

AI Prompt Engineering in Health Professions Education

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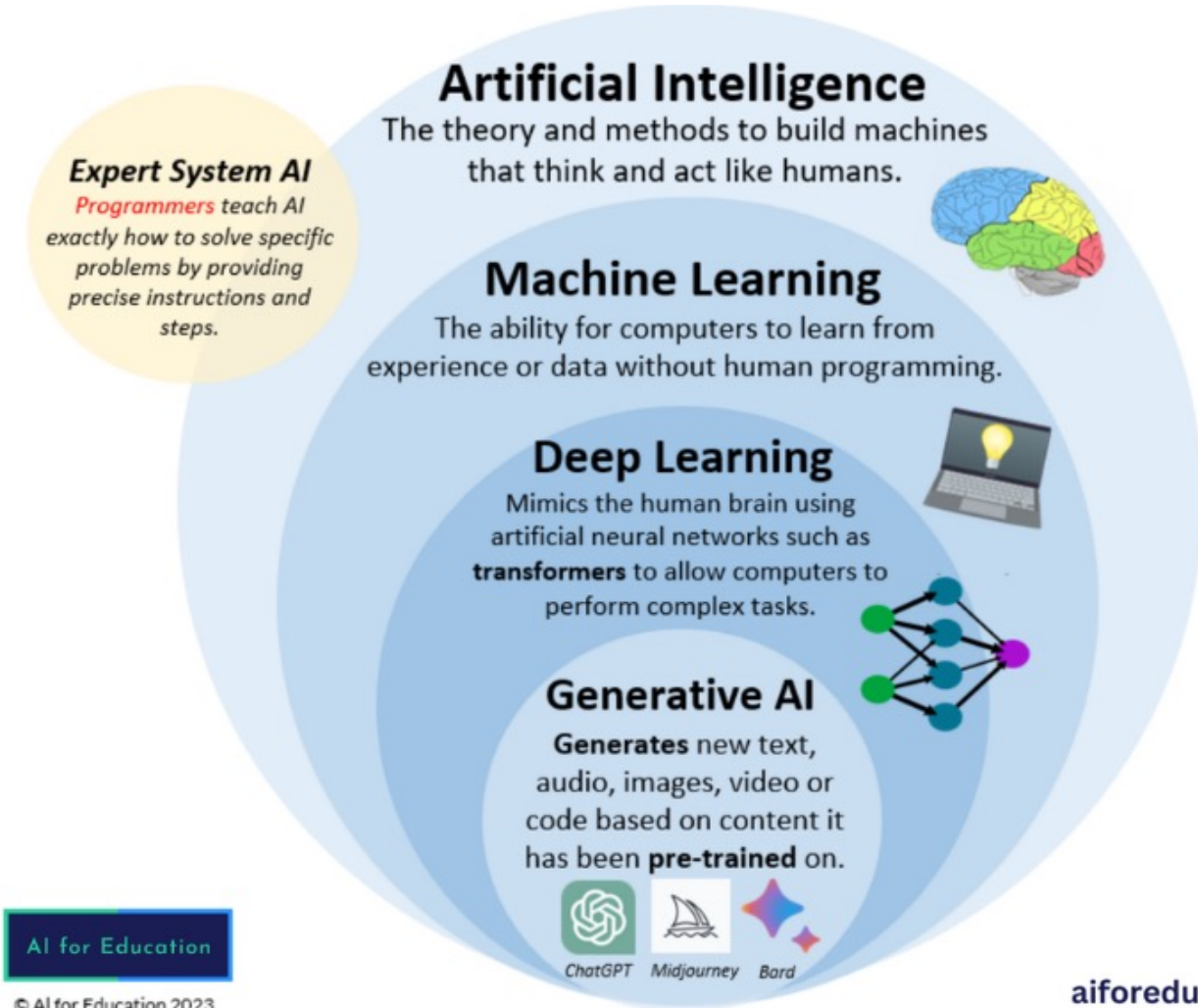
The background features a stylized illustration of several hands raised in the air, each emerging from a sleeve of a different color (blue, light blue, dark blue, and brown). The hands are positioned on the left side of the image. To the right of the hands, there are several white speech bubbles of varying sizes. The entire scene is set against a light blue background with a dark blue diagonal band running from the top left to the bottom right. The text is centered within this dark band.

