big Data Development" issued by Premier Li Keqiang. Among them, the sixth aspect is to strengthen the training of professional talents, and establish and improve a multi-level and multi-type talent training system for big data. Therefore, governments across China have continuously introduced policies to attract big data talents. Take Yangquan City of Shanxi Province and Guiyang City of Guizhou Province as an example.

1. Yangquan City, Shanxi Province. Here are only three: (1) The employees of the electronic information industry park enterprises who have settled in the development zone for more than one year are given a subsidy of 5,000 yuan/year for graduate students and 8,000 yuan/year for doctoral students; (2) more than one year for employment. The enterprise executives and core technical personnel who pay the annual personal income tax of more than 30,000 yuan (including 30,000 yuan), according to their personal income tax within the city's financial retention, the first 1-5 years to give 90% of the reward, the 6th 60% reward for 10 years; (3) Enterprise executives and core technical personnel who pay individual income tax of more than 30,000 yuan (including 30,000 yuan), purchase housing in urban areas and sign a local service agreement for more than 5 years. Each person is given a one-time purchase subsidy of 100,000 yuan and so on.

2. Guiyang City, Guizhou Province. Guiyang’s preferential policies for big data talents are constantly being promoted in terms of financial support. Here are just three: (1) For high-level talents in the Internet field, give priority support in preparation management, job hiring, medical security, etc., and provide convenience in the employment of spouses and children's enrollment. The introduction of talents will be included in the scope of accreditation of the “100 Million Talents Introduction Program” in Guizhou Province, “100 Leading Talents”, “Thousands of People innovating and Entrepreneurial Talents”, and enjoying the various preferential policies stipulated in the “Measures for Implementation of the “100 Million Talents Introduction Plan” in Guizhou Province” Treatment (QianFufa[2015] No. 34). (2) For the first-line professional and technical personnel who have obtained master's and doctoral degrees related to their work, 50% of the tuition fee of up to 50,000 yuan per person (ZhuDangfa [2015] No. 3). (3) For the direct introduction of graduate students with master's degree or above, senior professional and technical talents, or the annual salary of 200,000 yuan, the urgent need for talents, and the national “thousand people plan”, respectively, according to the standard of 10,000 yuan and 100,000 yuan per person. Employer rewards...

In September 2017, the “2017 China Big Data Development Report” (hereinafter referred to as the “Report”) prepared by the National Information Center and the Nanhai Big Data Application Research Institute was announced. According to the "Report", Guizhou's big data development index ranks first in terms of the three southwestern provinces. Guizhou has become one of the main purposes of the flow of big data talents. From the perspective of the national new district, the development of big data industry in Gui’an New District is concerned. It ranks first and has become the most concerned area for the development of big data industry in the new district of the country.

**The Employment of Big Data Graduates is Wide**

The big data profession involves a wide range of disciplines and is a complex emerging profession. The employment of students is more extensive. In September 2015, the State Council issued the “Outline for the Promotion of Big Data Development” and systematically deployed big data development work. The "Outline” clearly puts forward seven policy mechanisms, of which the sixth
is to strengthen the training of professional talents and establish a sound multi-level and multi-type talent training system for big data. At present, big data mainly has three major employment directions: big data system research and development, big data application development and big data analysis. Among them, big data analysis talents are the most scarce, not only enterprises have demand, military, public security, government departments and medical care, There are also demand for institutions such as education, and the supply index is the lowest. The most popular big data jobs include chief data officer, big data analyst, data management expert, big data algorithm engineer, business intelligence development engineer, data architect, and data scientist.

In addition, you can also work in close proximity to big data majors, such as computers, mathematics, and statistics, based on your personal strengths.

**The Demand for Big Data Professionals in China is Large**

1. The shortage of high-end CPI talents. The three armies must not be handsome, and all companies that want to succeed in big data projects need the chief data officer to take the command. In the UK, the number of CDOs in 2014 was only 400, and in 2015 it grew to 1,000. According to this, Gardner expects that by 2019, 90% of large British companies will have their own chief data officer. China started late, and in 2016 just opened a major undergraduate major in big data, high-end chief data officer, and a specialist with a master's degree or a doctoral degree. In order to adapt to the needs of the society, some colleges and universities have set up some on-the-job postgraduate training courses, but they are still just starting.

2. The industry has a fast growth rate with a talent shortage of 1.8 million. According to the data analysis professional committee of the China Business Federation, China needs 1.8 million data talents in the next three to five years, but as of now, there are only about 300,000 big data practitioners in China, and the demand for big data talents in various regions of China is not balanced. According to the statistics of 2018, in the next three to five years, in terms of demand for big data talents, Beijing has a gap of 37,000, Shanghai 23,000, Shenzhen 14,000, Guangzhou 11,000, and Hangzhou 10,000. At the same time, the standards for selecting talents in the big data industry are constantly changing. In the early days, the demand for big data talents was mainly concentrated in the hardware fields such as ETL R&D, system architecture development, and data warehouse research. Most of the talents in IT and computer backgrounds. With the development of big data to various vertical fields, the demand for statistical, mathematics professionals, data analysis, data mining, artificial intelligence and other partial software fields has increased.

