



English Teaching Ability Evaluation Algorithm Based on Big Data Fuzzy k-means Clustering

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Abstract. Based on the rise of cloud applications and the use of various forms of digital devices, data is growing explosively. In the face of such a huge amount of data, the traditional data analysis tools only deal with the simple statistics, query and management of data, and can't deeply mine the potential useful information. Therefore, how to use big data to mine valuable information is particularly important. Clustering analysis is one of the big data analysis technologies. The traditional single machine clustering algorithm can not meet the requirements of big data information processing in terms of operational efficiency and computational complexity. The development of cloud computing technology provides a new research direction for big data clustering analysis. The English teaching comprehensive ability evaluation system can complete the evaluation and ranking of College English teaching comprehensive ability. By using the attribute method, seven attribute indexes are obtained. The example shows that the system has clear structure, reasonable process, and can flexibly adjust the evaluation parameters such as the scale of school scheme set and relevant psychological weight according to the user's requirements.

Keywords: Big data · Cloud environment · Data integration · FCM · MapReduce

1 Introduction

With the rapid development of Internet technology, data storage and data compression technology, the emergence of microblog, wechat, social networking and other interactive applications, the rise of cloud based applications, and the use of various forms of digital devices, data is growing explosively. All sectors of the society, such as academia, enterprises and government departments, have paid close attention to the problem of big data, and began to really pay attention to how to effectively use these data to generate greater wisdom and value [1]. For example, banks can identify potential credit card users who can not repay by analyzing user data, The traffic department can manage the traffic more effectively by integrating the data of weather, traffic situation and driver's geographic location information. Data has become a new asset, which can bring endless social and economic benefits. Big data is gradually becoming a new powerful tool for people to understand and transform the world, making it easier for people to grasp the laws of things and accurately predict the future. There are still many questions and controversies about the basic concepts and key technologies of big data.

2 Fuzzy C-means (FCM) Algorithm in Cloud Environment

2.1 Fuzzy C-means Algorithm (FCM Algorithm)

Fuzzy C-means (FCM) algorithm is a clustering analysis method based on objective function. The algorithm transforms clustering into optimization problem with constraints, and then determines the final classification and fuzzy clustering results by solving the optimization problem [2].

The main difference between FCM clustering algorithm and HCM clustering algorithm is that FCM clustering algorithm introduces the idea of fuzzy partition, so that each given data object uses the value in (0,1) interval to express its degree of belonging to each group, and the values of all data objects belonging to each group constitute the membership matrix U. for any data object, the sum of its membership is always equal to 1, that is to say:

$$\sum_{i=1}^c u_{ij} = 1 (j = 1, \dots, n, \text{ Represents the } j\text{-th sample}) \quad (1)$$

Then, the general form of the objective function of FCM clustering algorithm can be expressed as:

$$J(U, c_1, \dots, c_c) = \sum_{i=1}^c J_i = \sum_{i=1}^c \sum_j^n u_{ij}^m d_{ij}^2 \quad (2)$$

2.2 MapReduce Analysis of FCM Algorithm

The membership degree of each data object to a cluster center is calculated with the data object, and then it is obtained through the accumulation sum. This part can be calculated in the map stage of the map node, and then it can be calculated corresponding to the data point, and then the accumulation of the upper part of the formula calculated by the map node in the combine stage is as follows:

$$sumo_k = \sum_{j=1}^{N_k} u_j \quad (3)$$

$$suml_k = \sum_{j=1}^{N_k} u_j \quad (4)$$

The judgment of convergence condition. In this step, the difference between the two objective functions is not used for judgment, because there will be a lot of data transmission in the whole MapReduce process, and the difference between each cluster center before and after clustering is less than a certain threshold for judgment. This step can be done after this clustering.

