



УДК 72.012

CNKI-BASED CERAMIC ORNAMENTATION EXTRACTION AND METHOD RESEARCH KNOWLEDGE GRAPH ANALYSIS

TIAN Hangjuan, GUAN Ying
Shaanxi University of Science and Technology, Shaanxi, China

In order to deeply analyze the development status and trend of machine learning and deep learning in ceramic ornament extraction, the bibliometric tool CiteSpace was used to visually analyze the relevant journal literature in CNKI from 2006 to 2023. The study finds that the research results of machine learning in this field are increasing year by year. The links between research units and scholars are relatively close. The research hotspots in this field mainly focus on algorithms such as object detection, image segmentation, feature fusion, and feature extraction. In the past decade, the research of machine learning in the direction of ceramic ornament extraction has developed rapidly.

Key words: *deep learning, machine learning, ornamental extraction, CiteSpace.*

INTRODUCTION

With the development of the Chinese nation for thousands of years, ceramics have had profound historical significance under the deposition of time. As an important external visual feature of ceramics, ornaments represent the customs of different regions, and through the study of surface ornamentation patterns, we can help understand the living habits of ancient people. The content of ornamentation includes carving, painting, scratching, carving, openwork, painting and other decorative techniques, which is a direct embodiment of the social aesthetic concept in a certain historical period, is the expression of ideas at that time, and constantly evolves with the changes of social culture. Most of the motifs include characters, animals and plants, landscapes and inscriptions, etc., often symbolic to express auspicious meanings, with profound social and epochal attributes. Therefore, traditional ceramic ornaments have become the most representative part of ceramics because of their diverse forms, rich content, beautiful composition, and far-reaching meaning, which has direct significance for the development of Chinese art.

PURPOSE

In order to explore the overall development of machine learning in the extraction of ceramic ornaments in the past ten years, this paper visually analyzes the literature in this field, mainly organizes the information from the level of publication volume and keywords, summarizes the hot issues in this field [1], understands its development characteristics, and provides theoretical basis for researchers to conduct related research.



RESULTS AND DISCUSSION

Distribution of papers and analysis of journals

The annual publication volume of machine learning in related journal papers in ceramic ornament extraction is illustrated graphically, as shown in Figure 1.



Fig. 1 Annual output distribution of papers related to the research of domestic machine learning in the direction of ceramic ornamentation extraction

As can be seen from Figure 1, the amount of literature related to machine learning in the field of ceramics from 2006 to 2015 was minimal, and it showed an upward trend from 2019 to 2022, especially between 2020 and 2021, with the fastest growth. By 2020, the attention of deep learning in the field of ceramics has increased significantly, and its research results have advanced by leaps and bounds. In 2021, its publication growth rate reached 95%.

Keyword co-occurrence analysis

In this paper, CiteSpace is used to analyze the keywords in CNKI database from 2006 to 2022, and the keyword co-occurrence knowledge graph in Figure 2 is obtained, the size of the node in the graph represents the number of occurrences of the word, and the largest key node in the graph is "deep learning", which appears 32 times. The number of connections around the node represents the centrality of the keyword, combined with Figures 2 and 3, it can be seen that the centrality of "deep learning" is 0.38, and each keyword presents a situation of intersection with "deep learning", and the correlation between the main keywords and other keywords is large [2].



Fig. 2 Keyword co-occurrence map

Visible	Count	Central.	Year	Keywords
<input checked="" type="checkbox"/>	32	0.38	2018	深度学习
<input checked="" type="checkbox"/>	12	0.26	2017	机器学习
<input checked="" type="checkbox"/>	8	0.14	2016	特征提取
<input checked="" type="checkbox"/>	7	0.06	2020	缺陷检测
<input checked="" type="checkbox"/>	6	0.24	2021	目标检测
<input checked="" type="checkbox"/>	4	0.02	2021	陶瓷
<input checked="" type="checkbox"/>	4	0.13	2020	特征融合
<input checked="" type="checkbox"/>	4	0.12	2016	机器视觉
<input checked="" type="checkbox"/>	4	0.04	2018	图像分割
<input checked="" type="checkbox"/>	3	0.07	2020	古陶瓷
<input checked="" type="checkbox"/>	3	0.06	2019	神经网络

Fig. 3 High-frequency keywords

Keyword clustering

By clustering and analyzing the high-frequency key vocabulary in this field, the high-frequency keyword clustering map of machine learning in the extraction direction of ceramic ornaments is obtained. Figure 4 shows the seven largest



clusters of keywords: #0Defect detection, #1machine learning, #2Feature extraction, #3Ceramic fragments, #4Artificial intelligence, #5Ceramics, and #7Object detection.

The higher the co-occurrence frequency of keywords in the sample literature, the higher the research attention of the keywords. As shown in Figure 3, At present, domestic research in this field is mainly in feature extraction, target detection, feature fusion, image segmentation and other aspects.



Fig. 4 Keyword clustering

Top 11 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2006 - 2023
遗传算法	2010	0.84	2010	2019	—
信息融合	2017	0.71	2017	2020	—
图像分类	2020	0.89	2020	2021	—
缺陷检测	2020	0.68	2020	2021	—
卷积神经网络	2020	0.59	2020	2021	—
无迹检测	2020	0.59	2020	2021	—
fasto1-cnn	2020	0.59	2020	2021	—
目标检测	2021	1.36	2021	2023	—
数据增强	2021	0.44	2021	2023	—
尺寸测量	2021	0.44	2021	2023	—
划痕检测	2021	0.44	2021	2023	—

Fig. 5 The top 9 strongest accentuators

Selecting the software's "Burstness" option generates a map of prominent words, as shown in Figure 5, you can see the variation in the duration of the word. The first prominent word to appear in 2006 was the genetic algorithm, which lasted up to 10 years; Highlights from 2021 to date include object detection, data augmentation, dimensional measurement, and more. These keywords have continued to this day, reflecting that related keywords will still be a research hotspot in this field for some time to come.

CONCLUSION

Through the visual analysis of relevant literature, it can be seen that the research literature of machine learning in ceramic ornament extraction is on the rise, indicating that more and more people are paying attention to this hot issue, and the research efforts in this field are still insufficient and need more in-depth research. From the perspective of research hotspots, machine learning in this field mainly focuses on feature extraction, information fusion, image classification, etc., and the connection between keywords is relatively strong.

Shortcomings in this paper: Since this study mainly selects the literature in the domestic CNKI database and does not involve foreign journal literature, the results of this study cannot comprehensively and objectively explain the research results of machine learning in this field, and then it is necessary to select a larger range of journal literature to comprehensively analyze the development trend of this field.

REFERENCES

1. Liu Yaping. Literature visualization analysis of the research progress of Peking Opera costumes [J]. *silk*, 2022, 59(07): 71-78.
2. Sheng Yunmeng, Liu Qian. Analysis of international artificial intelligence research hotspots and trends based on CiteSpace [J]. *Software*, 2022, 25(11): 35-38+34.