



Current status and future prospects of research on the recognition of Academic Papers Masterpiece

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Abstract: [Purpose] This paper analyzes the development status of research on magnum opus recognition theory and methods in academic papers, and clarifies the future development direction of related research, which is aim at providing reference for subsequent research on the method system of magnus recognition. [Methods] This paper mainly uses the literature research method, subject analysis and content analysis method to carry out the whole research. The LDA topic model written based on python used as input to collect bibliographic data for topic clustering. According to the results of topic clustering, sort out the relevant theoretical system and method application, analyze the major and difficult problems in the process, and clarify research status and development trend of the theory and method of the recognition of academic papers masterpieces. [Conclusion and Prospect] Representative recognition is developing in the direction of intelligence, compound and network, however, the research on the theory and method of academic papers masterpieces is still not complete. There are still some problems in the recognition of masterpieces, such as the objects identification individual particularity, the disciplines and the research directions heterogeneity, the inflexibility of the combination of qualitative and quantitative methods, and the applicability of the masterpieces to authors of different levels. How to fully comprehend the semantic context information in the massive academic achievements and set up reasonable quantitative indicators of recognition is the future direction of representative recognition efforts we should make.

Keywords: Academic Papers Masterpieces, Representative Identification, Research status.

1 Introduction

China has become the country with the largest number of published scientific research papers and the second largest number of highly cited scientists in the world, so that everyone is competing to publish academic achievements. In order to improve the scientific evaluation of individual academic achievements, the representative system has gradually become a focus of attention in the field of information science[1]. The representative work is an important research achievement of an individual or a team, and is also an important issue in academic communication and scientific research evaluation, which reflects the researchers' long-term in-depth direction in a certain field and has certain professional foresight and technical advancement. Identifying the representative works of academic papers can help

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researchers understand the research hotspot and development trend in the professional field, promote knowledge discovery and application, and research on the theory and method of identifying the representative works of academic papers is of great significance.

In this paper, the LDA topic model will be used to conduct thematic analysis of related research on the masterpieces of academic papers. The theoretical system and methods will be summarized according to the data collection and analysis results, and the key difficulties and problems encountered in the identification process of the masterpieces of academic papers will be pointed out, so as to provide references for researchers to further improve the accuracy and efficiency of the identification of academic paper masterpieces.

2 Analysis of the identification content of the identification of academic paper masterpieces based on LDA model

2.1 Model selection

LDA topic model is adopted to analyze the collected data in this study. LDA topic model is a Bayesian probability model for modeling and mining text topics, and it is an "unsupervised learning" in machine learning, which can identify hidden topic information based on large-scale documents[2].

2.2 Data acquisition and preprocessing

The data in this study comes from CNKI and the core collection of Web Of Science respectively, and the domestic and foreign literature is searched with the search method of "TS=" recognition of academic papers representative works ", "evaluation of academic papers representative works", "the identification of academic paper masterpieces", "recognition of academic papers representative works" and "evaluation of representative works". Finally, a total of 109 Chinese literatures and 361 foreign literatures were retrieved. The data to be processed includes both Chinese and English languages, so different methods need to be used to cut the data content. The Chinese content can be cut by using the Chinese word segmentation database *jieba*, while the English content can be cut by using Spaces directly, and the words unrelated to the topic can be deleted according to different stop word tables to obtain the data to be analyzed.

Before formally training the LDA topic model, the optimal number of topics should be determined, the consistency and confusion degree should be calculated by importing data, and the values with high consistency and low confusion degree should be selected. After comprehensive consideration, the optimal topic clustering number for both the Chinese content and the English content is determined to be 6.

2.3 Topic clustering

Combining with the subject words and context with high word frequency in the probability distribution table, the subject is identified and named manually.

