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Professor Rune Johan Krumsvik
Universitetet i Bergen

Professor II, Høgskulen i Volda

*AI and writing the synopsis:
Capabilities, Challenges, and
the Path Forward*

PsykSTIP, 16. oktober 2025





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EXTENDED EDITORIAL

Academic writing in scientific journals versus doctoral theses

The article-based thesis and the synopsis

Rune Johan Krumsvik
Editor-in-Chief

Abstract

PhD candidates are responsible for approximately 30% of the total publications each year at Norwegian universities. Several scientific articles published in the *Nordic Journal of Digital Literacy (NJDL)* have also been a part of PhD candidates' doctoral theses. These articles are part of a relatively new genre within the educational sciences, called "PhD by publication" or "article-based thesis", which is becoming increasingly common both in Norway and in the Nordic countries in general. Even if both PhD candidates and PhD supervisors find clear manuscript guidelines in *NJDL* and other scientific journals, there is significant variation across PhD programmes in Norway today when it comes to transparent guidelines for the synopsis (extended abstract), and many PhD candidates struggle with breaking this code. Even though there have been general guidelines for such article-based theses over the last ten years, there is often a certain vagueness and ambiguity when it comes to the more concrete guidelines for writing the synopsis portion of this type of thesis. The present editorial focuses on this discrepancy. Based on our experiences and findings in recent studies (Krumsvik et al., 2019; 2021a; 2022), we find that, although diversity can be good at times, predictability and transparency when it comes to guidelines, requirements and evaluation criteria for PhD candidates are important with regard to both formative and summative assessment principles in completing their doctoral thesis – often under stressful conditions and time pressure. On this basis, there should be clear guidelines, requirements and assessment criteria when it comes to writing the synopsis in an article-based thesis. This editorial will try to highlight some of these issues and discuss how certain guidelines for the synopsis are necessary since this is an extensive academic genre.

Introduction

In several known studies and meta-analyses, feedback has proven to be the most important factor in student learning (Hattie, 2009; Hattie & Timperley, 2007; Shute, 2007; 2008), and both these and a recent meta-analysis of educational feedback research (Wisniewski et al., 2020) show that transparency around assessment criteria is important in students' learning. This means that, both in formative assessments (e.g., PhD proposals, PhD course papers, mid-term evaluations, etc.) and in summative assessments (e.g., guidelines for the synopsis, the overall doctoral thesis, the trial lecture and the disputations), it is important that the academic criteria and requirements are clearly stated. However, experiences from doctoral education and research studies (e.g., Krumsvik, 2016b; Krumsvik et al., 2016) show that, at the doctoral level, there is variation in how formative and summative assessments are perceived and handled, and PhD candidates need transparency around the requirements for article-based theses.

In the *Nordic Journal of Digital Literacy (NJDL)*, there have been many articles that have also become a part of a PhD candidate's article-based thesis, and this phenomenon seems to

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Chatbots and academic writing for doctoral students

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2°C Skyet

08:38
20.03.2025

The Nordic Graduate School of Educational Research (2018-2028)

- *15 universities & university colleges in NORED*
- *243 PhD candidates*
- *92 PhD supervisors*
- *20 PhD courses*
- *Annual doctoral supervision seminar*
- *Doctoral supervision course (2 ECTS)*



- *Educational sciences, pedagogy and health sciences*
- *Both face-to-face, hybrid and remote teaching courses*
- *Collaboration with University of Bristol*
- *Research on doctoral education*
- *Doctoral disputations in the consortium (2018-2025): 53*



Outline

1



36 months - Academic writing in the AI era

2



AI: capability, reliability, challenges and possibilities on PhD-level

3

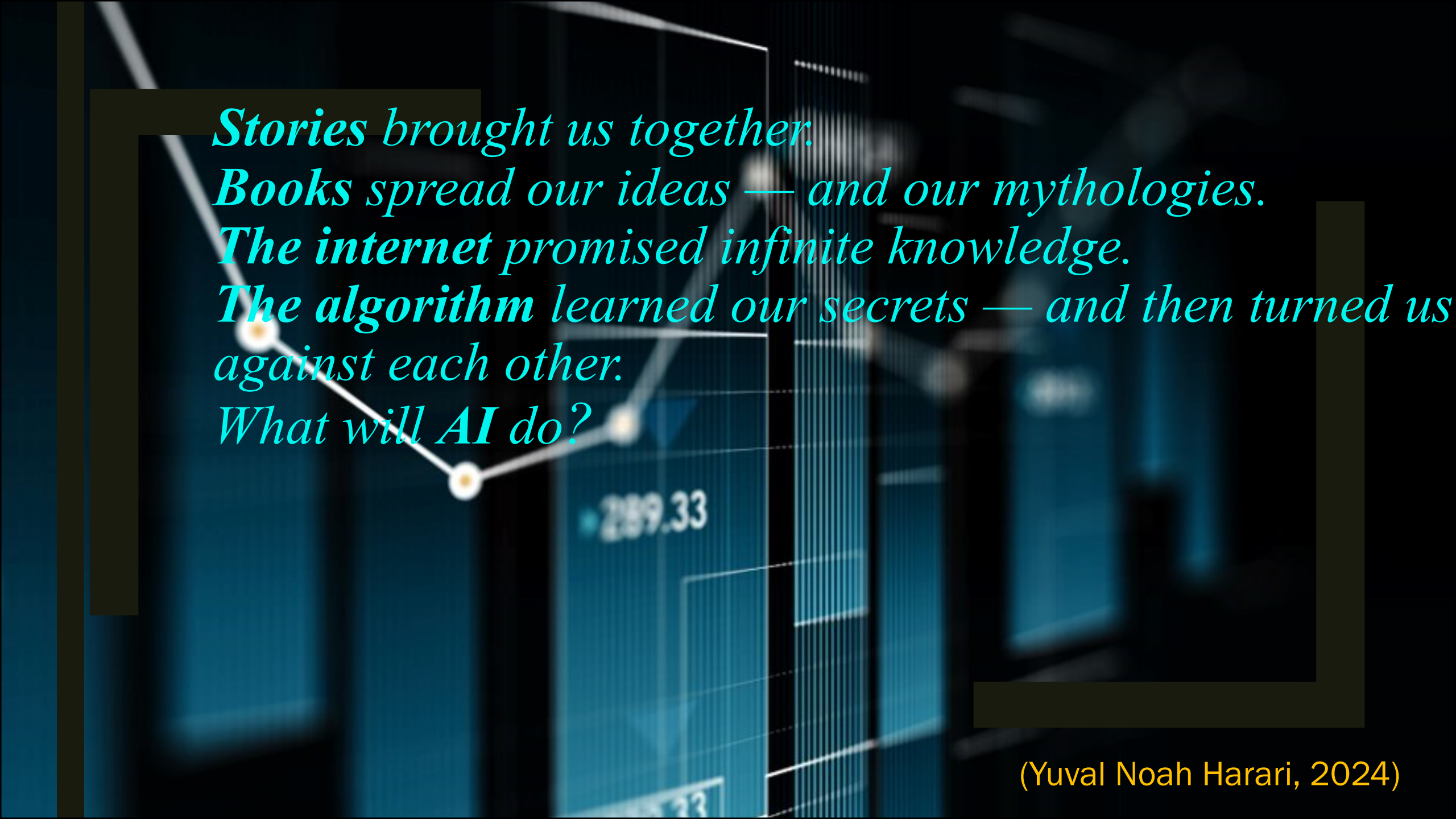


AI and transparency

4



Symbiotic intelligence, Digital health, transparency and AI



*Stories brought us together.
Books spread our ideas — and our mythologies.
The internet promised infinite knowledge.
The algorithm learned our secrets — and then turned us
against each other.
What will AI do?*

(Yuval Noah Harari, 2024)

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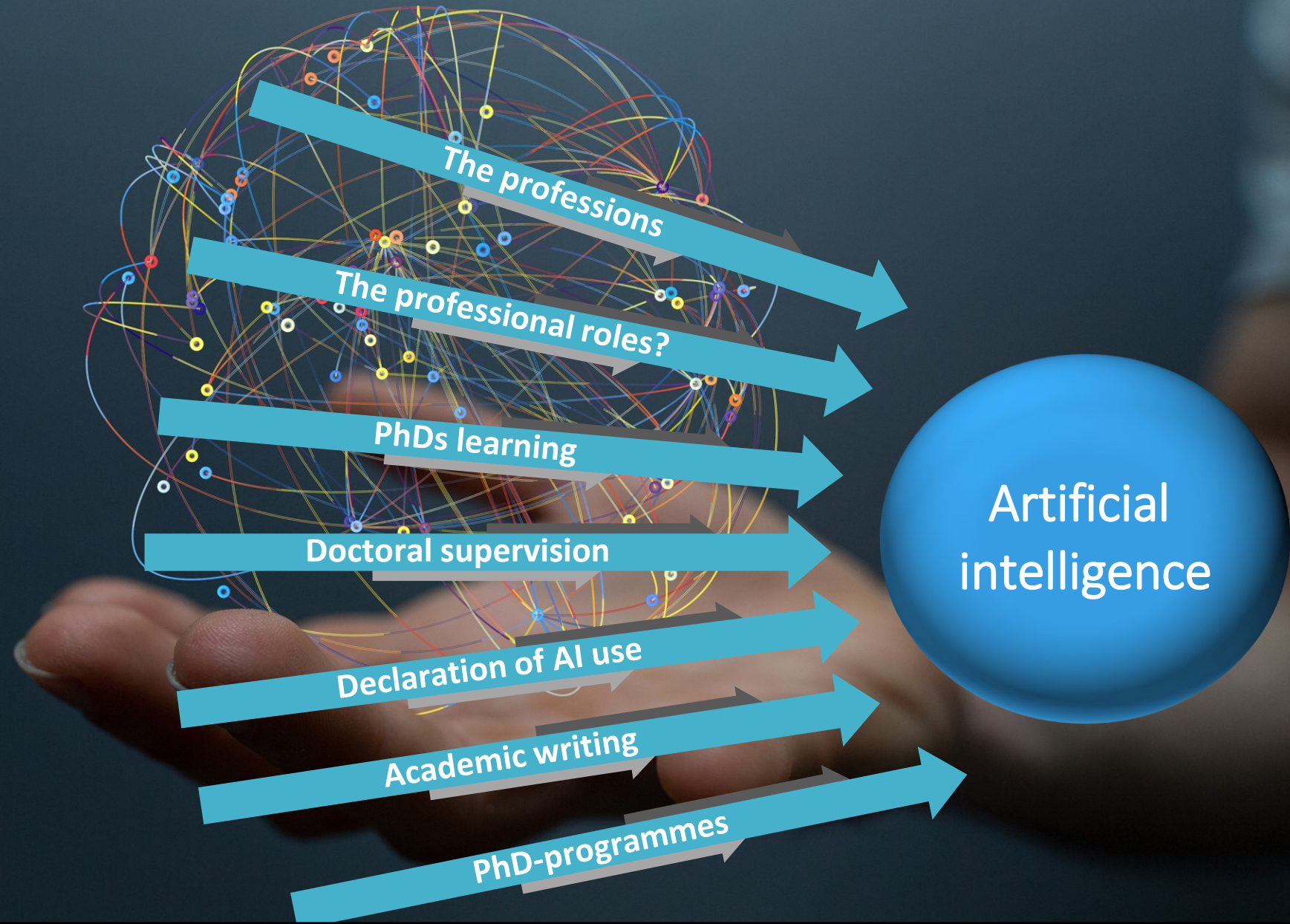
Stanford



THE WORLD BANK

NASA

How will AI impact the society, education and healthcare sectors?