**Adjusting the Direction of Information Management and Information System Professional Training**

The information management and information system majors are mainly composite majors based on computer science, mathematics and management science, while the big data majors are mainly composite majors based on computer science, mathematics and statistics. The basic disciplines of the two majors are very similar. The basic courses offered are mostly the same. The information management and information system majors also have courses in statistics, probability and statistics, but they are only slightly different in the direction of training. However, at present, the enrollment of information management and information systems in some colleges and universities is not ideal. Some colleges and universities have even cancelled enrollment this year. Taking Guangxi as an example, the enrollment of 2017 information management and information system majors in some universities in Guangxi is shown in Table 1. The table shows that among the 11 universities with information management and information systems, only Guangxi University for Nationalities, Guangxi Normal University, and Guangxi University of Finance and Economics have completed or slightly exceeded the planned indicators. Therefore, in the information management and information system profession, it is feasible to adjust or add the direction of training big data. First,
it can meet the needs of the society. Second, it can complete the enrollment for colleges and universities, and third, it can broaden the employment channels of students.

Table 1. Comparison of enrollment in the 2017 district information management and information system in some universities in Guangxi.

<table>
<thead>
<tr>
<th>School name</th>
<th>Plan enrollment number</th>
<th>Actual enrollment number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guangxi University for Nationalities</td>
<td>29</td>
<td>34</td>
</tr>
<tr>
<td>Guangxi Normal University</td>
<td>46</td>
<td>47</td>
</tr>
<tr>
<td>Guangxi College of Finance and Economics</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>Guangxi Medical University</td>
<td>41</td>
<td>28</td>
</tr>
<tr>
<td>Guangxi University of Traditional Chinese Medicine</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>Guilin Medical College</td>
<td>45</td>
<td>14</td>
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<td>Guangxi Normal College</td>
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<td>23</td>
</tr>
<tr>
<td>Yulin Normal College</td>
<td>47</td>
<td>24</td>
</tr>
<tr>
<td>Guangxi University for Nationalities, Xiangshiu College</td>
<td>86</td>
<td>57</td>
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<td>Guangxi Normal University, Linjiang College</td>
<td>29</td>
<td>2</td>
</tr>
<tr>
<td>Guangxi Normal College, Shiyuan College</td>
<td>63</td>
<td>3</td>
</tr>
</tbody>
</table>


The Successful Response to the Big Data Professional Strategy

Integrating the Talent Resources of Colleges and Universities and Strengthening the Teacher Training for College Teachers

Based on the teachers of the school or the teachers of information management and system, the teachers engaged in computer science, mathematics and statistics form a team of big data professionals, rational division of labor, clear responsibilities, and strengthen the pre-class training of team teachers. Go out and come in to strengthen the teacher's study, training and team building.

Recognizing the Advantages of the University's Professional Talents and Opening a Big Data Professional Direction Suitable for Social Needs

The direction of big data majors is based on science and engineering, business-based, liberal arts-based, management-based, medical-based and farm-based, etc. It is difficult to set up a university. The professional training direction must be based on the combination of the university's teacher ability, social needs and regional economic development, in order to cultivate a marketable big data professional who is in line with the social expectations.

Introducing High-end Talents in Big Data

Intensify the introduction of talents, and provide high-end talents and experts from famous foreign universities or domestic 985, 211 colleges or universities that started earlier by providing incentives such as generous treatment, good teaching environment and working environment.

Multi-party Linkage, School-enterprise Cooperation, and Strengthening Students' Practical Training

Big Data is a complex professional with strong practical, statistical analysis software and computer programming applications. It must invest enough funds to strengthen the construction of professional laboratories in the school, and actively cooperate with big data parks, big data centers, cloud computing, etc. Enterprises cooperate to establish students' internship and training bases.
Summary

Professor Parkes, head of Harvard University's “Data Science Project”, believes that Harvard chose to launch a new “data science” project at this time based on the following three considerations: First, the school currently has a large number of different types of research data, and researchers are eager to pass Reasonable use of these data to obtain breakthroughs in research; second, the school currently has a very mature computing platform; third, new algorithms are under development, and have formed a more mature operating system.

Professor Parkes's views are useful for universities that have already opened or are planning to develop data science-related majors. How to use existing data to support research and innovation in the next step and how to integrate data science with more fields is the most important problem that universities need to explore and solve at present. Opening a new major is only the beginning, or It is only one of the solutions, and the road to continue to explore in colleges and universities is still very long.

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References

[1] Beth [translation]. These 23 American universities have strong data analysis skills [EB/OL].IDP North Learning, 2018.5.17.