A Quick Survey -
What is your
experience level
with Gen AI?

Breakout Heads Up

- ▶ Breakout session to co-develop AI prompts in small groups
- ▶ Please have access to a common gen AI tool (eg, ChatGPT)
- ▶ Be prepared to learn from each other

What is Generative AI?



Popular General Gen AI tools



ANTHROPIC

OPINION - HEALTH AND SCIENCE

Op-ed: How well can AI chatbots mimic doctors in a treatment setting? We put 5 to the test

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Dr. Scott Gottlieb and Shani Benezra

<https://www.cnbc.com/2024/07/18/op-ed-how-well-can-ai-chatbots-mimic-doctors.html>

Gen AI Performance on USMLE Step 3

- ChatGPT-4o (OpenAI) — 49/50 questions correct (98%)
- Claude 3.5 (Anthropic) — 45/50 (90%)
- Gemini Advanced (Google) — 43/50 (86%)
- Grok (xAI) — 42/50 (84%)
- HuggingChat (Llama) — 33/50 (66%)

<https://www.cnbc.com/2024/07/18/op-ed-how-well-can-ai-chatbots-mimic-doctors.html>

Applications

EDUCAUSE

Dreaming

Helping you think



- Brainstorming/ideation/getting unstuck
- Summarization and synthesization of complex content
- Research and analysis
- Asking questions/learning

Drudgery

Lightening your load



- Sending communications/emails
- Drafting administrative documents, materials, reports
- Reviewing and proofreading materials
- Grant, proposal, and contract writing

Design

Building your content



- Creating presentations, slides, and other content
- Creating course materials, exams, and syllabi
- Editing and creating images and videos
- Suggesting prompts and materials for trainings and workshops

Development

Advancing your work



- Drafting department and institution policies
- Developing department and institution strategic plans
- Creating detailed project plans
- Offering advanced scripting and coding (e.g., complex SQL queries, Excel formulas)

<https://er.educause.edu/articles/2023/4/educause-quickpoll-results-adopting-and-adapting-to-generative-ai-in-higher-ed-tech>

In Health Professions Education

- ▶ Admissions
- ▶ Learning
- ▶ Assessment
- ▶ Medical education research

Recommended Practices - 3Cs

- ▶ Be **Concise**
- ▶ Be **Clear** (specific)
- ▶ Provide **Context** (HINT: gives the AI an explicit role and identify your audience)

- ▶ Iterate and refine the prompt
- ▶ Test frequently for important use cases

- ▶ Know the model's weaknesses:
 - Complex logic
 - References and citations
 - Math
 - Potential biases in the training dataset

Recommended Practices

- ▶ Provide human-approved examples (“Few shot” techniques)
- ▶ Breaking a task into specific standard steps if possible.
(Chain-of-thoughts techniques)
- ▶ Use AI to create the base prompt
- ▶ Use AI to check itself



ROLE TASK FORMAT

<https://easyaibeginner.com/rtf-framework-for-chatgpt/>

What Does ChatGPT Recommend?

- ▶ **C.R.A.F.T.S.**
- ▶ **C - Clarity** - Ensure the prompt is clear and unambiguous.
- ▶ **R - Relevance** - Make the prompt contextually relevant to the learning objectives.
- ▶ **A - Accuracy** - Provide precise and specific information.
- ▶ **F - Flow** - Structure the prompt logically and sequentially.
- ▶ **T - Thought-Provoking** - Use open-ended questions to encourage critical thinking.
- ▶ **S - Support with Multimedia** - Enhance the prompt with images, videos, or other media.

Zero Shot

- ▶ You are an experienced medical educator who is assessing second year medical students. Please generate a USMLE Step 1-style question that assesses knowledge in the area of [cardiovascular physiology]. The question should be clinically relevant, involve a patient scenario, and test the student's understanding of the underlying mechanisms of [a common cardiovascular condition]. The question should be multiple choice with one correct answer and four distractors. Provide a detailed explanation for the correct answer, including why the other options are incorrect.