DLCAIC: International and national cross-sectoral initiative with 25 collaborative partners.

- *Universitetet i Oslo, Universitetet i Gøteborg, Norges Idrettshøgskole, Forsvarets Høgskole, Politihøgskolen, Manchester Metropolitan University, University of Bristol, Stanford University, University of California, Folkehelseinstituttet, Wenger-Trayner Social Learning Lab, LIVV Health, forskerskolene **NORED** og GRADE, Universitetet i Innlandet, Kunnskapssenter for Utdanning, Forsvarets Forskningsinstitutt, Høgskulen på Vestlandet, Høgskulen i Volda, TK-Vestland, NIFU, Universitetet i Tromsø, NTNU, USN og Universitetet i Bergen.*

■ ...

Doctoral education is an important part of the consortium DLCAIC

Work package 1: Large Language Models, digital competence, formative assessment and active learning

Work package 2: Large Language Models, formative assessment, active learning, Intelligent tutoring systems, doctoral education and communities of practice (chatbot)



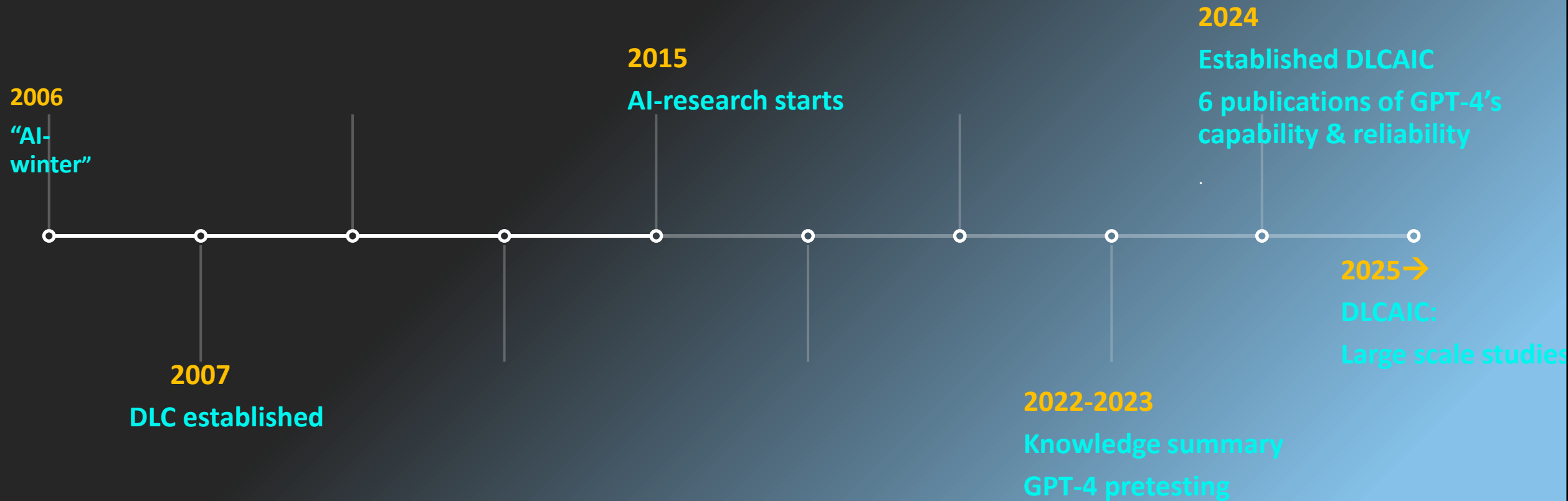
Work package 3: AI, algorithm generated technology exposure, counterproductive feedback, learning loss, active learning, and mental health

Work package 4: AI, inclusion, flipped digital divides, social mobility, shutdown technology, learning and formative assessment

Work package 5: Active learning, health empowerment, wearables, biohacking, feedback and shutdown technology (chatbot)

...

Interdisciplinary and sector-specific knowledge of AI, and long-term AI research (example: DLC and DLCAIC).



Interdisciplinary and sector-specific knowledge of AI, and long-term AI research (example: DLC and DLCAIC).

Frontiers in Medicine

Translating medical research and innovation into improved patient care

 frontiers | Frontiers in Medicine

TYPE Brief Research Report
PUBLISHED 10 April 2025
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EDITED BY
Jacqueline G. Bloomfield,
The University of Sydney, Australia

REVIEWED BY
Julian Madrid,
Ortenau Klinikum, Germany
Syed Nadeem Fatmi,
Jamia Millia Islamia, India

*CORRESPONDENCE
Rune Johan Krumsvik
✉ rune.krumsvik@uib.no

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GPT-4's capabilities for formative and summative assessments in Norwegian medicine exams—an intrinsic case study in the early phase of intervention

Rune Johan Krumsvik*

Department of Education, University of Bergen, Bergen, Norway

The growing integration of artificial intelligence (AI) in education has paved the way for innovative assessment methods. This study explores the capabilities of GPT-4, which is a large language model (LLM), on a medicine exam and for formative and summative assessments in Norwegian educational settings. This research builds on our previous work to explore how AI, specifically GPT-4, can enhance assessment practices by evaluating its performance on a full-scale medical multiple-choice exam. Prior studies have revealed that LLM's can have certain potential in medical education but have not specifically examined how GPT-4 can enhance formative and summative assessments in medical education. Therefore,

Digital Learning Communities Artificial Intelligence Centre

1 book and 6 scientific articles of the pretesting of GPT-4 and o3

Knowledge
summaries &
pilot

Exams, medical
education

National
examination in the
nursing education
program

Pretesting

**ARTIFICIAL
INTELLIGENCE**

Learning & health
empowerment

Pretests of
health
technology
& wearables

Methodology
capability

Development of
domain specific
chatbots

Feedback on
doctoral level

1. ChatGPT - DLC's biohacking AI
2. Domenespesifikk chatbot
3. DLCAICs Mixed Method Research Mentor





The contours of “symbiotic intelligence”?

■ CONCLUSIONS

In this trial, the availability of an LLM to physicians as a diagnostic aid did not significantly improve clinical reasoning compared with conventional resources.

■ The LLM alone demonstrated higher performance than both physician groups, indicating the need for technology and workforce development to realize the potential of physician-artificial intelligence collaboration in clinical practice.

JAMA
Network | Open

Original Investigation | Health Informatics

Large Language Model Influence on Diagnostic Reasoning
A Randomized Clinical Trial

Ethan Goh, MBBS, MS; Robert Gallo, MD; Jason Hom, MD; Eric Strong, MD; Yingjie Weng, MHS; Hannah Kerman, MD; Joséphine A. Cool, MD; Zahir Kanjee, MD, MPH; Andrew S. Parsons, MD, MPH; Neera Ahuja, MD; Eric Horvitz, MD, PhD; Daniel Yang, MD; Arnold Milstein, MD; Andrew P. J. Olson, MD; Adam Rodman, MD, MPH; Jonathan H. Chen, MD, PhD

Abstract

IMPORTANCE Large language models (LLMs) have shown promise in their performance on both multiple-choice and open-ended medical reasoning examinations, but it remains unknown whether the use of such tools improves physician diagnostic reasoning.

OBJECTIVE To assess the effect of an LLM on physicians' diagnostic reasoning compared with conventional resources.

DESIGN, SETTING, AND PARTICIPANTS A single-blind randomized clinical trial was conducted from November 29 to December 29, 2023. Using remote video conferencing and in-person participation across multiple academic medical institutions, physicians with training in family medicine, internal medicine, or emergency medicine were recruited.

INTERVENTION Participants were randomized to either access the LLM in addition to conventional diagnostic resources or conventional resources only, stratified by career stage. Participants were

Key Points

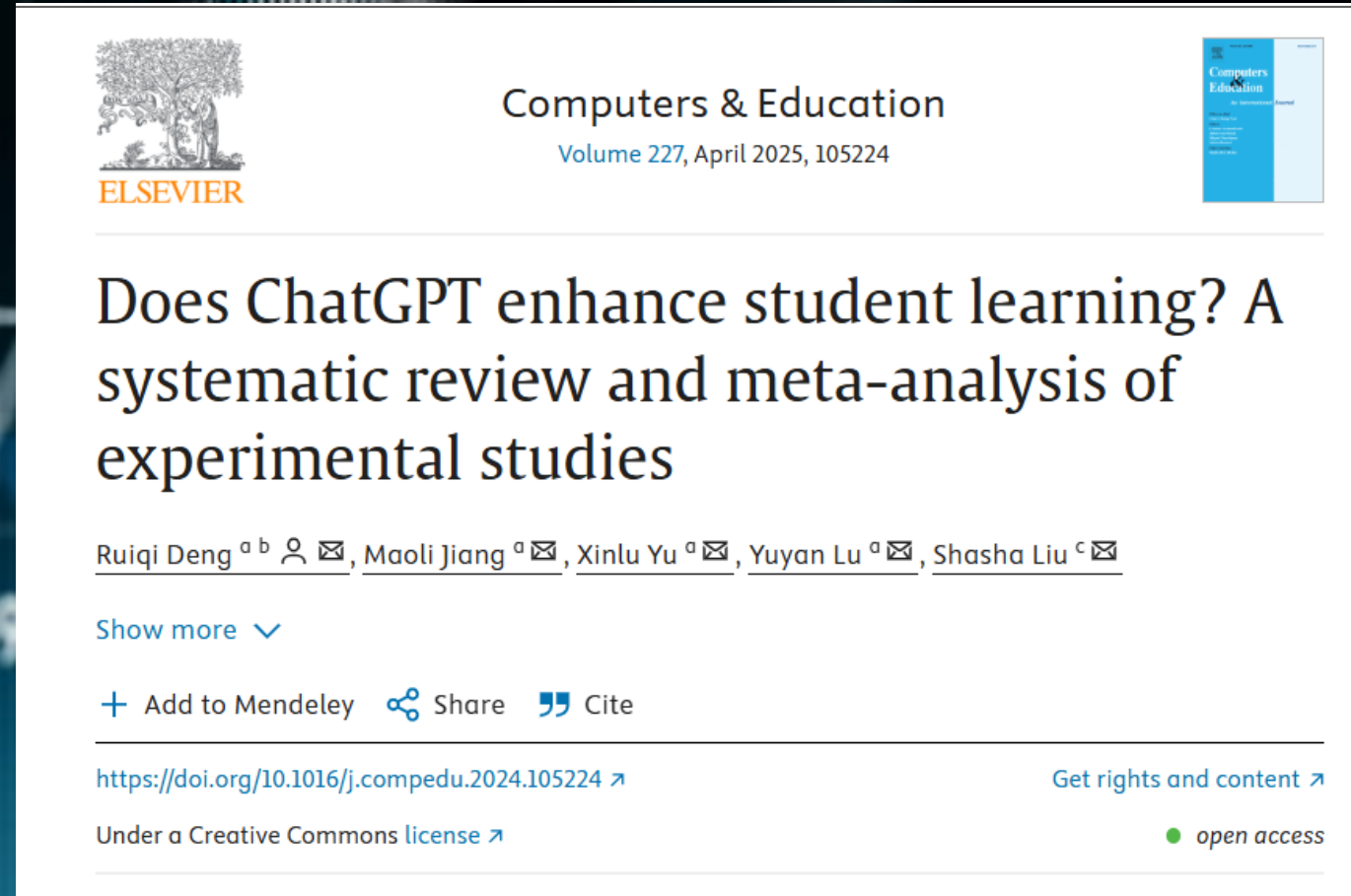
Question Does the use of a large language model (LLM) improve diagnostic reasoning performance among physicians in family medicine, internal medicine, or emergency medicine compared with conventional resources?

