

# **Reinforcement Learning-Tuned Socratic Scenarios for Healthcare Students**

## **Abstract**

PROaCTiVE is a conversational training platform designed to help healthcare students practice clinical communication and decision-making through realistic patient scenarios.

This paper presents implemented enhancements that integrate Socratic reasoning with reinforcement learning (RL) to deliver adaptive learning experiences. Socratic dialogue is a valuable skill in clinical reasoning, as it enables healthcare members and patients to collaborate and achieve a shared understanding of necessary assessments and care goals. Building on this foundation, an RL layer will adapt the feedback style, the cadence of the questions, and the difficulty of the scenario in response to the learners' behaviors and outcomes. The approach aims to personalize practice by selecting question strategies that maximize reflection, clarity, and safe clinical judgment, while incorporating multimodal signals (e.g., speech timing) to improve communication skills. We describe the system design within PROaCTiVE, including conversational orchestration and a feedback-effectiveness loop that treats student ratings and performance as rewards for RL. We present initial evaluation results from a controlled simulation study with 10 diverse student profiles, demonstrating 11.1% learning improvement and effective personalization across different learner types. By combining the formative power of Socratic questioning with data-driven adaptation,

PROaCTiVE aims to deliver scalable, evidence-based coaching that helps students not only learn what to say but also how to think.