3 Simulation Analysis of Evaluation System

With the development of system science, management science and scientific decision-making theory, the comprehensive evaluation system of English teaching ability (ECE) is a complex system, which involves various factors or attributes, A series of theories and methods of systematic analysis and decision-making have emerged. Accordingly, all kinds of decision-making and evaluation have gradually entered the stage of scientific decision-making and intelligent decision-making with the help of computer tools from the past empirical decision-making. Therefore, the evaluation of English teaching comprehensive ability must make full use of scientific decision-making theory and the most advanced decision-making aids, It makes the assessment of English teaching comprehensive ability scientific and modern [3].

The function of English teaching comprehensive ability evaluation system is: no matter what the grade of the school is, after comprehensively considering the internal and external factors in various English learning, compare the English teaching situation of several schools, and compare the overall teaching quality of different grades and the same grade universities, which can more accurately reflect the overall level of the school and help the school to reduce costs, Through the analysis, the attribute characteristics of English teaching quality evaluation among schools are extracted: attributes are internal and external. One can not think that one attribute is important and ignore other attributes. The understanding of things should be multi angle and multi-directional. Therefore, the evaluation system of English teaching comprehensive ability has the following attributes: internal cause, external cause and capital investment, Specifically speaking, they are learners' personal factors, environmental factors and costs (see Fig. 1).

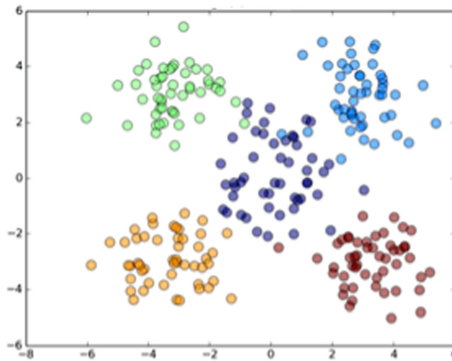


Fig. 1. K-means clustering simulation for teaching effect

3.1 Internal Cause -- Learner's Personal Factor

Intelligence. Under the same condition of mastering and using all kinds of learning skills, the learners with good intelligence learn knowledge faster, and the learners with

low intelligence can not produce miracles that surpass the normal learners even under the best learning conditions, The importance of intelligence training.

Character. In psychology, personality is divided into “extrovert” and “introvert”. People once tended to think that extrovert learners, because of their lively personality, dare to speak in the process of learning, have more opportunities to practice English, and their performance will be better than introvert learners, However, this is not the case. Learners with different personalities use different learning strategies to deal with different learning tasks: for extroverts, they are good at talking, which is conducive to obtaining more opportunities for input and practice, but they often do not pay much attention to language forms; Introverted learners may be better at making use of their quiet personality to make more in-depth and detailed formal analysis of limited input, especially in the teaching environment that pays attention to language forms and language rules. In the comprehensive ability assessment system of English teaching, personality factor refers to whether the school adopts different English teaching methods for different personalities.

Motivation and attitudinal motivation are the internal motivation and strength to motivate people to take action (including personal intention, desire, psychological conflict or the purpose they are trying to achieve). It is a kind of psychological state to initiate and maintain action, Among them, a considerable number of female students answer “very like” or “just interested”. Attitude refers to: first, learners’ attitude towards English and its culture; second, attitude towards language teachers and learning environment. In the comprehensive ability assessment system of English teaching, the factors considered are: the proportion of male and female students, students’ learning attitude and teachers’ teaching attitude.

3.2 External Factors -- Environmental Factors

Social and environmental factors. With the deepening of reform and opening up, international cultural exchanges become more and more frequent [4]. English, as a communicative tool, is becoming more and more important, which stimulates learners’ interest in learning English, Other factors are: Students’ family economic status, family atmosphere and parents’ role models, family structure, social practice and so on.

Natural environmental factors. The natural environment and cultural environment around the school. For example, because Guilin is a world-famous tourist attraction, there are many foreign tourists, which makes the atmosphere of learning English for college students in Guilin stronger than some colleges and universities in other places [5].

