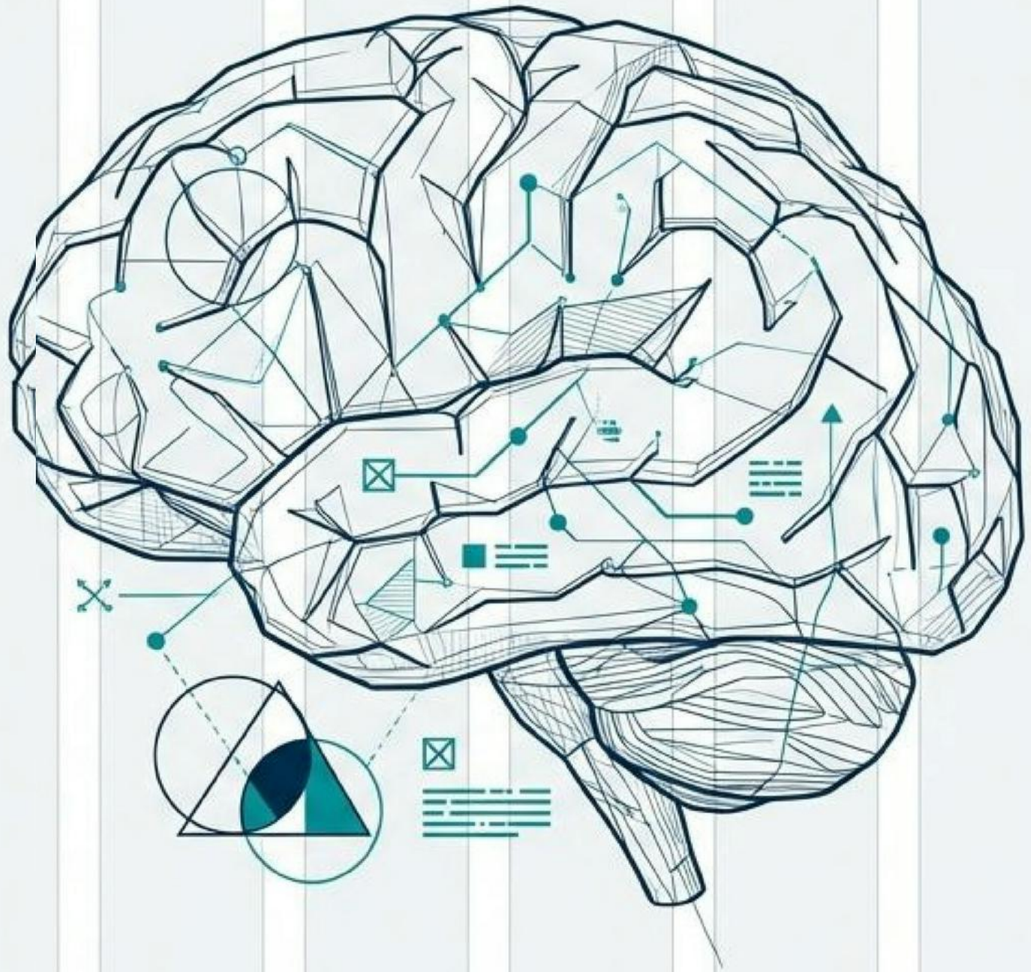
Artificial Intelligence in Undergraduate Medical Education

Enhancing Clinical Reasoning Without Replacing Human Judgment — A Narrative Review



