Research on Combining Mathematical Modeling to Improve Data Processing Capability under the Background of Big Data Era

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Abstract

The mathematical modeling competition plays an important role in the cultivation of innovative talents. And excellent data processing capability is an important part of the cultivation of innovative talents. In the era of big data, we must think about how to improve students' data processing capabilities. Therefore, the combination of data analysis and mathematical modeling competition matter a great deal to the cultivation of innovative talents.

Keywords

Data processing, Mathematical modeling, Innovation, Big data.

1.   Introduction

Since the beginning of the 20th century, the development of science and technology has produced massive data. As of the end of 2012, the amount of data has been upgraded from TB to PB, EB, and even ZB. Especially in 2012, the era of big data has quietly arrived. In this case, big data refers to all data, and the amount of data is quite large, also it is no longer the traditional random sampling data. There is a complex correlation between data, so the effective information of massive data is purified, which is applied to the effective combination of modern computer technology and mathematical science. With the rapid development of modern computer technology, mathematical modeling in mathematical science is an effective means to solve data change in the era of information explosion. Therefore, it is especially important to cultivate the thinking and ability of mathematical modeling of contemporary students. The characteristics of traditional mathematical modeling should actively explore the students' innovative thinking ability, and let students try to apply the massive data in various fields to study the actual problems, also solve the business problems by adjusting the traditional mathematical modeling models. Therefore, the combination of data analysis and mathematical modeling competition plays an important role in the cultivation of innovative talents.

2.   The mathematical modeling in the context of the era of big data

Mathematical modeling is to abstract, generalize, assume and simplify specific objects in the real world according to the inherent laws of things for specific purposes. It also means using appropriate mathematical tools to establish a mathematical structure that provides people with a quantitative analysis result of analysis, prediction, decision-making or control. The mathematical modeling process is a creative work process, for the actual problem is not completely consistent with the mathematical model constructed. The mathematical model has to go back to the original problem to repeatedly adjust, correct, replace, and even re-create. The teaching of mathematical modeling in the traditional teaching mode mainly focuses on the establishment, solution and application of the model. At the same time, this course plays a unique function and role in cultivating students' scientific computing ability, scientific research creation and innovation ability, also the ability to use mathematics knowledge to solve practical problems and the spirit of teamwork. However, with the advent of the era of big data, the mathematical modeling curriculum has been given some new "missions", not only to undertake the curriculum functions in the sense of traditional teaching, but also to keep up with the pace of the times, facing new requirements and challenges. In the era of big

data, some new requirements for the teaching of mathematical modeling courses are mainly reflected in the following aspects.

2.1 Realization of problem handling

In the traditional sense, the problems of mathematical modeling courses are often idealized. Applying existing methods, algorithms and procedures may solve the problem better. With the advent of the era of big data and the development and reform of modeling courses, the problems that need to be dealt with are getting closer and closer to real life. This can be seen from the questions of various mathematics modeling competitions of college students in recent years. Therefore, the teaching of mathematical modeling courses should also be guided by the practical problems faced in social and economic development.

2.2 Process data quantization

In the context of the rapid growth of data in modern society, the teaching of mathematical modeling courses is required to focus on the processing of large and numerous digital data in practical problems, and at the same time, it is required to be able to process diverse data, such as effective mining of images, video, audio, etc. Therefore, the mathematical modeling course teaching activities should focus on strengthening the process of data collection, preprocessing, modeling, analysis and feedback.

2.3 Innovation in processing methods

In the context of highly data-based and intelligent society, there are more and more complicated and novel problems. The problems often involve various disciplines and industry fields. Traditional methods or algorithms may be powerless, which requires mathematics modeling courses. Improving, innovating, and even creating existing methods when dealing with problems provides a source of motivation for the birth of new disciplines or new courses, such as the "data science and big data" that has emerged in some universities in the past two years. "Technology" is a new type of talent training based on mathematical modeling in the era of big data.