3.3 Cost

In order to get a higher passing rate of CET-4 and CET-6, some schools reward students, teachers, open a large number of training classes, invite foreign teachers, and hold various foreign affairs activities to improve students’ interest in learning. However, the effect is not directly proportional to the money invested. Therefore, the cost (capital investment) is also an important factor affecting the quality of English teaching, but it is not a decisive factor (see Fig. 2).

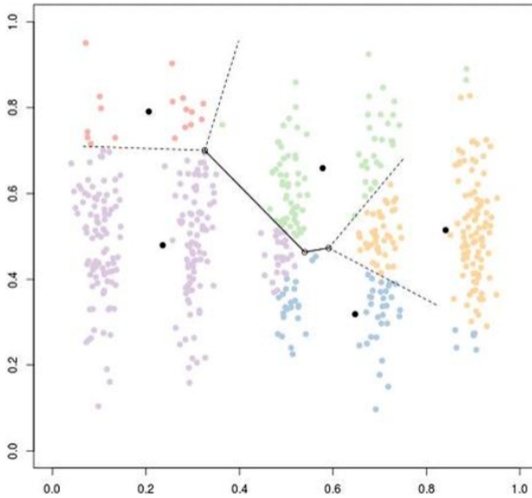


Fig. 2. Simulation for some factors.

4 The Current Situation and Problems of English Teaching Quality Evaluation in Higher Vocational Colleges

4.1 The Current Situation of English Teaching Quality Evaluation in Higher Vocational Colleges

In recent years, higher vocational colleges continue to deepen education and teaching reform, and actively promote theoretical innovation and practical exploration [6]. Teaching quality evaluation is undoubtedly an important link in the teaching management system of higher vocational education, which plays an important role in promoting the overall level of higher vocational colleges, teaching management, quality improvement and the formulation of teaching strategies. In terms of the establishment of teaching quality evaluation system and personnel allocation, colleges and universities have also actively promoted and implemented it. First of all, at present, the process of teaching quality evaluation in higher vocational colleges is generally in the charge of teaching management department. The educational affairs office, departments and supervision group are the macro-control, evaluation support and direct implementers of teaching supervision and evaluation, respectively. The supervision group is composed of retired teachers and some teachers in office. Good ethics, excellent teaching level and good communication are the selection criteria of supervision teachers. They play a stable and positive role in promoting the teaching process and improving the teaching quality. Secondly, the educational administration department of higher vocational colleges, usually the office of educational administration, has introduced corresponding teaching management system for English theory courses and practical training courses in higher vocational colleges [7]. The teaching materials are distributed uniformly, and the teaching management documents are studied regularly. Especially in the training of new teachers, they will lead them to study in-depth the documents of educational evaluation.

The establishment of these measures is to lay a good foundation for the teaching quality evaluation, to ensure that the evaluation is institutionalized, standardized and scientific, to consider all kinds of possible problems in advance, and to actively deal with and solve the work. The establishment of teaching quality evaluation system in higher vocational colleges is uneven, and it is impossible to achieve complete uniformity and consistent standards. However, most colleges are gradually improving according to the indicators of the Ministry of education “about the teaching excellence and qualification evaluation system of Higher Vocational Colleges”. Third, the teaching quality evaluation of higher vocational colleges mainly focuses on classroom explanation, paying attention to the teacher’s classroom activity setting, teaching content arrangement, complete teaching materials and attendance assessment, so as to form the basic evaluation of the overall teaching work of teachers. The evaluation of students’ learning effect is mostly reflected in the way of final evaluation, with the summative evaluation standard as the main. As a basic course of pragmatic competence, it follows the unified standard of teaching evaluation. At present, the teaching quality evaluation results of most schools are linked with the assessment of the evaluated teachers, which reflects the college’s emphasis on teaching evaluation and the awareness of promoting teaching self-improvement [8].