East European University

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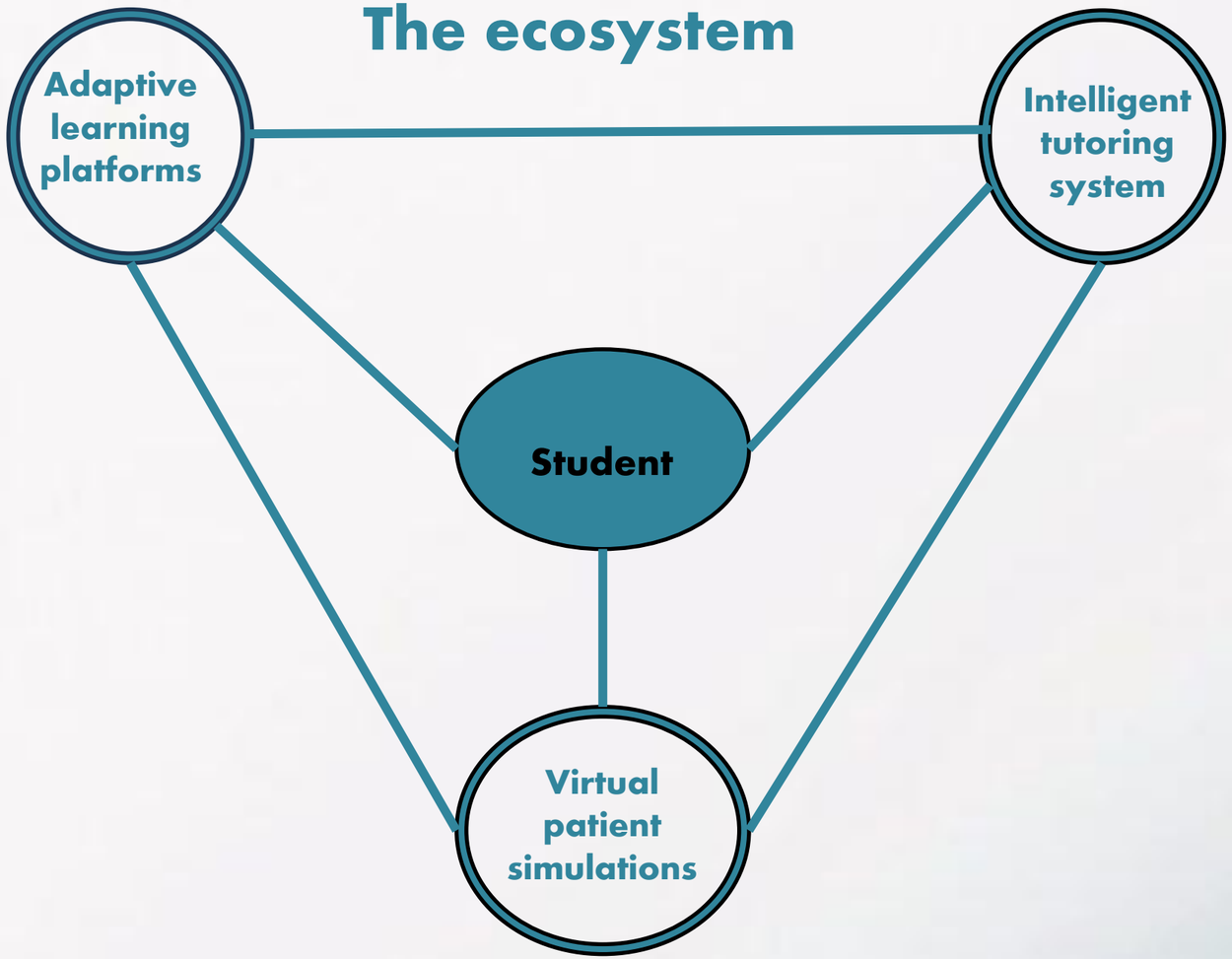
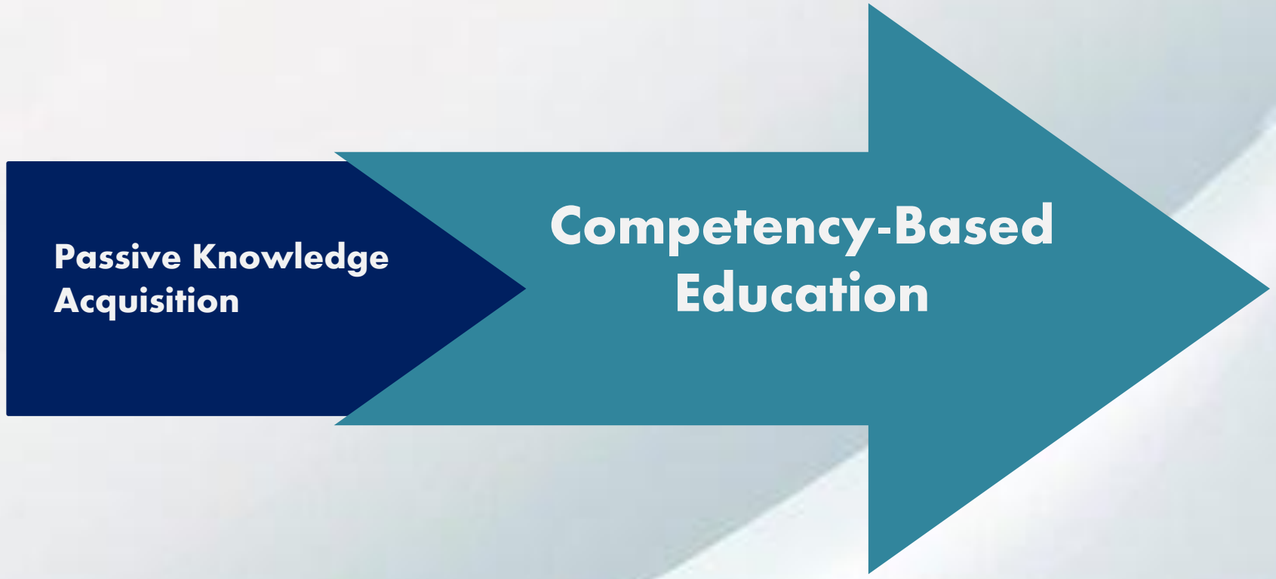
The Acceleration of Digital Transformation in Healthcare Education

