Evaluating the Impact of AI on Radiology Research: A Systematic Review Approach

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INTRODUCTION

The quickly expanding body of medical literature has posed a unique challenge for researchers, as their ability to analyze the sheer volume of published data and draw upon areas of worthy investigation has proven to be very difficult. The automated nature of Large Language models (LLMs) has enabled vast textual information and targeted responses based on generated commands, potentially offering researches relief by assisting in the discovery of new research topics. While promising, the utility and accuracy in this context remains largely unexplored. This study aims to determine the ability of Scite® Large Language Model to generate both novel and relevant topics for future systematic reviews in radiology.

METHODS

- Utilizing a descriptive, cross-sectional study, three researcher-generated commands given to Scite® to produce systematic review topics in radiology, interventional radiology and neuroradiology.
    1. "Provide 10 novel systematic review ideas that have yet to be published in radiological imaging" (Table 1)
    2. "Provide 5 novel systematic review ideas that have yet to be published related to Interventional radiology" (Table 2)
    3. "Provide 5 novel systematic review ideas that have yet to be published related to neuroimaging and interventions" (Table 3)
- Each generated review topic was cross analyzed for novelty and relevance through key words and searching in PubMed, EMBASE, and Cochrane
- Novelty was defined on whether a prior systematic review already existed while relevance was listed as the number of non-reviewed articles relating to the generated topic
- The results were then analyzed as a percentage of novel topics and median relevance cross compared to its novelty status

RESULTS

- Research topics generated included ten Systematic topics in radiology, five in interventional radiology and five in neuroradiology with a novel generated percentage of 35%. Relevance was conclude as a median count of 21.5 for all generated topics and six for novel topics with one having no associated publications.
- This analysis highlights significant variation in research saturation and novelty and suggest substantial opportunities for research in emerging technologies and under examined interventions within radiology.
- Radiological imaging topics such as pediatric radiation dose reduction and augmented reality in interventions are well-covered, while novel areas like 3D printing, blockchain security, and radiogenomics remain largely unexplored. Interventional radiology shows a high volume of existing literature in patient shielding and ultrasound-guided pain management, but innovative techniques in pediatric pancreaticobiliary interventions stand out as a new research frontier. Neuroimaging, by contrast, is a relatively underrepresented field, with low counts across both systematic and non-systematic reviews.

Figure 1:Ten Scite-generated Systematic Review Topics within Radiological Imaging: Count of Existing Non-Systematic and Systematic Reviews, Along with Novelty Status.

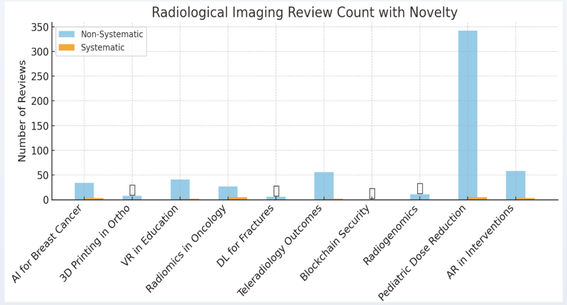


Figure 2: Five Scite-generated Systematic Review Topics within Interventional Radiology: Count of Existing Non-Systematic and Systematic Reviews, Along with Novelty Status.

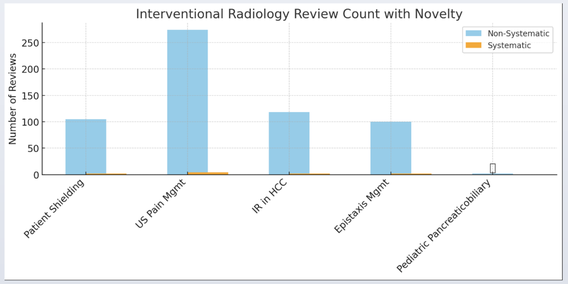
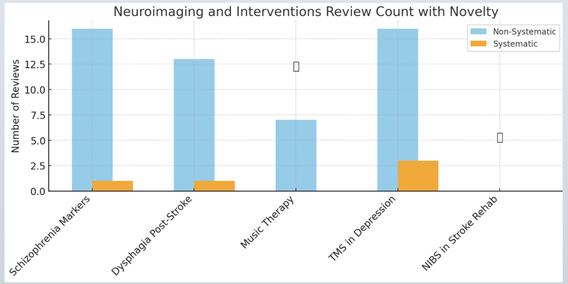


Figure 3: Five Scite-generated Systematic Review Topics within neuroimaging and interventions: Count of Existing Non-Systematic and Systematic Reviews, Along with Novelty Status



DISCUSSION

The findings suggest that AI can effectively identify novel and impactful research areas in radiology. Systematic reviews based on AI-generated topics could lead to advancements in understanding AI's specific applications and limitations within radiology and various other field of medicine as the application of AI is ever expanding.

LIMITATIONS

- While the utilization of AI platforms like Scite presents promising opportunities for identifying novel research topics in radiology, several limitations should be acknowledged.
    - **Scope limitations:** While Scite may offer a vast database of citations, its scope may not cover all relevant literature sources, leading to potential gaps in the generated research topics
    - **Algorithm bias:** Biases in data collection, training, or algorithm design may inadvertently influence the selection and ranking of research articles, leading to skewed recommendations or overlooking emerging trends and perspectives.
    - **Quality/accuracy assurance challenges:** There remains a challenge in ensuring the reliability and robustness of the identified systematic review topics suggested by AI platforms like Scite.
    - **Dynamic nature of research:** AI platforms may struggle to keep pace with the quick developments in the field of radiology, leading to outdated or incomplete recommendations.

CONCLUSION

- Our findings encourage the continued integration of AI in radiological research and the expansion of its applications to improve patient care.
- Although ScITE currently exhibits a lower accuracy rate for the development of novel investigations, the program has proven itself to be a useful tool in finding areas of research that have been underexplored in radiological academia.
- Further research and development are necessary to refine and improve these algorithmics before they can be safely implemented in our daily practice along with adequate analyzation of the responses through traditional literature review to ensure quality.
- Ultimately, AI holds the promise as a tool in radiological practice, advancing the medical field, and achieving optimal patient outcomes.

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