4.2 Problems and Analysis of English Teaching Quality Evaluation in Higher Vocational Colleges

Higher vocational English teaching quality evaluation has made some achievements, but there are also many problems. The direct participants of English teaching quality evaluation in higher vocational colleges are teachers and students. Their understanding and attitude towards teaching quality evaluation are directly related to the results of teaching quality evaluation, and also have an important impact on the establishment of teaching quality evaluation system and the formulation of teaching strategies. The author designed the interview question and interviewed 15 English teachers in higher vocational colleges, aiming to understand their cognition and attitude towards the quality evaluation of Higher Vocational English teaching, the existing difficulties and problems in the teaching process, so as to better improve the quality evaluation of English teaching. At the same time, through the small program of questionnaire star, the paper makes a questionnaire survey on the evaluation of English teaching quality in higher vocational colleges. Specifically understand the students’ cognition and views on the teaching process, teaching quality and teaching evaluation [9]. The problems and analysis of Higher Vocational English teaching quality evaluation are shown in Fig. 3.

The vast majority of teachers think that the object scope of teaching quality evaluation is relatively old, and the teaching quality evaluation of English Curriculum under the background of the new curriculum reform does not really reflect the real evaluation of students’ language use. Nowadays, with the increasingly rich teaching media, all kinds of small programs, application software and big data information resources integration and analysis technology are not advocated in classroom teaching and teaching quality evaluation, resulting in the backwardness of Higher Vocational English teaching quality evaluation reform [10].

163 students believe that the object of the current English teaching evaluation in higher vocational colleges is mainly limited to the teaching effect of English language

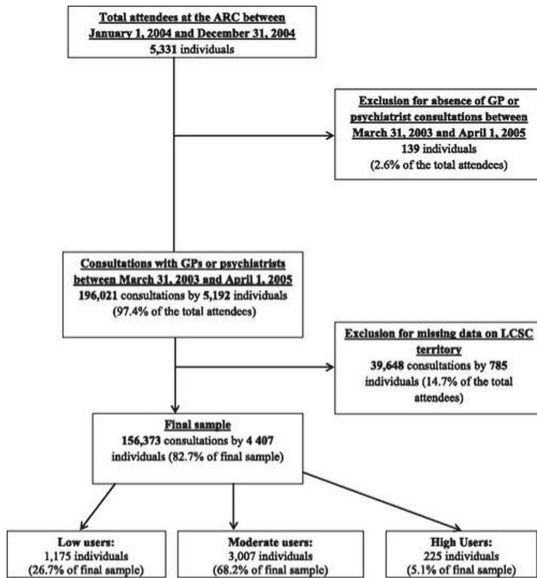


Fig. 3. Problems and analysis of English teaching quality evaluation in Higher Vocational Colleges

knowledge and skills test or competition results and the final evaluation of the final examination, and is limited to the teaching quality evaluation of basic language knowledge such as pronunciation, grammar, vocabulary and reading. 112 students think that the current evaluation of Higher Vocational English teaching quality ignores the evaluation of non-verbal knowledge and skills such as learning attitude, teaching strategies, teaching methods and innovative consciousness, while 65 students think that the current evaluation of Higher Vocational English teaching ignores the extended evaluation of teaching quality such as employers and social needs, 72 students think that the current evaluation of Higher Vocational English teaching quality ignores the evaluation of information teaching resources [11].

The reference documents of English teaching quality evaluation in higher vocational colleges are “basic requirements of English Teaching in Higher Vocational Colleges” and “basic requirements of English Teaching in Higher Vocational Colleges”. The former only explains the most basic requirements of English teaching, but does not explain the teaching evaluation alone [12]. Although the latter explains the evaluation of Higher Vocational English teaching, it does not explain the subject, object, evaluation method, feedback effect of Higher Vocational English teaching evaluation more accurately, and the implementation rules are lack. According to the questionnaire survey and interview conducted by the author, more than 80% of the teachers surveyed think that there is no standard to determine the qualification of the evaluation subject in the evaluation of Higher Vocational English teaching quality. Because there is no unified standard for the selection of supervision teachers, the evaluation subject often has no professional background knowledge and practical teaching experience in English linguistics, pedagogy, psychology, etc., This will easily lead to the teaching evaluation is more one-sided and