Table 1. Results of Chinese literature subject clustering

No.	Topic name	Feature words
1	University representative system	Evaluation, Representative, System, Academic,

	reform	University, Research, Teacher, Research, Reform, Dilemma
2	Professional title evaluation method system	Evaluation, Representative Works, Research, Papers, Methods, Titles, Systems, Systems, Scientific Research
3	Evaluation system of university representative works	Evaluation, Representative, Analysis, University, System, Research, Development, Perspective, Background, System
4	Humanities and social sciences representative evaluation	Evaluation, Research, Humanities, Social Sciences, Thinking, Outcomes, Representation, Scholarship, Experience, Thesis
5	Faculty representative evaluation	Evaluation, Research, Talent, Representative Work, Science, Teachers, Teaching, Performance, Primary School, Index, University
6	Evaluation of humanities and social science achievements under the background of "breaking five dimensions"	Evaluation, Social Science, Technology, Analysis, Research, Science And Technology Talent, Breaking The Fifth Dimension, Our Country, Development, Thinking

Table 2. Results of topic clustering in English literature

No.	Topic name	Feature words
1	Deep learning and neural network methods	Recognition, Network, Analysis, Neural, Review, Using, Face, Deep, Artificial, Human
2	Representative identification based on case studies	Method, Review, Using, Based, Recognition, Research, Case, Deep, Learning, Analysis
3	Research methods based on data characteristics	Study, Learning, Using, Based, Feature, Deep, Data, Approach, Selection, Design
4	Model-based evaluation methods	Recognition, Analysis, Model, Care, Classification, Management, Assessment, Performance, Data, Factor
5	Representative recognition system	Recognition, System, Review, Using, Representation,

		Classification, Interaction, Model, Based, Network
6	Review of representative work evaluation methods	Review, Evaluation, Recognition, Health, Disease, Application, Service, Approach, Energy, Problem

Based on the above clustering results, it can be concluded that the research content of Chinese literature focuses on the institutional level and methods of representative works, while the research content of foreign literature focuses on different methods of representative works recognition. The following will discuss the status quo of representative recognition of academic papers based on the clustering results.

3 Overview of the recognition system for academic papers masterpieces

3.1 Related Concepts

Masterpieces of academic papers. There are many researches on masterpieces of academic papers in China. In the Chinese dictionary, masterpieces are works that best show the author's ideological level or artistic style[3]. In the ranking catalogue published by the National Committee for the Examination and Approval of Scientific and Technical Terms, masterpieces are interpreted as works that best demonstrate the author's literacy, attainments, level and personal style[4]. Scholars also put forward different definitions when studying the representative work system. Wang Shipeng et al believe that representative work is mainly a benchmark for measuring the skill level, scientific research ability and academic achievements of a certain researcher or individual, and can also be extended as an important basis for evaluating the level of academic institutions and research projects[5]. Ye Jiyuan believes that representative work refers to "representative achievements that can reflect and measure the academic level of researchers"[6]. In addition to the title of representative work, there are more names in foreign countries such as "landmark papers" and "landmark papers"[7], which are defined by Mary Hamm and Dennis Adams as proof materials that can reflect a person's skill level. Beck and GUI understood "representative works" as documents representing the quality of scientific achievements[8].

From this, it can be seen that the concept of academic papers masterpieces is not strictly defined in current academic circles. In daily research and published documents, representative work is often equated with "representative academic work" and "representative work", etc. Su Jinyan believes that representative work is not equal to representative work, but an important type of representative work[9]. Some scholars have clarified the definition of the masterpiece of a paper in their research. Liu Jiacheng et al. pointed out that the representative papers are innovative research papers that best represent the research level of researchers[10]. Ma Ruimin et al believe that the representative paper should first be consistent with the research direction of the researcher, and should have the dual characteristics of high representativeness and high level[11]. Based on the research theme, the representative works studied in this paper refer to the representative works of academic papers.

Representative work identification and evaluation. The identification of academic papers masterpieces can also be called the selection of academic papers masterpieces, which uses scientific indicators and scientific methods to identify the most scientific and professional representative academic papers in a large number of academic papers, which can help researchers quickly screen out high-quality key documents in a large number of papers[10].