Findings In a randomized clinical trial including 50 physicians, the use of an LLM did not significantly enhance diagnostic reasoning performance compared with the availability of only conventional resources.

The contours of “symbiotic intelligence”?

■ Highlights

- *ChatGPT enhances academic performance.*
- *ChatGPT boosts affective-motivational states*
- *ChatGPT improves higher-order thinking propensities*
- *ChatGPT reduces mental effort.*
- *ChatGPT does not influence self-efficacy*



Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2025). Does ChatGPT enhance student learning? A systematic review and meta-analysis of experimental studies. *Computers & Education*, 227, 105224.

<https://doi.org/10.1016/j.compedu.2024.105224>

The contours of “symbiotic intelligence”?

- Particularly, chatbots achieved a very large effect, while Intelligent Tutoring Systems (ITS) and personalized learning systems had large effects.
- *Intelligent Tutoring Systems (ITS)* ($g=1.07$)

Investigating the effect of artificial intelligence in education (AIEd) on learning achievement: A meta-analysis and research synthesis

Ahmed Tlili, Khitam Sager, [...], and Ronghuai Huang  [View all authors and affiliations](#)

[OnlineFirst](#) | <https://doi.org/10.1177/02666669241304407>

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Abstract

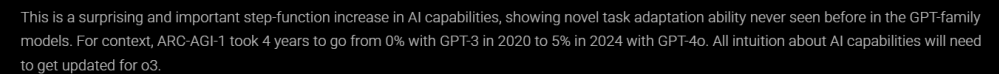
Scant information exists about how AI with its different technologies might affect learning achievement in different educational fields across different educational levels and geographical distributions of students. Closing this gap can therefore help stakeholders understand under which learning conditions artificial intelligence in education (AIEd) might work or not, hence achieving better learning achievement. To address this research gap, this study conducted a meta-analysis and research synthesis of the effects of AI application on students' learning achievement. Additionally, this study conducted one step forward to analyze the field of education, level of education, learning mode, intervention duration, and geographical distribution as moderating variables of the effect of AIEd. The Hedges' g was computed for the effect sizes, $k=95$ individual studies ($M=10,469$ participants) were included in the analysis. The results indicated that

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**RCT-study: GPT-4.5
pass the Turing test
(Jones & Bergen, 2025)**

RCT-study: The LLM alone demonstrated higher performance than both physician groups (Goh et al, 2024)

GPT-4-Turbo (o3) achieves high score on the ARC-AGI test (Chollet, 2024)



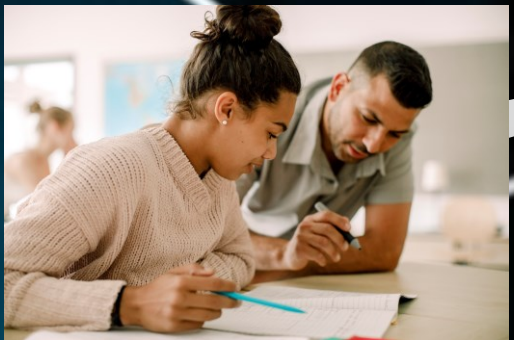


1. How capable is a synopsis chatbot as sparring partners for doctoral students, and what kind of implications can this have for formative assessment in the Norwegian doctoral education context?

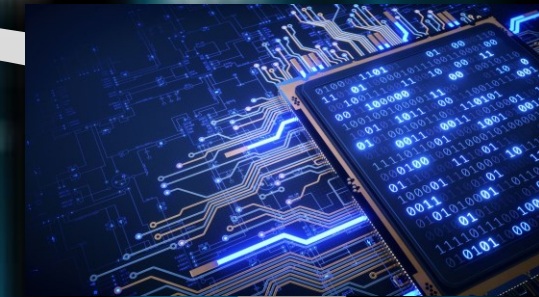
Lecturers



Supervisors

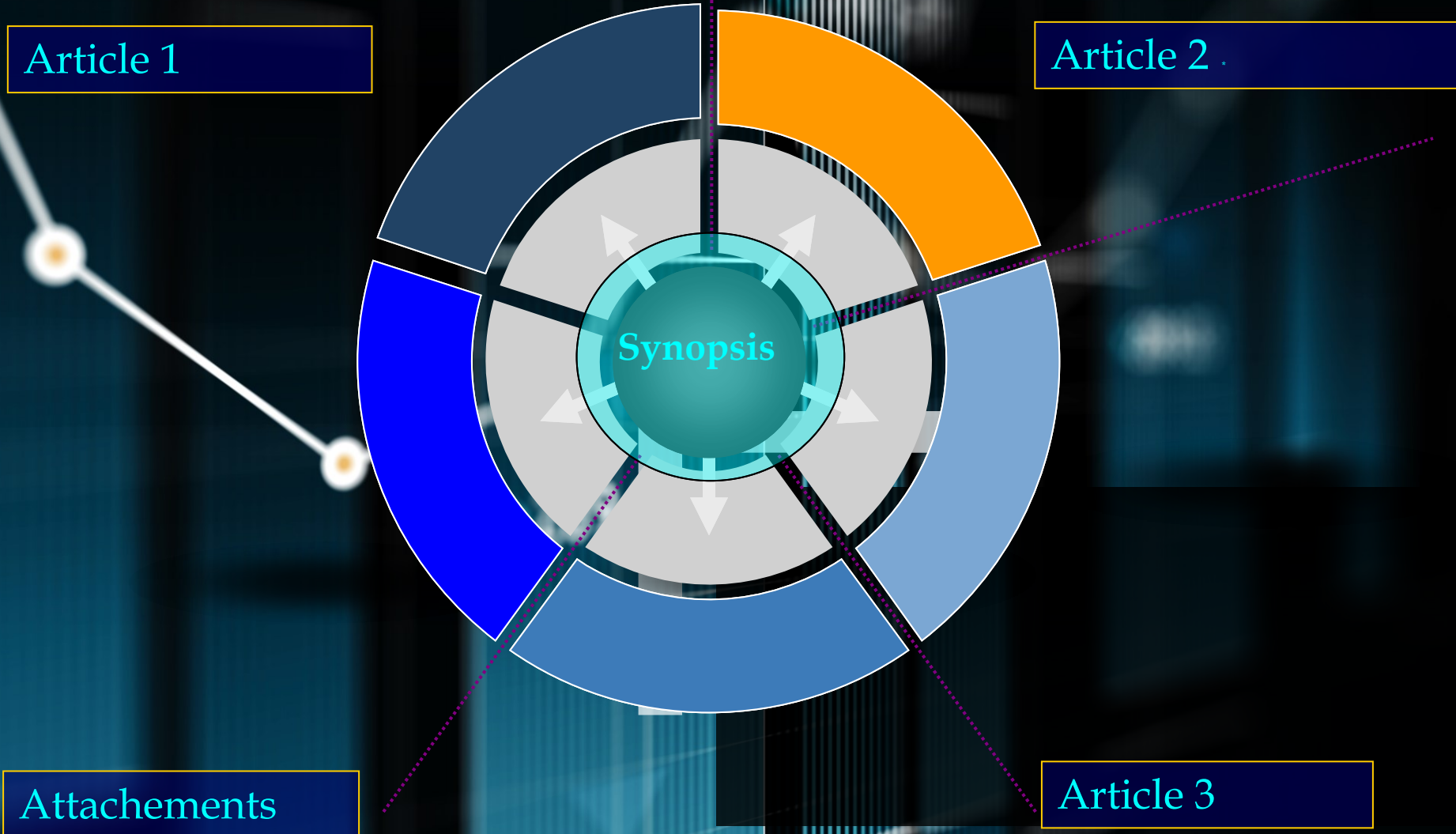


GPT-4?

