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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 48(0)

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Publication Date

2026

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Peer reviewed

Knowledge-Driven Cognitive Reasoning for Diagnosis

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Abstract

Accurate radiological diagnosis relies on regulated integration of visual evidence with established clinical knowledge. Despite strong representational capacity, many Vision–Language Models lack mechanisms for reasoning regulation, frequently producing internally inconsistent reports even when final predictions appear correct. We introduce structured reasoning with clinical constraints, a framework that reformulates radiological report generation as constrained inference instead of unconstrained decoding. The method grounds intermediate reasoning trajectories in the BI-RADS lexicon and verifies their compliance with clinical rules, enforcing consistency between visual descriptions and diagnostic conclusions. The framework reflects core aspects of dual-process cognition by combining stochastic hypothesis generation with knowledge-based validation. Experiments demonstrate the effectiveness of the proposed method.