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THE INTERSECTION OF DEEP LEARNING AND ORAL CANCER RESEARCH: A KEYWORD COOCCURRENCE NETWORK ANALYSIS

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ABSTRACT

Integrating artificial intelligence (AI) into medical research has fundamentally transformed the identification and management of diseases, particularly in oral cancer research, where deep learning has demonstrated considerable potential. The complexity of the causes and the delayed diagnosis of oral cancer present significant problems. This report investigates the use of keyword cooccurrence network analysis to visually represent the research field of deep learning applications in oral cancer. The network reveals the advancements in Convolutional neural networks (CNNs), a type of deep learning that enhances diagnosis accuracy and enables early intervention. Analyzing the cooccurrences of significant phrases can improve the possibilities for future research and the outcomes for patients.

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Incorporating artificial intelligence (AI) into medical research has fundamentally transformed numerous facets of disease detection and therapy [1,2]. An area that shows excellent potential is using deep learning methods in oral cancer research [3–5]. Oral cancer, which is a kind of head and neck cancer, poses considerable difficulties in terms of diagnosis and treatment due to its intricate causes and frequently delayed detection [6–8]. Conventional detection and analysis methods are progressively being complemented and even substituted by sophisticated AI technologies, including deep learning. This article examines how keyword cooccurrence network analysis can be used to map the research landscape of deep learning applications in oral cancer.

Deep learning is an advanced form of machine learning that utilizes neural networks with numerous layers to represent intricate patterns in data accurately. The use of this technology in medical imaging has demonstrated remarkable potential. Convolutional neural networks (CNNs), a specific sort of deep learning architecture, have shown remarkable effectiveness in examining medical images to identify various diseases, such as oral cancer, at an early stage [9–12]. These models can detect intricate patterns in imaging data that may not be noticeable to human radiologists. As a result, they improve the accuracy of diagnoses and allow for early intervention. Studies have shown that CNNs may effectively detect cancerous tumors in oral tissues using digital images, potentially surpassing established diagnostic procedures [13,14]. This capacity is vital due to the predictive significance of detecting oral cancer at an early stage. In addition, deep learning models can be taught to forecast patient outcomes using diverse inputs, such as histopathology data, genetic profiles, and textual information extracted from electronic health records (EHRs).

Keyword cooccurrence network analysis is an effective bibliometric technique employed to visually represent and examine the connections between essential terms in a collection of literature [15,16]. Researchers can uncover central themes, developing trends, and multidisciplinary links by analyzing the frequency of specific

terms appearing together in academic publications. This strategy is especially beneficial in quickly advancing domains such as AI and medical research, where the sheer number of papers can be daunting.

The Scopus database was queried using the keywords "deep learning AND oral cancer" to retrieve academic publications. A total of 272 research outputs were included in the present investigation. Scopus is an internet-based database and analytical tool that grants access to a worldwide collection of scholarly literature metadata, including citation indexing. A total of 272 publications were downloaded in RIS format. Subsequently, the files were employed for network analysis using the VOSviewer software (https://www.vosviewer.com/), from which keywords were collected.

Keyword cooccurrence networks in deep learning and oral cancer research provide insights into the most significant studies, prominent research clusters, and potential gaps in the existing literature (Figure 1). An analysis of the network about this issue reveals significant cooccurrences among phrases such as "CNN," "oral cancer diagnosis," and "medical imaging," suggesting a substantial body of research in this field. On the other hand, less strong links could bring attention to subjects that have yet to be thoroughly examined or present new prospects for research.