Few Shot

- ▶ Zero shot prompt. **Plus** examples:
- ▶ **Example 1:**
- ▶ A 65-year-old woman with a history of diabetes mellitus presents to the emergency department with sudden onset of shortness of breath and chest pain that began 1 hour ago. She describes the pain as a heavy pressure that radiates to her jaw. Her blood pressure is 160/95 mm Hg, heart rate is 110/min, and respiratory rate is 22/min. An ECG shows ST-segment elevations in leads V1-V4.
- ▶ Which of the following is the most likely diagnosis?
- ▶
 - A. Acute myocardial infarction
 - B. Pulmonary embolism
 - C. Aortic dissection
 - D. Pneumonia
 - E. Gastroesophageal reflux disease

Chain of Thought

1. You are an experienced medical educator who is assessing second year medical students.
2. Start by identifying a common cardiovascular condition that is often tested in USMLE exams, such as myocardial infarction.
3. Develop a patient scenario that includes relevant clinical symptoms, history, and physical examination findings.
4. Integrate diagnostic data, such as ECG findings, to provide a comprehensive clinical picture.
5. Formulate a question stem that presents this patient scenario clearly and concisely.
6. Construct multiple-choice options, ensuring one correct answer and four plausible distractors.
7. Write a detailed explanation for why the correct answer is accurate, referencing key clinical findings and diagnostic data.
8. For each distractor, explain why it is incorrect, highlighting differences in clinical presentation, diagnostic criteria, or pathophysiology.
9. Review the question to ensure it aligns with USMLE standards and effectively assesses the targeted knowledge area.

Breakout Session

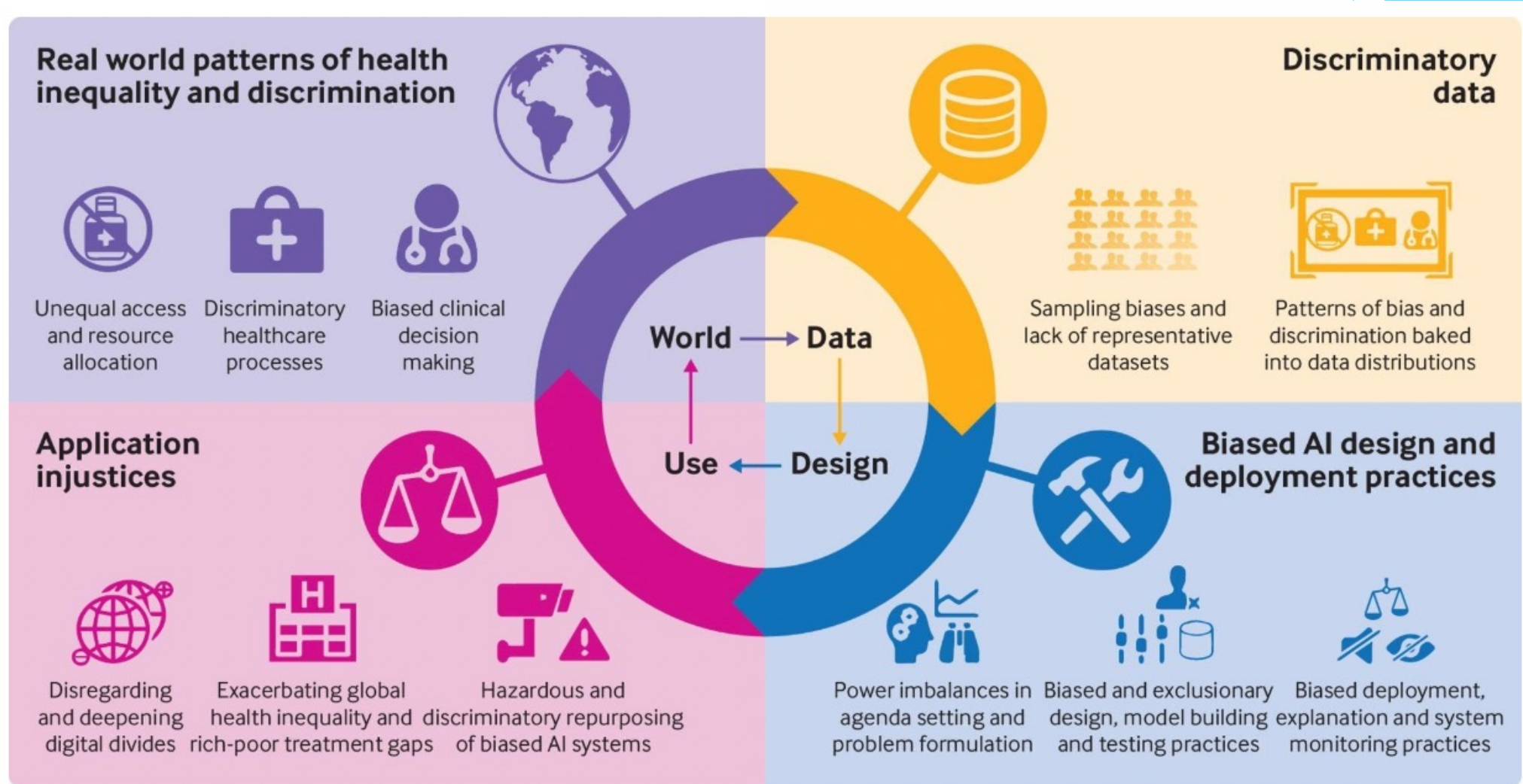
- ▶ In facilitated small groups, co-develop a gen AI prompt to address one of the following scenarios:
 - ▶ Create a 5 item MCQ quiz for an asthma pathophysiology module
 - ▶ Create a PBL case for thyroiditis
 - ▶ Create a grading rubric on counseling a standardized patient who suffered a miscarriage
 - ▶ Develop a cardiovascular course syllabus
 - ▶ Develop a faculty promotion guide
- ▶ Pick a gen AI operator and a reporter
- ▶ Document your final prompt and be prepared to discuss