2.4 Value of processing results

In the past 20 years, the course of mathematical modeling has been developing vigorously in various universities. On the one hand, it plays an incomparable role in talent cultivation in other disciplines; on the other hand, it provides a mathematical, modelling and quantitative basis for the treatment of practical problems. Therefore, in the era of big data, the teaching of mathematical modeling courses is required to focus on the industrialization value of problem-solving results and the use of market-oriented curriculum.

3. Combined with mathematical modeling to improve data processing capabilities

The role of mathematics in processing data is enormous, and the value it creates is even more incalculable. As the amount of data grows larger, traditional mathematical modeling is also seriously challenged. Mathematics has undergone the following processes in data processing. In the 1980s, mathematical heat promoted the development of mathematical modeling, but the classical mathematical model has limited ability to process data with observation errors. In the 1990s, there was an information boom, but the information processing technology at that time was difficult to meet the standard of use in many aspects. From the mid-1990s, statistics became a hot spot of mass consumption data, making statisticians move from academic theory to the real world, thus statistical modeling appeared. As a hotspot of mass consumption data, statisticians have moved from academic theory to the real world, resulting in the emergence of statistical modeling. However, as the volume of big data continues to increase and the types are complex, statistical modeling methods are no longer fully competent. In recent years, methods such as data acquisition, data processing, data modeling, and data application have become new hotspots. Establishing a scientific and rational mathematical model is especially important for the correctness of the prediction results.

Big data research is different from the traditional logical reasoning research. It makes statistical analysis and induction on a large number of data, such as statistical search and comparison, clustering analysis, pattern recognition, principal component analysis, discriminant analysis, correspondence analysis and optimal scale analysis. Therefore, it inherits some of the characteristics of statistical science. In this way, we can judge the relationship between data, and the degree of association, that is, the correlation of data, and further discover some regularity between the values of multiple variables, and find out the hidden relationship in the data set. Correlation is reflected by parameters such as support and credibility. Mastering efficient and fast processing in the data analysis process is the key to solving the problem. In the era of big data, due to the rapid expansion of data volume, complex data sources, latent value, and fast processing speed, some scientific research methods based on accurate analysis are not catching up with the pace of the times. Inaccurate calculation methods are urgently needed. Recent modeling and analysis methods for big data mainly include data collection, data access, infrastructure, distributed file storage and cloud storage. Students can learn more about the software that processes the data. For example, SPSS statistical software, mathematical modeling competition often used this software for data processing.

SPSS software is one of the world's most famous statistical analysis software. It can play a huge role in all fields of social sciences and natural sciences, and it has been applied to economics, biology, education, psychology, medicine, finance, etc.. SPSS is powerful, widely used, and easy to learn and use, and it provides user graphical interface and window environment.

The screen clearly displays a variety of analysis options, with full drop-down menus and dialogs, and the user interface is very user-friendly, with the same features as other Windows applications. The most notable feature is the use of menus and dialogs. Most of the operations are done with just a mouse click and are easy to operate, making them the most widely used statistical software for non-statisticians.

Students'comprehensive application of mathematical theory, and calculation realization of mathematical software for big data problems, as well as design of calculation methods and programming ability that have been systematically trained by personal experience, which improves the ability of data processing, also creates an active extracurricular interaction atmosphere between teachers and students, and builds up a good sense of teamwork, so that the output talents of colleges and universities can play a higher role in social practice.

References

[1] Su Liyun, Ye Zhiyong, Song Jiangmin. Using mathematical modeling as a platform to enhance the application, practice and innovation ability of college students [J]. Education and Teaching Forum, 2012, (11).

[2] Wang Xiaoyong, Yu Songkun. Leading the cultivation of innovative talents by subject competition [J]. Chinese University Teaching, 2007, (12): 59-60.

[3] Li Jianrui. Exploration and thinking on the cultivation of college students' innovative practical ability [J]. Success, 2012, (12): 54.

[4] Wu Zhanfu, Ma Xuping, Li Yakui. Statistical analysis software SPSS introduction [J]. Journal of Hebei North University, 2006, (6).

[5] Qin Yu. Analysis on the cultivation of innovative quality of talents in applied undergraduate colleges [J]. China Education Journal, 2015, (S1): 155-156.