The academic circles believe that representative evaluation is both an evaluation system and an evaluation method. Chen Yan et al believe that representative evaluation refers to a set of rules for expert

academic review of a certain number of "achievements" that best represent the academic level of the evaluation object[12]. Representative evaluation essentially refers to academic entities such as individual scholars, academic teams and academic journals at the mesolevel through the evaluation of academic achievements[13].

In a broad sense, scholars often equate representative work identification with representative work evaluation. On the micro level, the concepts and properties of representative recognition and representative evaluation are different. Representative work identification is to identify and select one or several papers that can best show the academic research direction or achievements among the massive literatures, while representative work evaluation is to conduct content and quantitative evaluation of the literatures that have been characterized as representative works, and the context and purpose of this process are different. The application methods of the two are similar but different. Representative work identification mainly uses quantitative methods to identify the representative results of researchers or teams, but it is qualitative research in essence. Compared with representative work identification, representative work evaluation has more extensive evaluation indicators and factors, and the evaluation results will change over time.

3.2 Overview of the Representative system

In 1994, Zhang Peihong introduced "Portfolio Assessment" into our country, but the meaning of "Portfolio Assessment" is not the same as that of our country's representative work. In essence, The evaluation system of academic paper representative works is more similar to the implementation process of peer review and quantitative evaluation in Western countries[14]. Nankai University was the first to introduce the representative work evaluation system[15], followed by other universities. For example, Peking University implemented the academic representative work evaluation system on a pilot basis in its Chinese department in 2005[16]. In 2009, Renmin University of China began to promote it on a university-wide basis, and some scholars believe that such actions by major universities have effectively promoted the return of research to academics[17]. Since then, the relevant departments of the State have successively issued a series of documents to encourage the academic community, especially universities, to actively implement the evaluation system of academic representative works.

Table 3.Policy documents related to Chinese academic representative works

Time	Department	Policy documents
2011.11	Ministry of Education of PRC	<i>Opinions on Further Improving the Evaluation of Philosophy and Social Science Research in Colleges and Universities</i>
2018.11	Ministry of Education of PRC	<i>Notice on the special action to clean up "only papers, only hats, only titles, only academic qualifications, only awards"</i>
2020.1	Ministry of Science and Technology of PRC, National	<i>Strengthening the work programme for "from 0 to 1" basic research</i>

	Development and Reform Commission, etc	
2020.2	Ministry of Science and Technology, Ministry of Finance of PRC	<i>Some Measures to Eliminate the bad orientation of "Only Papers" in Science and Technology Evaluation (Trial)</i>
2020.9	CPC Central Committee, State Council	<i>Overall Plan for Deepening the Reform of Educational Evaluation in the New Era</i>
2020.12	Ministry of Education of PRC	<i>Some Opinions on Breaking the Bad Orientation of "Only Papers" in the Evaluation of Philosophy and Social Science Research in Universities</i>

In November 2011, the state proposed the implementation of this system for the first time and issued Opinions on Further Improving the Evaluation of Philosophy and Social Science Research in Institutions of higher Learning[18]. Subsequently, relevant departments of the state intensively issued relevant policy documents to encourage the implementation of the academic representative system and to correct undesirable phenomena. In November 2018, the General Office of the Ministry of Education issued the Notice on carrying out a special action to clean up "only papers, only hats, only titles, only degrees, and only awards"[19], aiming to correct the unscientific value orientation in academic research and continue to promote the representative evaluation system. In September 2020, the Central Committee of the Communist Party of China and The State Council issued the Overall Plan for Deepening the Reform of Educational Evaluation in the New Era[20], which requires emphasizing quality-oriented, focusing on evaluating academic contributions, and adhering to classified evaluation based on the characteristics of different disciplines and positions.