The ecosystem



The Shift



Insight: There is an increasing demand for enhanced clinical reasoning skills. AI is not new, but its educational integration is accelerating.

Clinical Reasoning is the Core Competency of Medical Professionalism

✓ **Pattern Recognition**
Rapid identification of disease features based on prior experience.

✓ **Hypothesis Generation**
Formulating differential diagnoses and testing potential explanations

✓ **Reflective Judgment**
Metacognitive evaluation of the reasoning process and outcomes.

Diagnostic Accuracy

The Challenge: Traditional teaching suffers from limited patient exposure, variable feedback mechanisms, and severe time constraints

The Proposition: AI serves as a structured cognitive scaffold to bridge these gaps.

Defining the Scope of AI in Pedagogical Strategy

01

Role of Tools:

- Examining AI-assisted educational tools in enhancing clinical reasoning

02

Evidence Base:

- Evaluating evidence supporting AI-driven learning systems.

03

Risk Assessment:

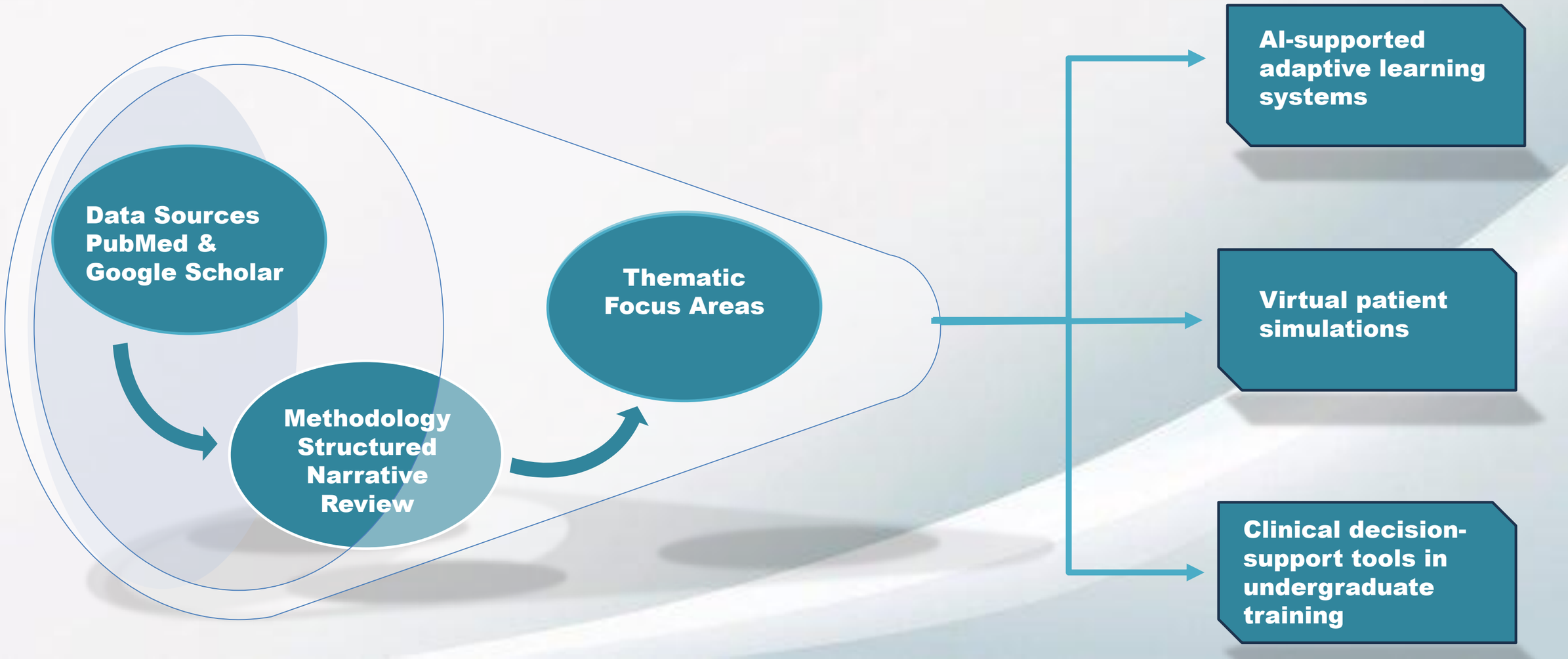
- Identifying risks of overreliance on algorithmic guidance.

