RadOntology: An Ontology-Driven Intelligent Platform for Radiology Education and Clinical Insights

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Background/Problem Being Solved

Radiological services are experiencing unprecedented demand, and radiologists are increasingly pressured to manage a higher volume of image interpretations while maintaining high-quality diagnostic accuracy. Although traditional AI tools offer potential relief, their adoption in clinical practice has been hindered by challenges such as low reliability and lack of transparency. To address these issues, we introduce RadOntology, an enriched knowledge graph derived from structured radiology reports, designed to assist radiologists with image interpretation and support training and education. By integrating intuitive and accurate data retrieval through natural language queries, reliable clinical insights, and enhanced report generation assistance, RadOntology aims to alleviate workload pressures, improve diagnostic outcomes, and bridge the gap between AI innovation and clinical utility.

Intervention(s)

RadOntology employs advanced large language models and Vision Transformers to transform unstructured radiology reports and images into an ontology-based knowledge graph. Through sophisticated entity extraction and structured data representation, the system enables users to perform intuitive natural language queries, explore relevant cases, and retrieve expert-authored radiology reports for guided report writing.

Barriers/Challenges

Key challenges include ensuring interoperability with existing radiology information systems, maintaining high-quality ontologies, and achieving broad acceptance among radiologists.

Outcome

RadOntology delivers an integrated and open-source platform that facilitates intuitive natural language queries to extract clinically relevant entities from radiology reports and retrieve structured data, such as similar expert-authored cases and imaging. These tools could reduce diagnostic ambiguity and increase confidence in clinical decision-making. The system's educational capabilities enable radiologists and trainees to explore curated case collections grouped by anatomical region or pathology type, promoting deeper insights through comparative analysis.

Conclusion/Statement of Impact/Lessons Learned

RadOntology generates ontology-based knowledge graphs, facilitates advanced image pattern retrieval, and provides reliable references, empowering users with greater diagnostic confidence and educational value.
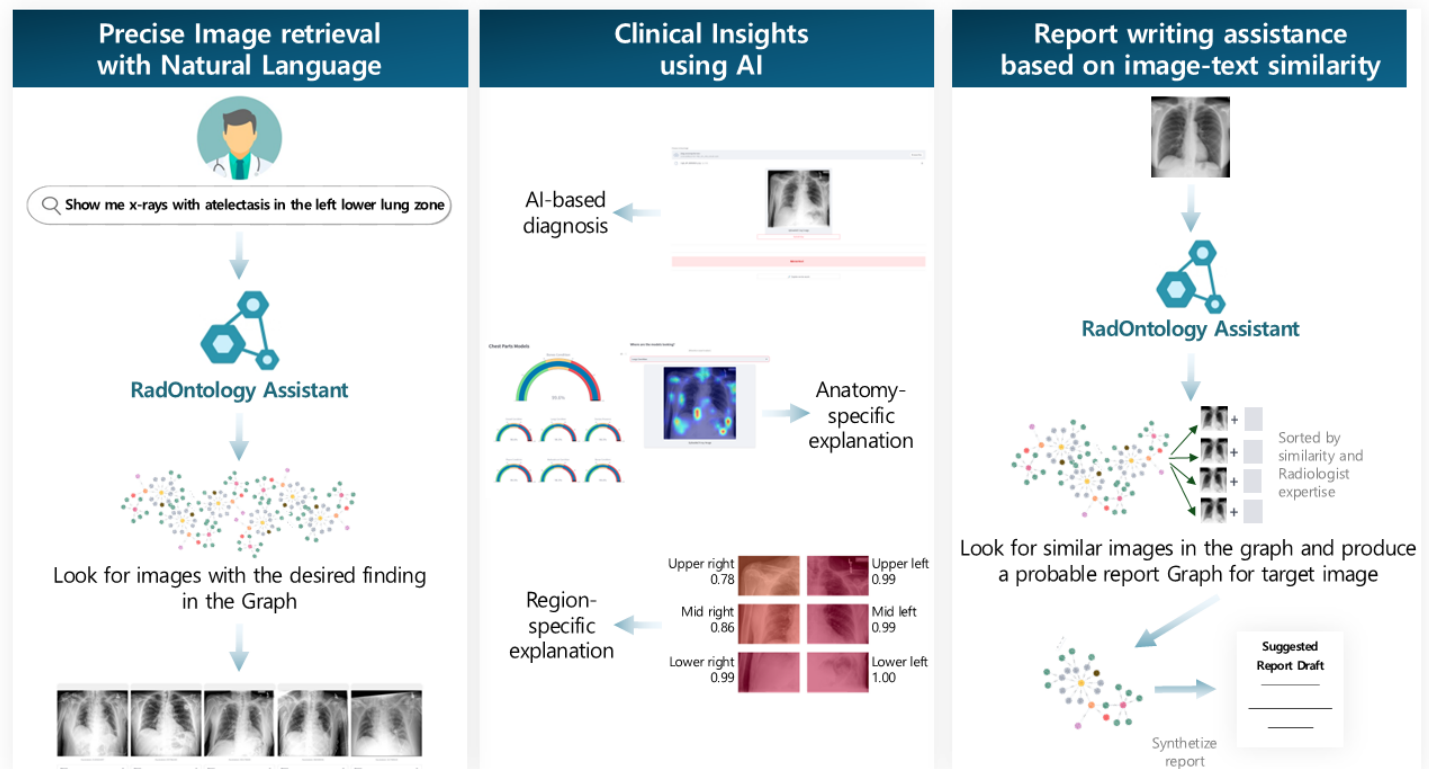
Figure(s)

Figure 1. Overview of RadOntology applications. RadOntology enables precise image retrieval via natural language queries, delivers clinical insights through AI-based diagnosis and region-specific explanations, and supports report writing by retrieving similar expert-authored cases and imaging.

Keywords

Applications; Artificial Intelligence/Machine Learning; Clinical Workflow & Productivity; Educational Systems