4 Overview of methods for identifying academic papers masterpieces

4.1 The identification of academic papers masterpieces based on content evaluation

Self-evaluation.Self-evaluation is one of the commonly used methods in the evaluation of academic papers, and it is also suitable for the identification of representative works of academic papers. Chen Xinhan pointed out in his research that individuals have the most profound understanding of themselves, and self-evaluation is of great significance to the establishment of self-consciousness[21]. In the process of self-evaluation, scholars can combine their published academic papers and choose the papers that best represent their academic level or research field as their representative works. However, this method often lacks objectivity, and the evaluation results will be affected by personal preferences.

Peer review.The term peer review was first proposed by Armstrong in his research in 1982[22]. At present, the concept of peer review mainly refers to the evaluation of a peer's achievement by scholars who have been engaged in a certain field for a long time according to their personal academic judgment. The peer review method is still in use today. On the one hand, the peer evaluation content is more professional and gathers wisdom, reflecting the scientific research logic and research development

direction in the professional field. On the other hand, peer evaluation is not limited to simple evaluation indicators and is more flexible. However, due to the participation of "people" in the process of peer review, the evaluation results will be subjective to a certain extent, and will also be affected by the knowledge limitations of the evaluation subject. In addition, the current process of peer review system in China is not standardized, and the rigor and scientificity of the evaluation process need to be improved[23].

Recognition method based on citation content.Some scholars judge the academic influence of cited documents based on their cited content. In terms of the citation topic, a set of subject words can be used to characterize the literature, and then the similarity of the topic distribution can be calculated to measure the impact of the cited literature on the original literature. If the subject distribution of the original text and the cited literature is about similar, the greater the impact of the cited literature is[24]. In terms of citation emotion, fine-grained emotion analysis is used to quantify the emotional views expressed by the authors in the citation content, and the influence of the literature is judged according to the index results[25].

4.2 The identification of academic papers masterpieces based on indicator measurement

The representative work identification method based on indicator measurement is a commonly used method in academic research. It determines the importance and influence of a paper in a specific field by analyzing the specific indicators of a paper. When analyzing the specific indicators of a paper, the citation status of the article is usually obtained first. Citation frequency refers to the number of times a paper is cited by other papers. Academic papers with high citation frequency tend to have high influence and importance. In 1955, Garfield first proposed the method of citation frequency to evaluate the authority of articles[26]. Since then, Virgo has proved that there is a positive correlation between citation frequency and the importance of papers. Citation frequency can be used as some common citation frequency indicators[27]. The details are shown in Table 4.

Table 4. The identification of academic papers masterpieces method based on indicator measurement

No.	Identification method	Method content
1	Citation counting	The most frequently cited is representative[23]
2	SP-Index	The number of citations is greater than the number of references[28]
3	Weight analysis based on power index	The power index of social network analysis is introduced into citation evaluation, and the influence of literature is evaluated by the power index of literature[29]
4	F-Index	Relevant algorithms are used to measure the influence of articles by direct citations and indirect citations[30]

		Ranking a scholar's paper from highest to lowest number of citations, calculating the maximum difference value and using this as the boundary, the number of citations greater than the difference value is representative[31]
5	Cited difference selection	Combined with the percentile of paper citation frequency, the reference line of citation frequency for authors of different disciplines and academic levels is established[32]
6	Setting of reference line of cited frequency	The structure of citation network is analyzed and the relationship between nodes is measured to distinguish the role degree of citation. Common indexes include point degree centrality, intermediate centrality, structural hole constraint coefficient, etc[33]
7	Representative recognition based on cited network	The self-avoiding priority diffusion process is used to determine whether the paper belongs to the research field and to identify the representative works by listing the impact ranking of the paper[34]
8	Self-avoiding preferential diffusion	

4.3 The identification of academic papers masterpieces based on machine learning

The identification of academic papers masterpieces method based on machine learning can automatically identify representative works from a large number of academic literatures by using machine learning algorithms and technologies. In this process, feature extraction of literatures is required. Commonly used features include keyword frequency, topic model, citation times, etc. Machine learning algorithm is applied in combination with the extracted features. By learning the patterns and rules of the training data set, the new literature can be classified and recognized. In the current research, the algorithm and technology of machine learning still play the role of auxiliary recognition and cannot directly identify the representative works. Currently, the commonly used algorithms include support vector machine (SVM), Random Forest, Markov model, neural network, etc. For example, Y Al Amrani classifies citations based on random forest algorithm and then conducts sentiment analysis[35]. P Yang puts forward the automatic Academic paper rating method (AAPR) and uses hierarchical convolutional neural networks to achieve automatic paper rating[36].