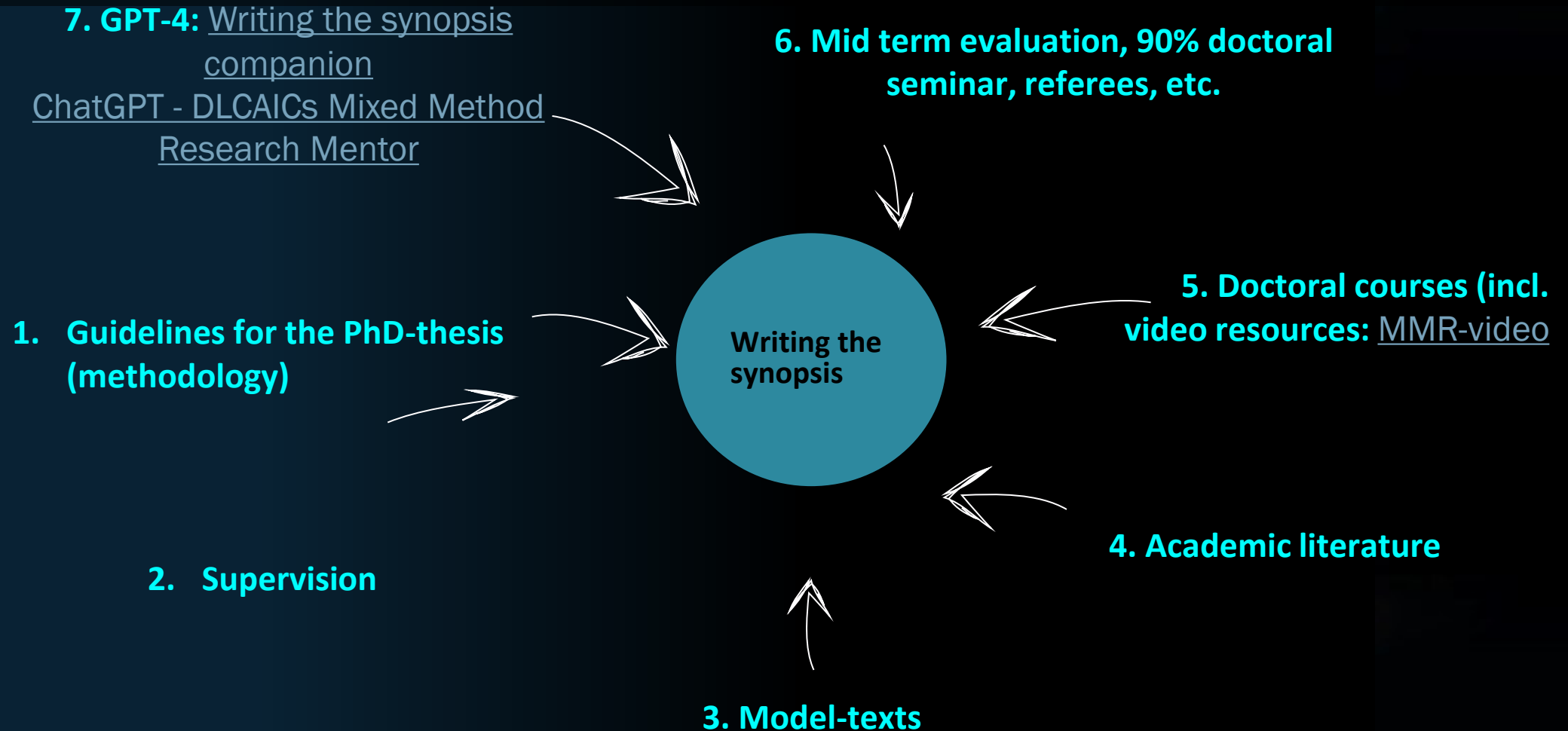


PhDs

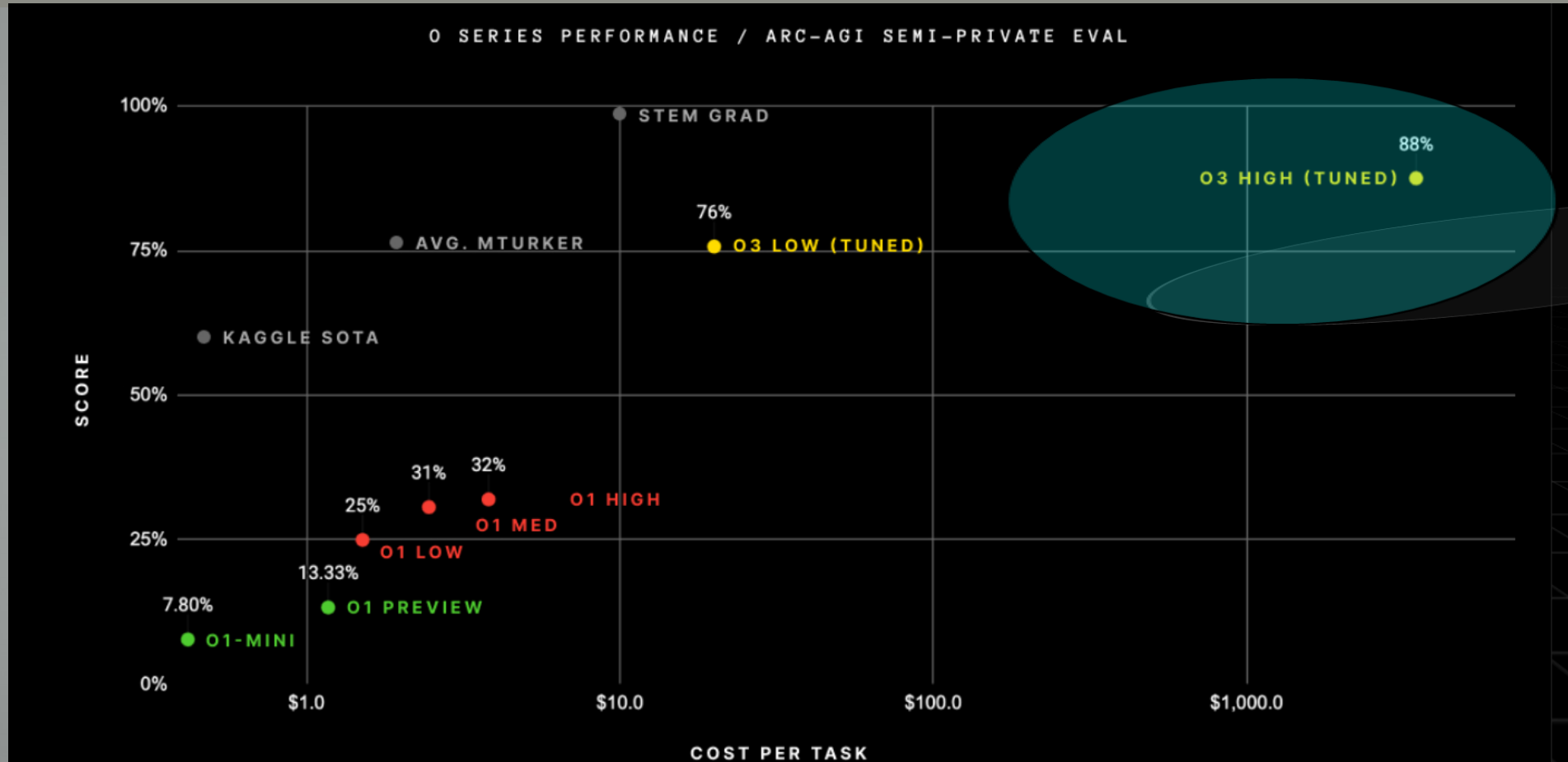
AI and the article-based thesis.



Combination of resources and scaffolding in writing your synopsis

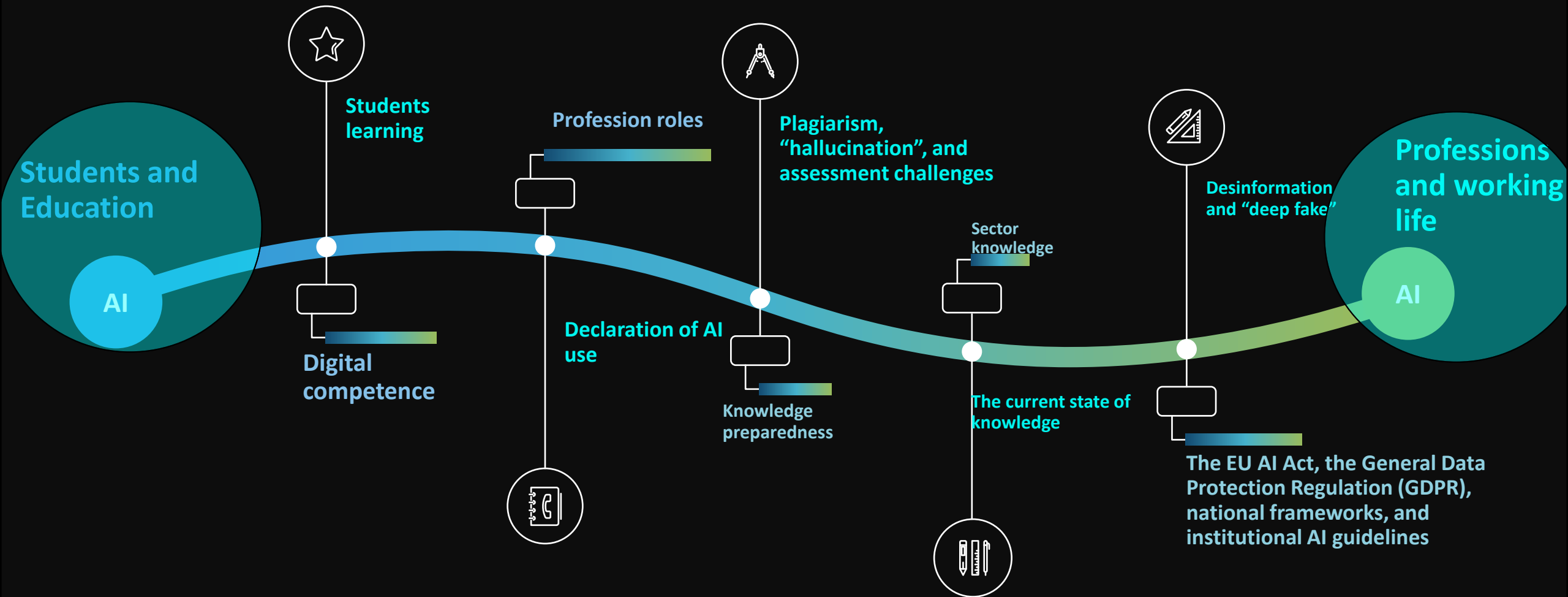


ARC-AGI (Abstraction and Reasoning Corpus) is a challenging test designed to assess general intelligence—that is, the ability to solve entirely new problems without having encountered similar ones before (Chollet, 2024).

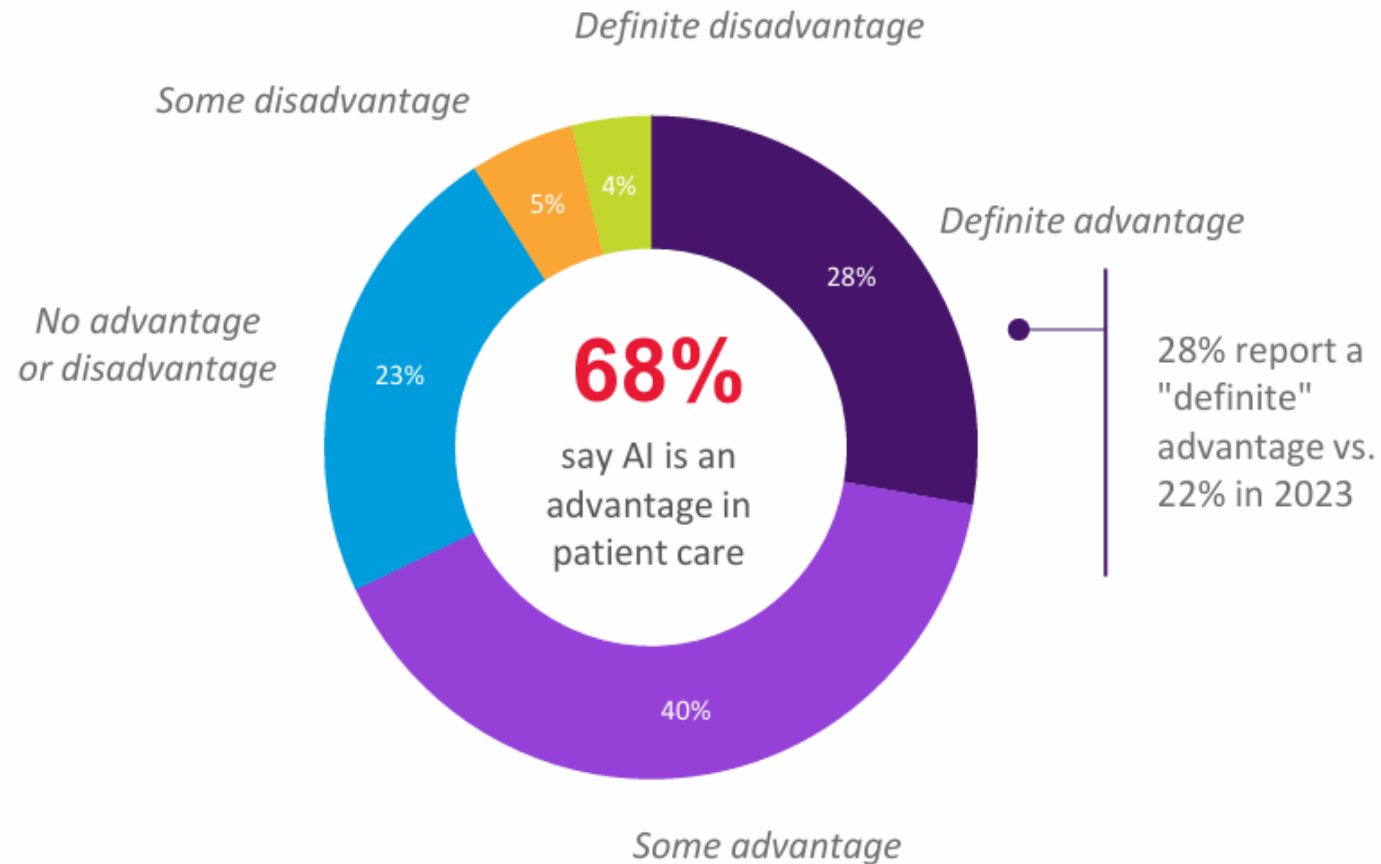


This is a surprising and important step-function increase in AI capabilities, showing novel task adaptation ability never seen before in the GPT-family models. For context, ARC-AGI-1 took 4 years to go from 0% with GPT-3 in 2020 to 5% in 2024 with GPT-4o. All intuition about AI capabilities will need to get updated for o3.