Pitfalls - Practice, Policy and Ethics

- ▶ AI confabulations (hallucinations)
- ▶ AI “black box” problem
- ▶ Security and privacy
- ▶ Copyright/plagiarism
- ▶ Access and equity
- ▶ AI-driven decision making
- ▶ Overreliance on technology

Masters K. Ethical use of Artificial Intelligence in Health Professions
Education: AMEE Guide No. 158. Med Teach. 2023 Jun;45(6):574-584. doi:
10.1080/0142159X.2023.2186203. Epub 2023 Mar 13. PMID: 36912253.

AI is Biased??



Source: British Medical Journal

Harnessing the potential of large language models in medical education: promise and pitfalls

Get access >

Trista M Benítez, MPH, Yueyuan Xu, MD, J Donald Boudreau, MD,
Alfred Wei Chieh Kow, PhD, Fernando Bello, PhD, Le Van Phuoc, MD, MPH, DTM&H,
Xiaofei Wang, PhD, Xiaodong Sun, MD, PhD, Gilberto Ka-Kit Leung, MS, PhD,
Yanyan Lan, PhD ... Show more

Journal of the American Medical Informatics Association, Volume 31, Issue 3, March 2024,
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Published: 24 January 2024 **Article history** ▼



[BMC Med Educ.](#) 2023; 23: 772.

Published online 2023 Oct 17. doi: [10.1186/s12909-023-04752-w](https://doi.org/10.1186/s12909-023-04752-w)

PMCID: PMC10580534

PMID: [37848913](#)

Advantages and pitfalls in utilizing artificial intelligence for crafting medical examinations: a medical education pilot study with GPT-4

[Klang E](#),^{#1} [Portugez S](#),^{#2} [Gross R](#),³ [Kassif Lerner R](#),⁴ [Brenner A](#),⁵ [Gilboa M](#),⁶ [Ortal T](#),⁷ [Ron S](#),⁷ [Robinson V](#),⁷ [Meiri H](#),⁸
and [Segal G](#)^{✉6}

Prompts Created in Breakout Rooms

Breakout Session - Prompt 1

- ▶ I am a clinical science instructor teaching second-year medical students in the United States. I need to create an interactive, problem-based learning case on thyroiditis. The case should include:
 - ▶ A schedule specifying small-group breakout sessions and large-group discussions
 - ▶ Learning objectives, including: ‘Evaluate a patient’s physical exam, recommend appropriate lab studies, and create a differential diagnosis for thyroiditis’.
- ▶ Please provide a structured outline for this problem-based learning case, incorporating these elements and other relevant components for an effective educational session on thyroiditis.