04

Implications:

- Analyzing ethical and pedagogical implications in undergraduate curriculum.

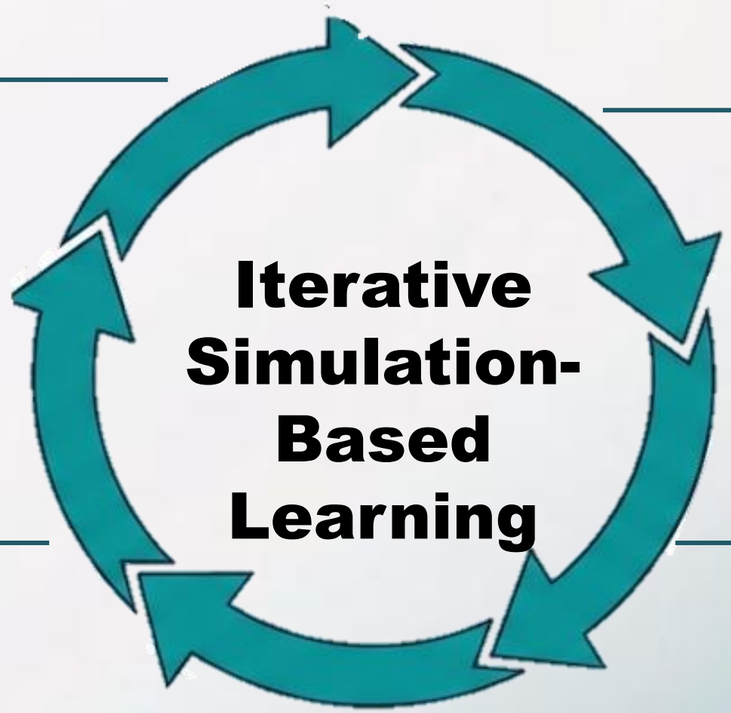
A Thematic Synthesis of Literature (2020-2025)



Enhancing Diagnostic Accuracy Through Adaptive Systems

Personalization:
Creating personalized learning pathways.

Recognition:
Enhanced diagnostic pattern recognition



Feedback:
Providing instant, adaptive feedback loops

Safety:
Safe rehearsal of clinical skills before patient contact

Tracking:
Competency-based progression tracking.

The Risks of Algorithmic Opacity and Cognitive Offloading

Core Risks:

- **Cognitive Offloading:** Students relying on AI outputs instead of developing independent reasoning.
- **Reduced** Independent Analytical Thinking.
- **Algorithmic Opacity:** Black-box systems where the reasoning is hidden.
- **Data Privacy Concerns** in educational settings.
- Lack of Standardized AI Integration Guidelines.

Critical Research Gap: There is insufficient research evaluating whether AI improves real-world bedside diagnostic performance (long-term outcomes).

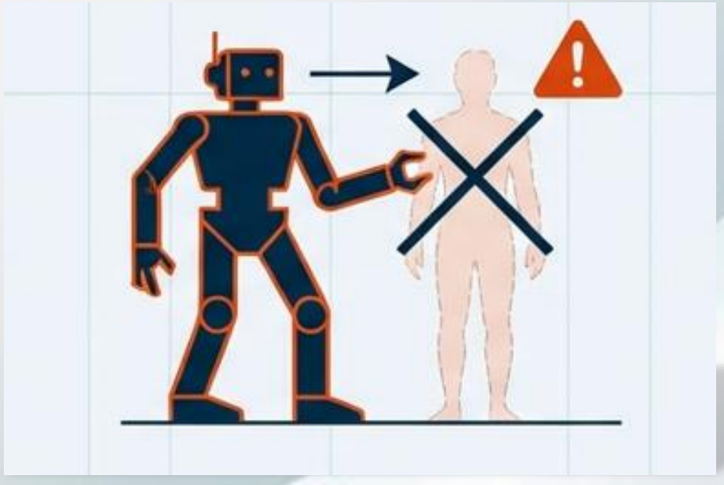
Defining the Boundary: Cognitive Scaffold vs. Clinical Surrogate

AI Must Be (Augmentative)

A tool for transparency, accountability, and support.