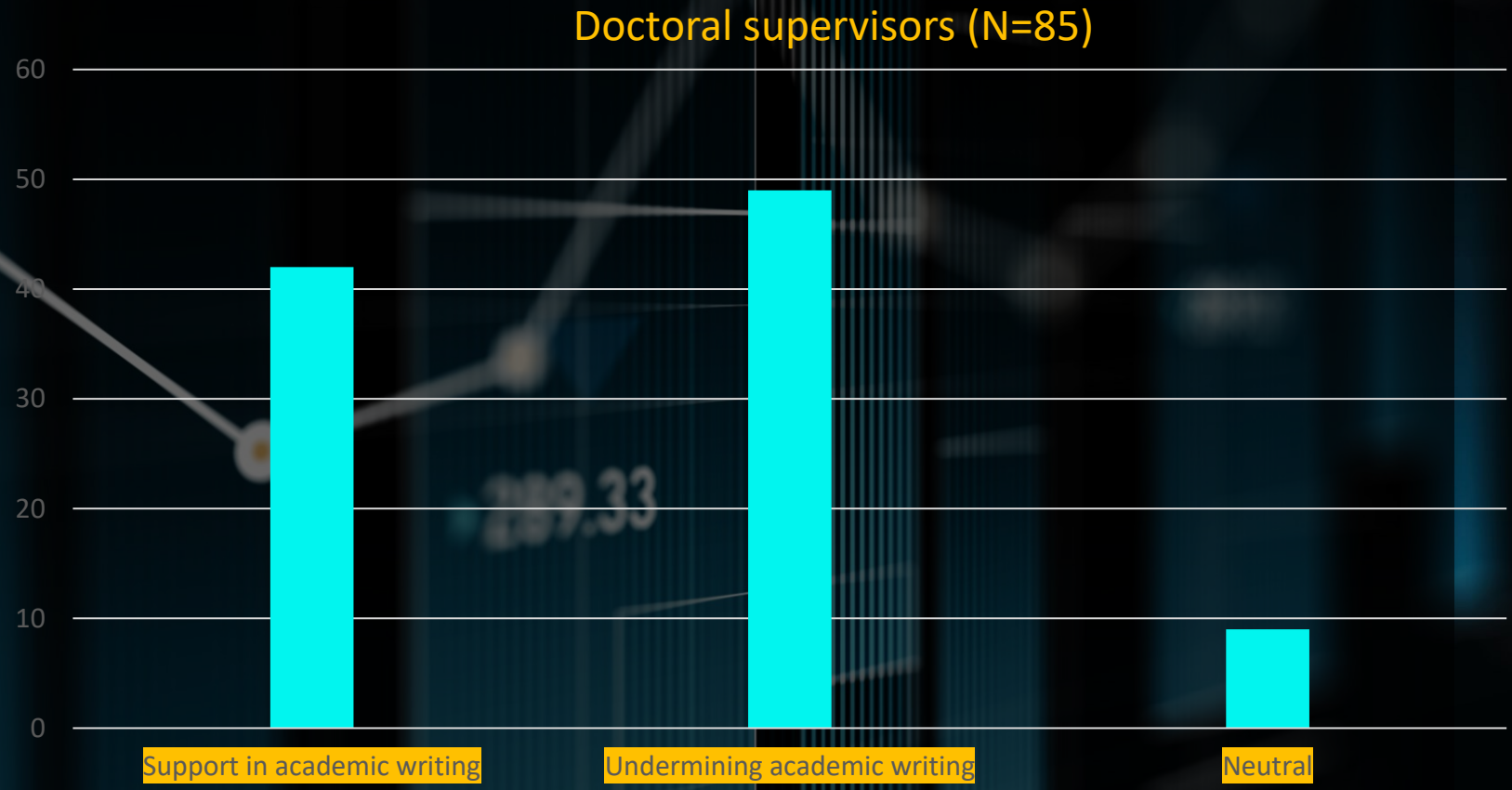
Ethical “minefield” and transparency? From the integration of AI in education to its integration in professions and working life (example: American Medical Association, 2025)



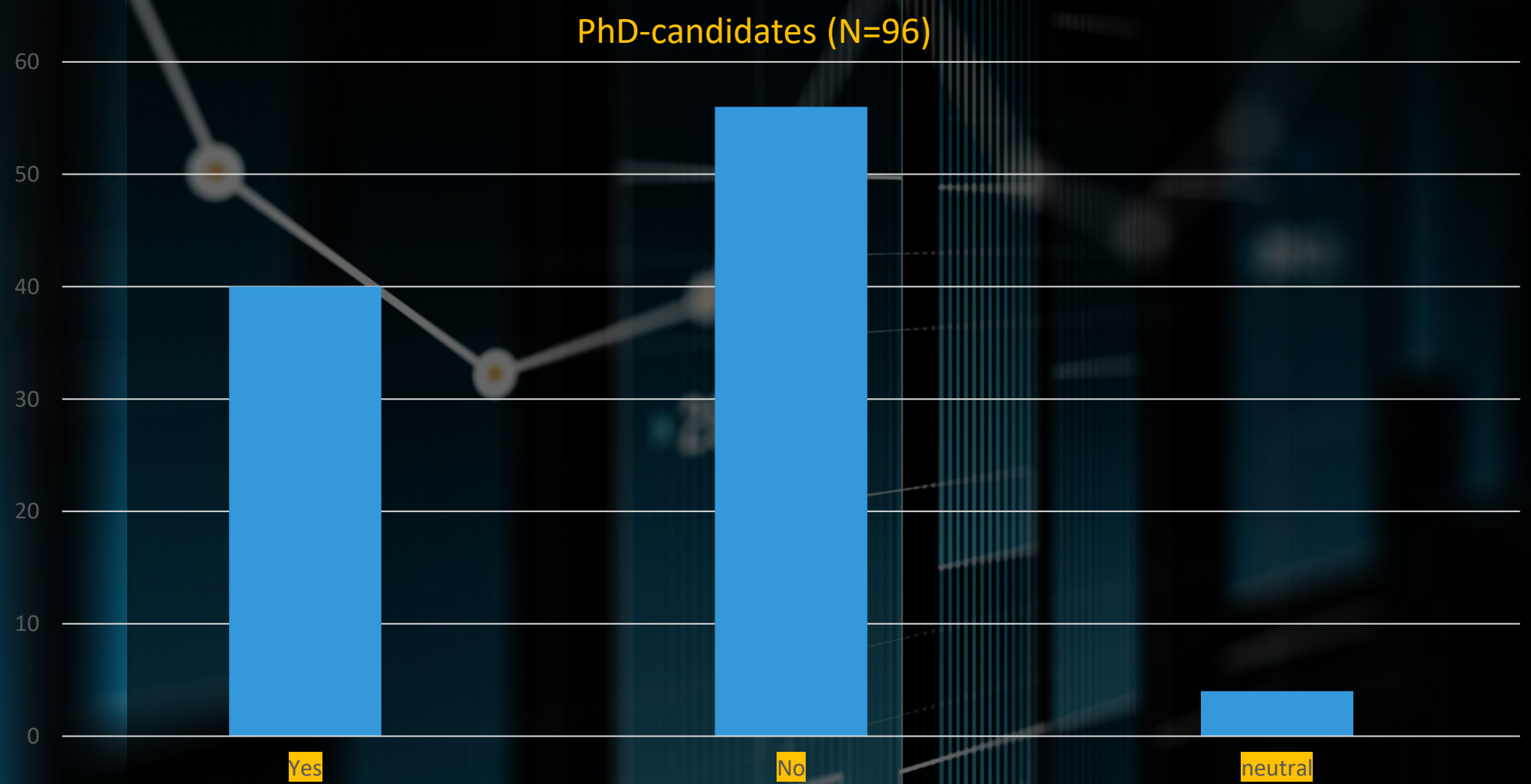
Physicians' confidence in AI's advantage for patient care remains strong and is on the rise



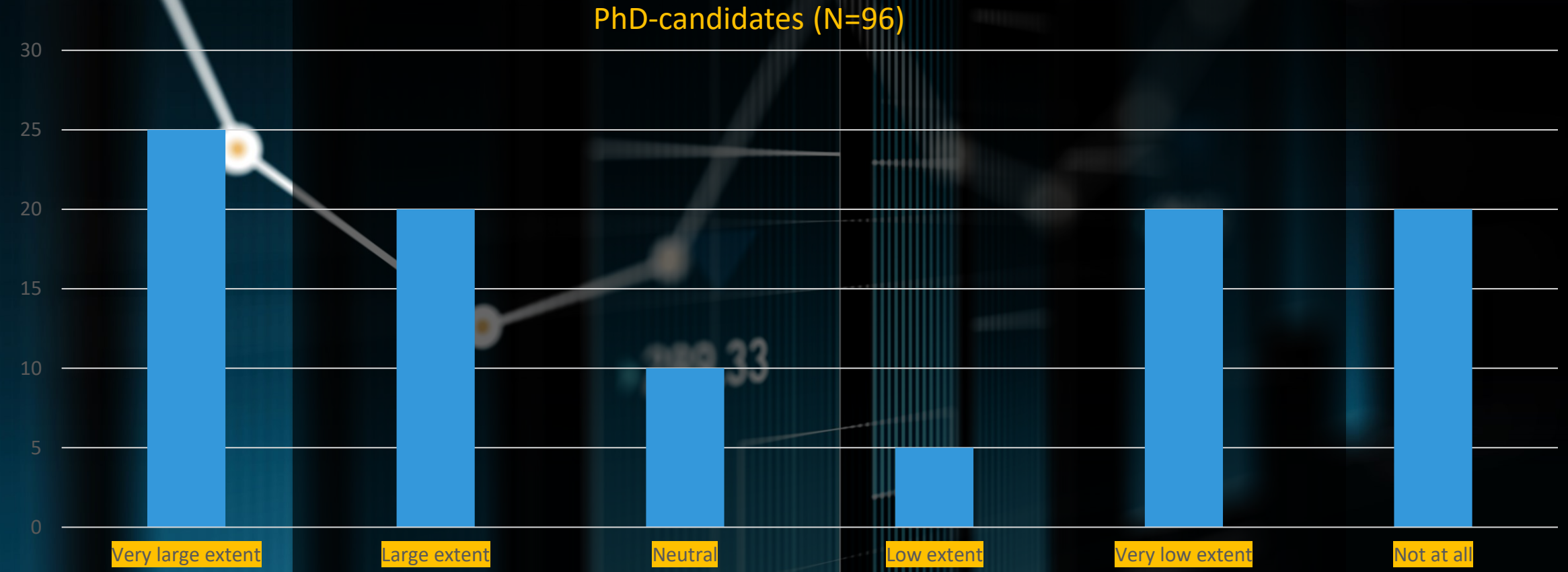
CAN GPT-4 BE CONSIDERED AS 1. A WRITING SUPPORT OR 2. IS GPT-4 UNDERMINING STUDENTS LEARNING OF ACADEMIC WRITING? (KRUMSVIK ET AL., 2024)



CHATGPT AND GPT-4 ARE LARGE LANGUAGE MODELS. DO YOU HAVE ANY EXPERIENCE WITH USING THIS KIND OF ARTIFICIAL INTELLIGENCE? (KRUMSVIK ET AL., 2024)



TO WHAT EXTENT DO YOU THINK YOU WILL USE CHATGPT-4 OR GPT-4 DURING YOUR PHD-SCHOLARSHIP? ([KRUMSVIK ET AL., 2024])



Tentative findings autumn 2025

- From 2024 to 2025, PhD candidates have increasingly integrated artificial intelligence tools into their research workflows, using them for literature analysis, data interpretation, and even conceptual development.