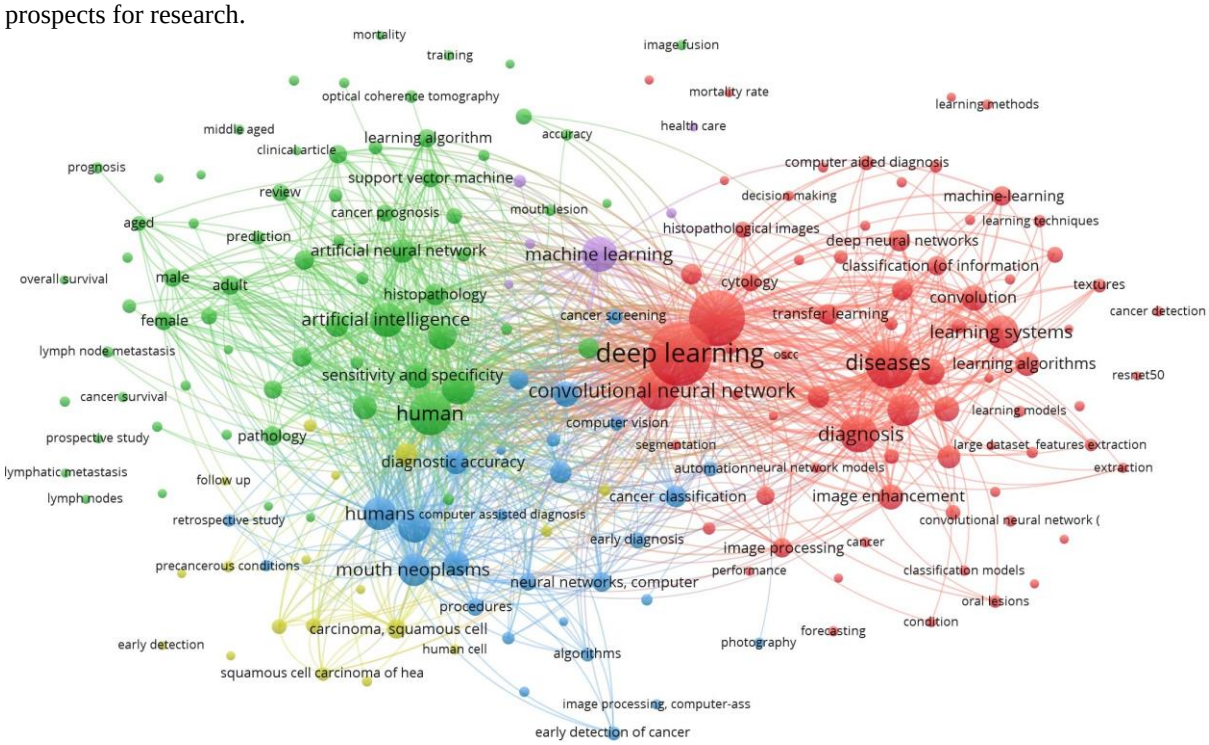

Figure 1. Networks of keyword cooccurrences by topic "deep learning and oral cancer." The keywords and their cooccurrence in the study are expressed as nodes and links, respectively. Node sizes are scaled by degrees (number of occurrences of a keyword with others), and colors reflect the proportion of occurrences in each topic.

The potential of keyword cooccurrence network analysis in deep learning and oral cancer research is highly promising. The ongoing development of AI technology and growing interdisciplinary collaboration are expected to improve this field substantially. With the increasing availability of data, the performance of deep learning models for detecting and predicting the prognosis of oral cancer will continue to enhance. By incorporating various data sources, including genetic, proteomic, and environmental data, the accuracy of these models will be improved, resulting in more individualized and efficient treatment approaches [17–22]. In addition to detection and prognosis, deep learning can also be utilized in other areas of oral cancer care, including treatment planning and monitoring. Keyword cooccurrence network analysis can enhance innovation and patient outcomes by systematically mapping the research landscape, finding significant trends and gaps, and promoting interdisciplinary collaboration. To fully realize these benefits, it will be crucial to tackle the issues related to data quality, volume, and complexity. As we further allocate resources to this interdisciplinary approach, the outlook for oral cancer research becomes increasingly optimistic, with AI positioned to have a pivotal impact on enhancing diagnostic and therapeutic methods.

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COMPETING INTEREST

The authors declare no conflict of interest.

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