AI Must Not Be (Substitutive)

A replacement for bedside teaching or human mentorship.



“AI should function as a cognitive scaffold, not a clinical surrogate.”

Requirement: Need for AI literacy training embedded in medical curriculum.

Sustainable Integration Requires Preserving Human Judgment

AI demonstrates substantial potential to strengthen clinical reasoning and enhance individualized, competency-based training.

The Path Forward

- **Address risks of overdependence immediately.**
- **Preserve human judgment as the core competency.**
- **Maintain robust bedside exposure.**
- **Implement ethical frameworks for algorithmic transparency.**

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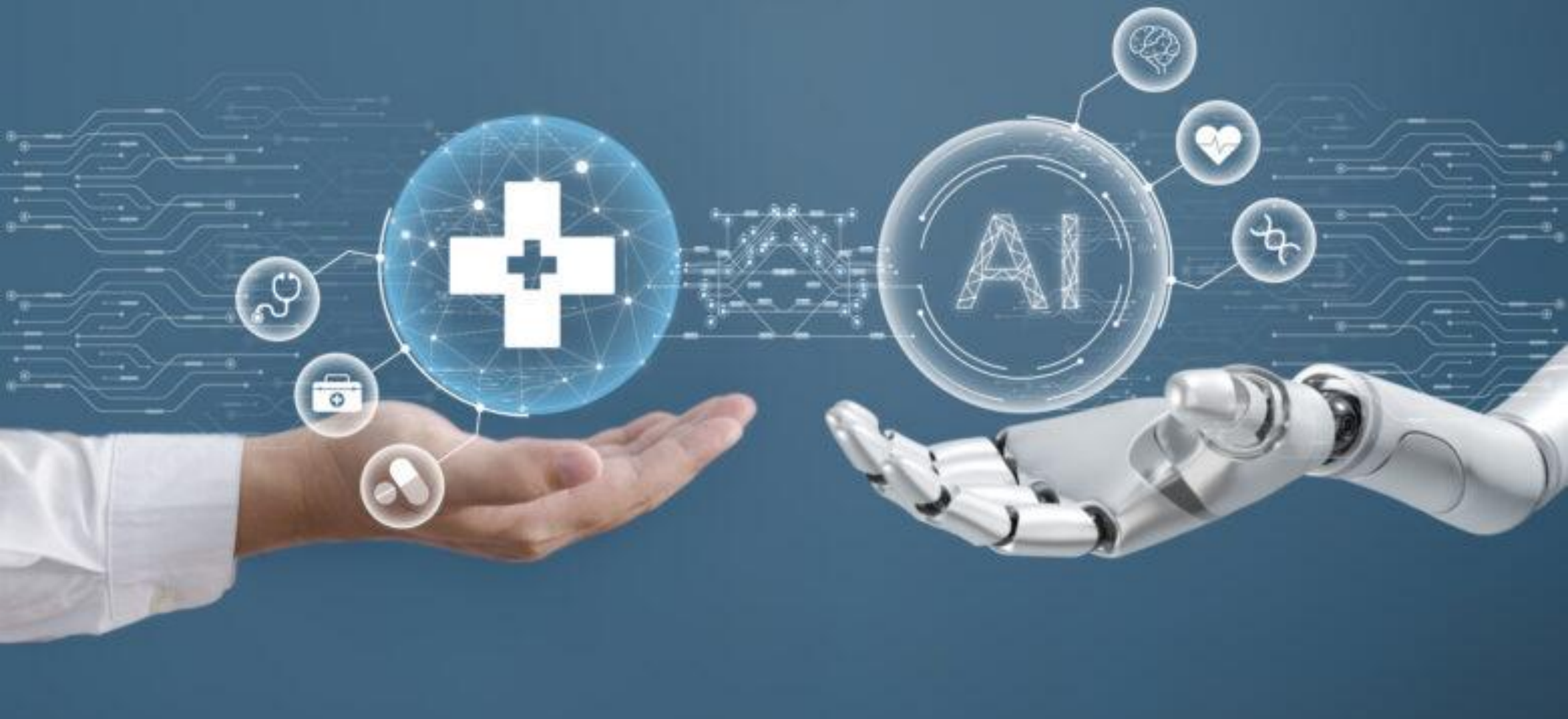
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