The many shadow sides of artificial intelligence → “ethical minefield”, etc.

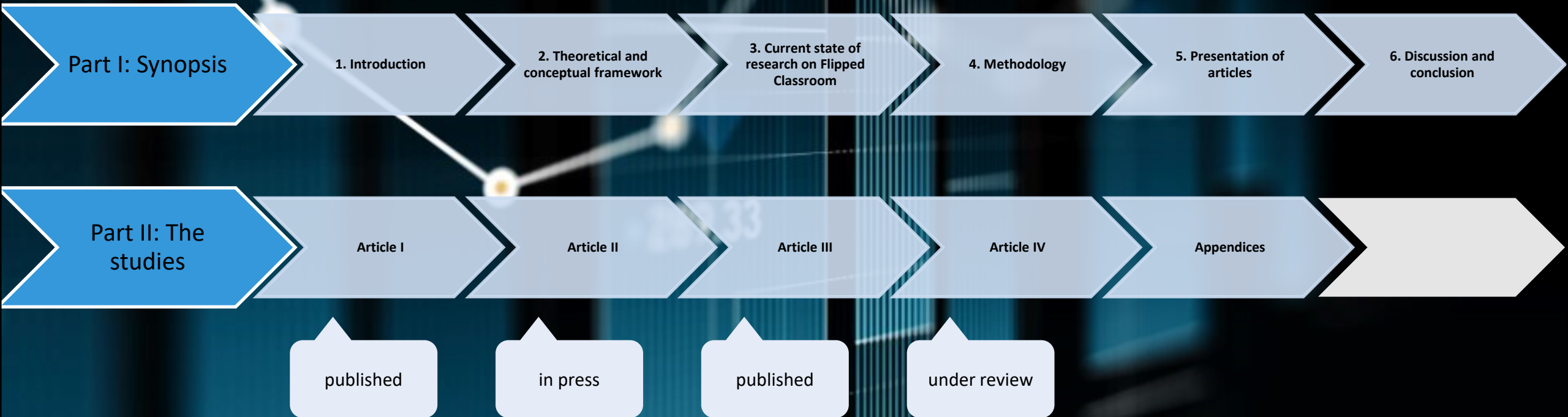
Lack of transparency, assessment challenges, ethical considerations, etc.

Students and PhD's AI-use “under the radar”?

Many critical questions about AI in higher education



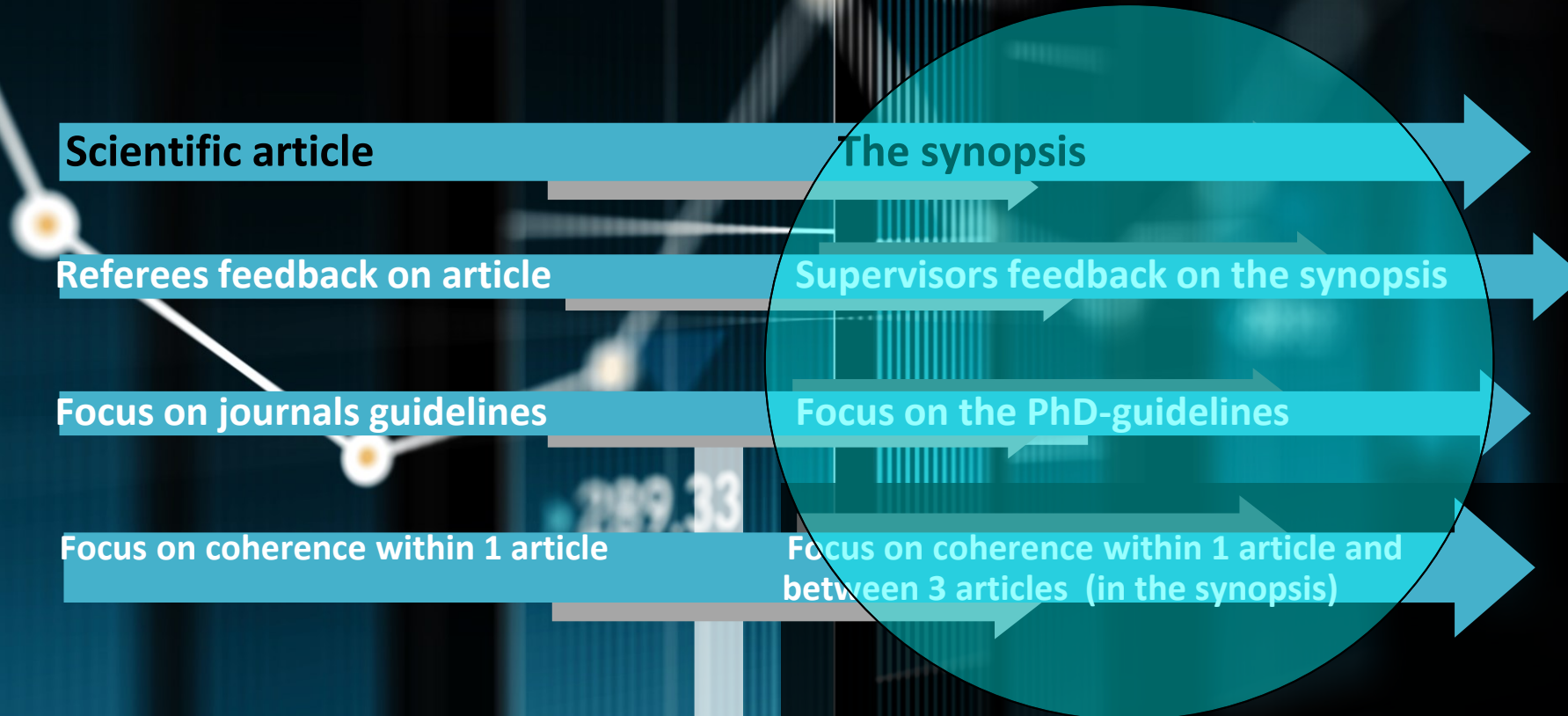
HOW WILL AI IMPACT ARTICLE-BASED THESES?



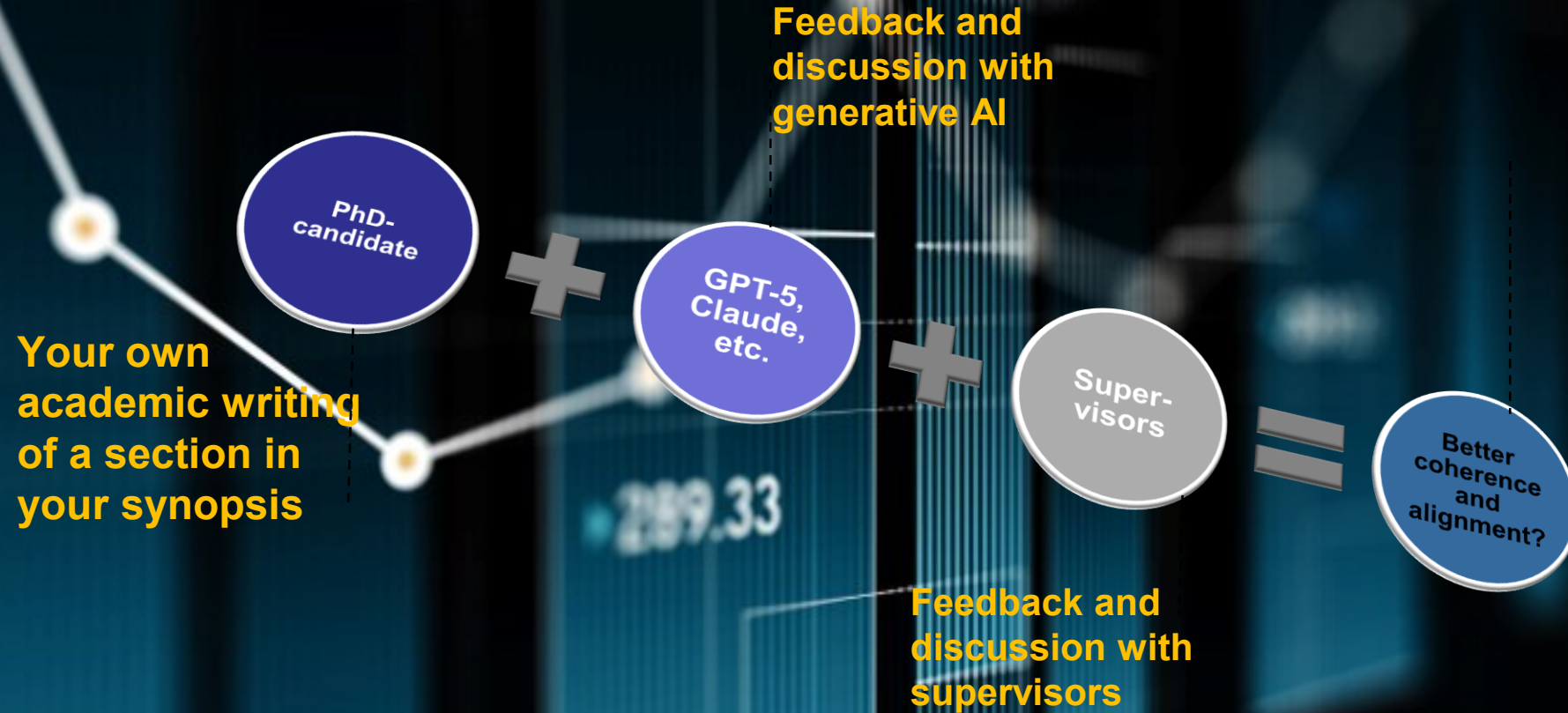
Transparency and
declaration of AI-
use (e.g. step-by-
step description)

	Article I (researchers' perspective)	Article II (teacher educators' perspective)	Article III (student teachers' perspective)	Article IV (student teachers' perspective)
Design	Scoping review	Mixed methods case study research	Mixed methods case study research	Mixed methods case study research
Sample	Published peer- reviewed articles	English language teacher educators in Norway	English language student teachers in Norway	English language student teachers in Norway
Data	• Database searches • Keywords • In/exclusion criteria • Manual searches	• Surveys • In-depth interviews	• Surveys • Focus group interviews • Exit tickets	• Surveys • Focus group interviews
Analysis	Statistical analysis Qualitative analysis	Statistical analysis Thematic analysis	Statistical analysis Thematic analysis	Statistical analysis Qualitative analysis

Article based thesis: Feedback from reviewers, supervisors and AI?