Breakout Session - Prompt 2

- ▶ You are a pathology medical educator for second-year undergraduate medical students in a respiratory system module. Create an NBME-style multiple-choice question (MCQ) that tests students' understanding of the pathophysiology of asthma. The question should:
Create a 5-item MCQ quiz for an asthma pathophysiology module
 - ▶ Include a detailed clinical vignette
 - ▶ Require students to interpret pulmonary function tests
 - ▶ Have 5 answer choices
 - ▶ Test the pathophysiology of asthma
- ▶ After presenting the question, provide:
 - ▶ The correct answer
 - ▶ A thorough explanation for why the correct answer is right
 - ▶ Explanations for why each of the incorrect answers is wrong
- ▶ The question should be an appropriate difficulty level for second-year medical students and follow NBME item-writing best practices.

Breakout Session - Prompt 3

- ▶ You are an educator creating multiple-choice questions for a practice USMLE Step 1 exam focusing on asthma pathophysiology. Your task is to:
 - ▶ Create 5 questions based on asthma pathophysiology
 - ▶ Provide 5 answer choices for each question
 - ▶ Design questions that challenge students to:
 - ▶ Differentiate between similar conditions
 - ▶ Correctly interpret and prioritize clinical data
 - ▶ Formulate diagnoses based on the most relevant factors
- ▶ For each question:
 - ▶ Ensure answer choices are similar but clearly differentiable based on the information provided
 - ▶ Provide the reasoning for the correct answer
 - ▶ Explain why each of the other answers is incorrect
- ▶ The questions should be at an appropriate difficulty level for USMLE Step 1 and follow NBME item-writing best practices

Breakout Session - Prompt 4

- ▶ As an expert teacher and curriculum writer specializing in medical education, your task is to create: Include a detailed clinical vignette
 - ▶ Clear and detailed student-facing directions for a 3rd year medical school OB/GYN clerkship simulation
 - ▶ A comprehensive rubric for evaluating student performance in this simulation
- ▶ Simulation scenario: Counseling a standardized patient who has experienced a miscarriage. Please provide:
 - ▶ Student-facing directions:
 - ▶ Outline the scenario and student expectations
 - ▶ Include any necessary background information
 - ▶ Specify time limits and any other relevant constraints
 - ▶ Evaluation rubric:
 - ▶ Format as a chart
 - ▶ Use a 5-point scale (define what each point represents)
 - ▶ Include key competencies such as:
 - ▶ Communication skills
 - ▶ Empathy and emotional support
 - ▶ Medical knowledge
 - ▶ Patient Education
 - ▶ Professional behavior
- ▶ For each competency in the rubric, provide clear descriptors for each point on the 5-point scale.
- ▶ Ensure all materials are appropriate for 3rd year medical students and align with current best practices in medical education and patient-centered care.

Breakout Session - Prompt 5

- ▶ Create a USMLE Step 1 question focusing on asthma pathophysiology. The question should:
 - ▶ Integrate elements of:
 - ▶ Physiology
 - ▶ Pharmacology
 - ▶ Immunology
 - ▶ Acid-base balance
 - ▶ Be a 2nd or 3rd-order question, requiring students to integrate and apply knowledge
 - ▶ Include:
 - ▶ A detailed clinical vignette
 - ▶ 5 answer choices with plausible distractors
 - ▶ The correct answer
 - ▶ Detailed explanations for why each answer choice is correct or incorrect
 - ▶ Be at an appropriate difficulty level for USMLE Step 1 and follow NBME item-writing best practices
- ▶ After presenting the question-and-answer choices, provide a comprehensive explanation that covers:
 - ▶ The key concept(s) being tested
 - ▶ The reasoning behind the correct answer
 - ▶ Why each distractor is incorrect, but plausible
 - ▶ Any relevant additional information that ties into asthma pathophysiology, treatment, or related topics
- ▶ Ensure the question challenges students to apply their understanding of asthma pathophysiology in a clinical context.