5 Summary and outlook

5.1 Problems in the process of identifying academic masterpieces

As mentioned above, representative recognition and representative evaluation are often generalized in the current research, and the research on the theory and method of representative recognition is not complete.

Identify the particularity of the object. When identifying academic masterpieces, a reasonable method should be chosen according to the object and data sample size. The recognition objects of masterpieces covers macro and micro levels, including institutional achievement recognition and discipline team achievement recognition, and micro level including project achievement recognition and individual achievement recognition, etc. [37]. The ability and work intensity of individuals and groups are very different. In the selection of methods and setting of indicators, the scale and research ability of the identified objects should be considered, and the quantity and quality of the academic representative works of the identified objects should also be taken into account. The academic ability of the identified objects cannot be judged from a single quantity or quality.

The applicability of academic papers masterpieces to authors of different levels. The academic level of different scholars is also different. For scholars with higher academic achievements, their scientific research level can be scientifically reflected through representative work evaluation, while for scholars with lower academic work, their representative work cannot be compared horizontally with that of the former, and the recognition process will cost a lot of material resources and manpower. Therefore, simple crude classification can be carried out before recognition to improve the efficiency of recognition.

Heterogeneity of academic papers masterpieces disciplines and directions. From the perspective of disciplines, there is a certain heterogeneity of academic masterpieces[38]. The theoretical basis and research methods of academic achievements in disciplines are fundamentally different. Meanwhile, there are multiple research directions among different disciplines, and each research direction will make different progress with the development of time, so it is impossible to use unified standards to judge and identify masterpieces. In the process of recognition, it is necessary to adjust the evaluation index according to the subject characteristics to improve the effectiveness of recognition. Judging from the current representative evaluation system, it is not able to identify and compare academic masterpieces across disciplines.

The combination of qualitative and quantitative methods is not flexible enough. Most qualitative methods are combined with quantitative methods in a complementary way, which cannot completely avoid the defects of strong subjectivity of qualitative methods and insufficient understanding of semantic meaning of quantitative methods. How to effectively combine the two is the difficulty of comparing current research.

5.2 Development Trend

Intelligent development of representative recognition. According to the current research results, the recognition of academic representative works has not been fully intelligent, and there is often artificial participation in the process of recognition and evaluation of representative works. Throughout the research progress at home and abroad, scholars have begun to use machine language and deep learning technology to develop representative recognition methods, but there is still a long way to go from landing applications and tool development.

Compound method of representative work identification. China is a big research country with the increasing of the number of researchers and academic achievement day by day. Simple and direct quantitative identification methods can no longer meet the practical needs. At present, many institutions and scholars have explored the construction of independent representative work identification and evaluation system to scientifically quantify the identification indicators, and the identification objects cover small individuals, groups and disciplines. Recognition methods vary from traditional metrology science to advanced deep language recognition algorithms. How to fully understand the semantic context information in the massive academic achievements and set up reasonable quantitative indicators of recognition is the future direction of representative recognition efforts.

The identification of academic papers materpieces and association network. Citation analysis is one of the most widely used methods to identify representative works. The traditional citation analysis method mainly evaluates literature from various indexes of citation frequency and evolution. Due to the extremely complex citation network and co-authorship network of researchers at present, many scholars have begun to explore the construction of citation network and co-authorship network model to measure the influence of literature[39]. A good network and association analysis of representative works citations is conducive to providing data basis for the identification of academic papers materpieces and comparison with similar works[40].

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