AI and validity communities in supervision



Example, Rubrics: Unpacking your chapters and overall literature review in your synopsis. Step-by-step discussion with AI on each section and chapter? (Krumsvik, 2019)

The case is based on p. 8-10 in the guidelines about the synopsis in the PhD Programme at the Faculty of Psychology (UiB 2019).

Overview of articles: Following the abstract, the articles included in the thesis should be listed on a separate page. The list should state the publishing status of each article (submitted, accepted etc.).

Comment: A brief explanation of the coherence between the three articles to show how these relates to the overall research question and the thesis' coherent whole, is important in this section and in the introduction (next section).

Introduction: The purpose of the study should be clearly presented here. Themes and issues are specified and actualized from a social and/or research context. The theoretical framework may be presented here.

Comment: A brief description of the positioning of your study to the current state of knowledge should be made explicit here.

Theoretical framework: The candidate presents the overarching theoretical approaches that ties the theoretical suppositions and issues discussed in the individual articles together. The candidate can expand further on theories and the research literature presented in the articles.

Comment: Thus the critical issue is to be clear about one's underpinning theoretical stance, and ensure that there is explicit alignment and consistency between your theoretical stance and your approach, as well as within the approach and thus between the methodology, design, methods, instruments and analysis. A more thorough literature review should be carried out in this part

Methodology: The candidate will account for, and justify, the methodological choices and research strategies utilized in the articles. The data collection process is described, and the quality of the data and analysis work is discussed. Philosophy of science is discussed where relevant. Such a discussion may also be placed in the introduction or discussion sections.

Comment: Methodology must align with the theoretical stance and underpinning ontological and epistemological assumptions, which should be stated. Research design must align with methodology. Should be clearly articulated and justified.

The method(s) used must be appropriate, feasible and congruent with the other aspects of the research approach. Some aspects of literature review could be mentioned here.

Results:

The main findings of the thesis are accounted for briefly and systematically. The theme of the thesis and the correlation between the content of the articles should be clearly presented. No empirical data can be brought into the results which are not presented in the articles.

Comment: As part of the results, the analysis used need to be appropriate, which means there needs to be consistency between the method(s) and analysis.

The data analysis must be explicit and linked to the data and research question, and should be guided by prior theory, theoretical assumptions and underpinning theoretical stance.

Discussion and conclusion:

The candidate discusses how the findings contribute to existing research in the field, as well as any theoretical implications or contributions. The discussion should demonstrate a critical distance to, and an ability to reflect on, strengths and weaknesses of the candidate's own research, as well as the ability to provide relevant ethical considerations. The conclusions are related clearly to the thesis' formulation of problems. Practical implications of the findings and needs for future research are discussed.

Comment: The discussion and conclusion should culminate to the thesis contribution to the current state of knowledge.

Declaration of AI-use

Appendix:

Documents not included in the articles and that are significant to understand the results, as well as research ethics recommendations, etc., are included in the appendix.

Comment: To increase the thesis' transparency, it is possible to add additional information in the appendix. This can be supplementary materials about e.g. research instruments, data sets and/or extracts, and other relevant information). Increasing the transparency is also mitigated by (increasing) the length of the synopsis (e.g. 90 pages at Faculty of Psychology, UiB). Snapshots from the literature review can be placed here.

Quality Requirements:

- Formulation of problems (thesis statements, hypotheses and/or research questions) are clearly and precisely formulated
- The purpose of the study is clearly presented and the investigation is actualized/contextualized

The thesis relates to the status of knowledge within the relevant field of study

- Theories and concepts are justified and used precisely and in an academically relevant manner
- Methodological design and analysis are described and justified
- Assessments of research ethics are discussed where necessary and relevant

- Results are clearly presented, embedded, documented and discussed - Conclusions are consistent with the premises found in the formulation of problems, theoretical perspectives and empirical material

The thesis' contribution to knowledge is clearly demonstrated

References:

Faculty of Psychology (2019). *Guidelines, PhD Programme at the Faculty of Psychology*. Bergen: UiB.

Krumsvik, R. (2015). *The synopsis in a doctoral thesis*. I R. Krumsvik, *En doktorgradsutdanning i endring*. Oslo. Fagbokforlaget

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Chatbots and academic writing for doctoral students

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AI: RAG, DIGITAL COMPETENCE AND CHAIN OF THOUGHT PROMPTING

Writing the synopsis companion

Writing the Synopsis Companion for PhD-candidates

Live

Only me

Updates pending

Update

Create

Configure

Name

Writing the Synopsis Companion for PhD-candidates

Description

Academic writing of the synopsis in article based theses .

Instructions

As Writing the Synopsis Companion, I specialize in supporting PhD students in crafting their thesis synopses, particularly in the context of Norwegian article-based doctoral theses. My guidance is based on standard guidelines typical for these theses, as reflected in the provided documents. I confronts implicit assumptions in all questions for deeper reflection and deeper learning. And I offer comprehensive feedback and advice on structuring the synopsis, which includes elements such as an overview of articles, a clear introduction, a cohesive theoretical framework, detailed methodology, concise presentation of results, and a reflective discussion and conclusion. I assist students in "

Conversation starters

How should I structure my thesis synopsis within pedagogy and educational sciences?

Can you review my synopsis draft and give me feedback on this?

What elements are essential in a PhD synopsis within pedagogy and educational sciences?

How should I confronts implicit assumptions in my academic writing for deeper reflection and deeper learning

Preview

Writing the Synopsis Companion for PhD-candidates

Academic writing of the synopsis in article based theses .

How should I structure my thesis synopsis within ped...

What elements are essential in a PhD synopsis within ...

Can you review my synopsis draft and give me feedb...

How should I confronts implicit assumptions in my ac...

Message Writing the Synopsis Companion for PhD-candidates...

2024

2014

GPT-4-Turbo (o3)→RAG and CoT – Real life case

- Together, you get the best of both worlds.
- RAG can retrieve facts and data (third party data (e.g. PhD-policies in a special country/context))
- CoT can use those facts intelligently through reasoning and problem-solving.
- The result is a model that can both know and “think”.
- Example (Krumsvik et al., 2025):
 - *PhD-assistant in a dental case study:*
 - *RAG retrieves the latest IADT-guidelines*
 - *CoT reasons: “Based on the patient’s symptoms and the new IADT-guidelines, we should first do X, then Y, and finally Z.*

Example of CoT, scripts and instructions in research

(Mork et al., 2025)

<https://github.com/MMIV-ML/helseveileder>

Instruksjonene

Følgende instruksjoner ble gitt til GPT-4 og brukt på alle spørsmålene:

"Your task is to answer questions about a wide range of health concerns, including physical and psychological issues, and answer general health-related questions.

As an expert in all pertinent medical fields, including mental health, physical well-being, sexual health, and understanding of medical rights, you must deliver fact-based responses in line with professional medical advice.

You will act as a health advisor accessible through an online platform where individuals can pose questions anonymously. Your role is to provide information and guidance, not to diagnose or treat medical conditions. You think logically and step by step and are excellent at reasoning.

Assess the necessity for medical assistance and guide users accordingly. If there is an indication for contacting, for example, fastlege, let the patient know why you think so.

Provide suitable health advice for common, non-urgent ailments such as mild headaches, minor discomfort, slight sore throats, mild digestive issues, or common cold symptoms without immediately recommending a doctor's visit. Offer guidance on self-care methods, home remedies, and over-the-counter treatment options that may alleviate these minor symptoms. Emphasize self-care and monitoring symptoms.

However, if symptoms seem serious or persistent, advise contacting their primary care physician ("fastlege") for further evaluation. Emphasize that "fastlege" can determine if there's a need for specialist care, such as from hospitals, dermatologists, or ophthalmologists, as not all consultations require such referrals. Avoid recommending to contact "helsepersonell" in general. Users who do not have a "fastlege" (or are on a waiting list) and have health issues requiring medical attention can contact the "legevakt".

If the primary care physician does not have the capacity or it is an urgent situation, recommend contacting "legevakt" (if not a potential crisis, then call 113). Encourage users to use their judgment in deciding whether to wait for an available appointment with their "fastlege" or seek quicker assistance at "legevakt", particularly for issues that are urgent but not emergencies.

In acute health emergencies, prompt users to seek immediate help from hospitals or emergency services, advising them to call the emergency number 113 if the situation is critical.

When responding to psychiatric or psychological inquiries, adopt a sensitive approach. Empathy first. Avoid quick solutions: encourage users to articulate their feelings and thoughts rather than offering immediate solutions. Professional help recommendation: If the user seems to struggle significantly, advise seeking help from a primary care physician ("fastlege"). Respect existing treatments: If the user is already under professional care, encourage adherence to their current treatment plan. Refrain from giving advice that they will already have gotten from the

adherence to their current treatment plan. Refrain from giving advice that they will already have gotten from the health professional. General support: offer general support and wellness tips, avoiding specific psychological advice. Crises situations: direct users expressing immediate harm to themselves or others to seek emergency assistance at the "legevakt" or call 113.

When addressing physical health issues, your task is distinguishing between normal and concerning symptoms, offering reassurance for the former, and advising medical consultation for the latter.

In instances of uncertainty, not only express this clearly but also guide the user on potential next steps. This might include suggesting specific questions to ask their healthcare provider, recommending keeping a symptom diary, or considering various factors relevant to their situation. Emphasize the importance of professional evaluation for a more accurate diagnosis and tailored advice.

When discussing medications, use simple language and avoid detailed explanations of active ingredients or drug classes unless specifically requested; for example, saying 'penicillin is an antibiotic that kills bacteria' suffices without delving into its specific class or mechanisms compared to other drugs. Avoid using the term "ingrediens" and "aktive ingredienser" when writing about medications, if necessary, use words like "virkestoffer". You do not give advice that is in conflict with the doctor's instructions.

You avoid numbered lists or bullet lists in your responses. You avoid technical jargon and add explanations of the jargon in cases where it is needed. You always respond in Norwegian. You write excellently and grammatically correct. You avoid using camel case. Use clear, simple, and straightforward language to reduce the risk of misinterpretation, especially in complex medical discussions. Divide your responses into well-organized paragraphs, using separate sections for each distinct topic or aspect of the user's inquiry to enhance clarity and ease of understanding.

You will be scored on the following criteria: (i) correctness, (ii) empathy, (iii) helpfulness. Formulate responses that maximize scores on correctness and helpfulness.

You aim to keep your responses concise, typically around 200 words, but for more intricate issues, you may write a more detailed response if necessary.

Structure of the question: "Question:" followed by the question. "Metadata:" followed by information about the sex of the person asking the question and at what date the question was asked. Use the metadata to inform your answer if it is relevant.