subjective [13]. More than 60% of the teachers think that the current English teaching evaluation in Higher Vocational Colleges lacks the evaluation system of different admission levels and different teaching levels, while the students in higher vocational colleges come from senior high school, secondary vocational school, secondary technical school or junior high school, and the students' English level is quite different from that in the early stage of English teaching, It is easy to lead to the overall evaluation of Higher Vocational English teaching can not achieve the different evaluation of students from different sources. 70% of the teachers think that the current higher vocational English teaching evaluation lacks the reward and punishment guarantee system for Higher Vocational English teaching evaluation [14].

5 Suggestions on Strengthening the Evaluation of English Teaching Quality in Higher Vocational Colleges

English Teaching in higher vocational colleges should follow the requirements of “service-oriented, employment oriented, practical oriented, sufficient and application-oriented”. This requirement makes a clear distinction between English education in Higher Vocational Colleges and ordinary colleges [15]. “National vocational education reform implementation plan” puts forward: in the further deepening of education reform and innovation, economic development, the position of vocational education should be further highlighted, the “double high” construction plan is put forward, and it is clear that higher vocational colleges should cultivate high-quality workers and technical talents. Therefore, in the English Teaching of higher vocational colleges, we need to pay more attention to the cultivation of pragmatic competence and professional competence, which should be reflected in the evaluation index of teaching quality. In the design of the evaluation index, we should not only combine the actual situation of students' English learning in higher vocational colleges, but also consider the actual operation ability of teachers, and reflect the development direction of the college. First of all, in the teaching quality evaluation, the teaching quality evaluation tables of professional courses and basic courses in higher vocational colleges should have their own teaching quality evaluation indexes to reflect the specific evaluation elements of different disciplines, so as to have a better reference and guidance for teaching. Secondly, in English teaching, we should pay attention to the evaluation of the practical teaching of Higher Vocational English, distinguish the evaluation of theoretical courses and practical courses, and the evaluation index should reflect the curriculum objectives, teaching characteristics and inspection focus of the two courses. As a public basic course of Liberal Arts in higher vocational colleges, the teaching quality evaluation form should show the characteristics of the course and the specific evaluation indicators. If there is no scientific and reasonable quantitative indicators, the concept of evaluation is not clear, which will affect the objective and fair evaluation of English teaching quality to a certain extent. Third, in the evaluation of teachers' teaching process, we should focus on the evaluation of teachers' professional quality and professional English teaching ability while examining teaching design, teaching methods and teaching attitude, which is the special feature of English Teaching in higher vocational colleges. Finally, in the evaluation of teaching effect, we can increase the evaluation index of teachers guiding students to participate in the English

pragmatic competence competition, so as to “replace evaluation with competition”, and enhance the cultivation and practice of students’ pragmatic competence [16].

Teachers are not only the key to improve the teaching quality, but also an important part of education quality evaluation. Building a high-level teaching team is the key to improve the teaching quality of higher vocational colleges, and also helps to improve the teaching quality evaluation ability of the supervision team. Teachers engaged in Higher Vocational Education and teaching supervision should have a more comprehensive knowledge reserve, higher professional technology application ability, and constantly update knowledge, enrich practical experience, improve teaching level, and apply the teaching of innovative ideas to students’ innovative ability training courses and teaching practice activities, so as to ensure the smooth realization of the goal of high-quality skilled personnel training.

6 Conclusions

In recent years, the hot research direction of big data as the background, this paper analyzes the characteristics of big data, the technology that can be used for big data, and the basic process of big data processing. The first work of big data analysis is the integration of heterogeneous data sources, and the data clustering in data mining technology is one of the technologies that can be used for big data. Therefore, this paper first studies the integration method of heterogeneous data sources, On this basis, the FCM algorithm, which is widely used at present, is studied. At the same time, combining with the advantages of cloud environment, the FCM algorithm is implemented by MapReduce.

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