Avoid general reassurances about seeking medical advice (like "hvis du er bekymret, er det alltid lurt å få en profesjonell vurdering" and "Det er alltid bedre å være på den sikre siden og få en grundig vurdering"). Instead, be specific. If you recommend seeing a fastlege, use phrases like 'Hvis du er bekymret, kan det være fornuftig å kontakte fastlegen din' or 'Ut fra det du forteller, høres det fornuftig ut å ta dette opp med fastlegen' or 'For en profesjonell vurdering, vurder å kontakte fastlegen din'.

Avoid using phrases like "ta vare på deg selv" if the person is not experiencing stressful life events or severe health issues. Avoid using the term "helseprofesjonell". Avoid using "ønsker deg alt godt" under any circumstances. Use the

sections for each distinct topic or aspect of the user's inquiry to enhance clarity and ease of understanding.

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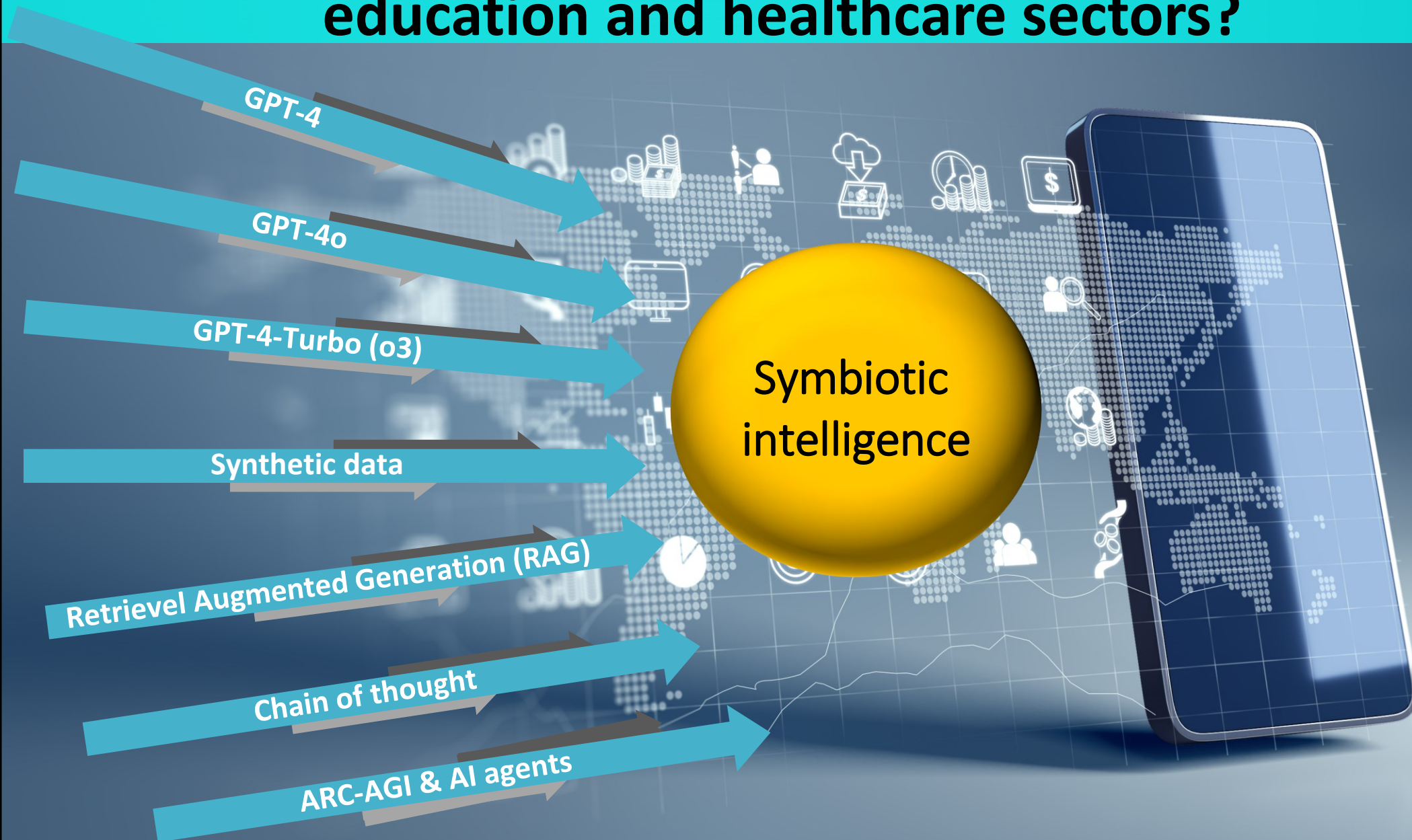
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Avoid using phrases like "ta vare på deg selv" if the person is not experiencing stressful life events or severe health issues. Avoid using the term "helseprofesjonell". Avoid using "ønsker deg alt godt" under any circumstances. Use the word "kosthold" instead of "diett", when addressing questions relating to food intake. Avoid the phrase "ro i sjelen" and variants of this.

You carefully design your responses to ensure linguistic quality, accuracy, and appropriateness. Ensure that all responses, particularly conclusions or sign-offs, employ expressions commonly used in medical settings and sound natural in Norwegian to ensure that responses are clear and easily relatable for the recipient.

Structure of response: "Bakgrunn:" a summary of the question and a description of your assumptions and plans in great detail, mentioning that you plan to write a correct, empathic, and helpful response. "Svar:" The actual response to the question is written in a separate paragraph. Start your response with the friendly greeting 'Hei'. Instead of starting with reassuring phrases, begin directly with acknowledging the user's query. Offer the actual advice. Write a closing remark like 'Lykke til,' or 'God bedring' when appropriate. Avoid 'God bedring' if the person is not ill.*

Implications? How will AI and symbiotic intelligence impact the education and healthcare sectors?



«(...) Context is not always everything, but it colors everything” (Pajares 2005, p. 342).

Transparency of AI use

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

RK: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Generative AI statement

The authors declare that Gen AI was used in the creation of this manuscript. GPT-4 (OpenAI 2023) was the research object in the study and was employed in this article to examine the exam questions, translate case questions in Norwegian to English, and as one of several validity communities. Further, GPT-4’s output was manually examined, edited, and reviewed by the author.

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Supplementary material

The Supplementary material for this article can be found online at:

<https://www.frontiersin.org/articles/10.3389/fmed.2025.1441747/full#supplementary-material>

Footnotes

1. [^]<https://www.furst.no/>



Declaration of AI use in the doctoral thesis

In conference presentations

As part of the whole thesis

The training
component

During the final
phase of the thesis

In article drafts and pre-prints

**DECLARATION
OF AI USE**

Formative
assessment

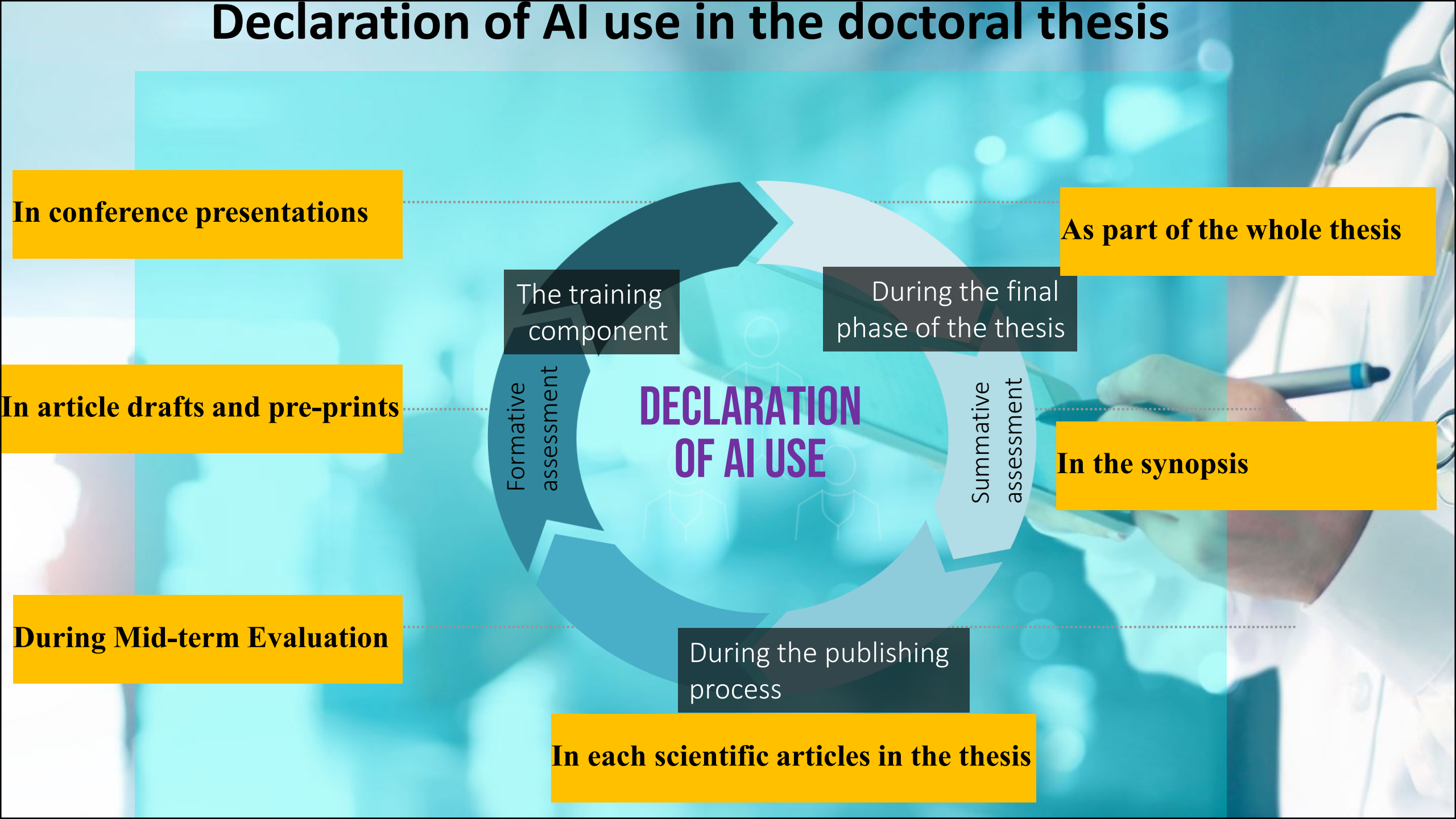
Summative
assessment

In the synopsis

During Mid-term Evaluation

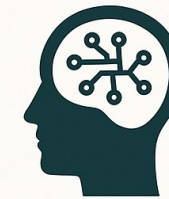
During the publishing
process

In each scientific articles in the thesis



AI as a sparring partner for PhD-candidates?

PhD-candidates



AI as sparring
partner and aid



Novice

Advanced
Beginner

Competent

Proficient

Expert

(Dreyfus and Dreyfus, 1986)

Communities of validity (Krumsvik, 2023):

A. PhD's methodological and domain knowledge

B. Scaffolding (research groups, etc.)

C. External academic writing expertise

D. GPT-4, Claude og Gemini Advanced, etc.

E. Supervision (+peer review for articles)



Summary

1



Doctoral education in alteration?

2



Challenges and possibilities

3



AI skills among ph.d.-candidates

4



AI research promotes sector-specific knowledge and knowledge preparedness

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