



Fotos: V. Müller

KI in der Medizin hautnah: Entwicklung und Implementierung eines Curriculums

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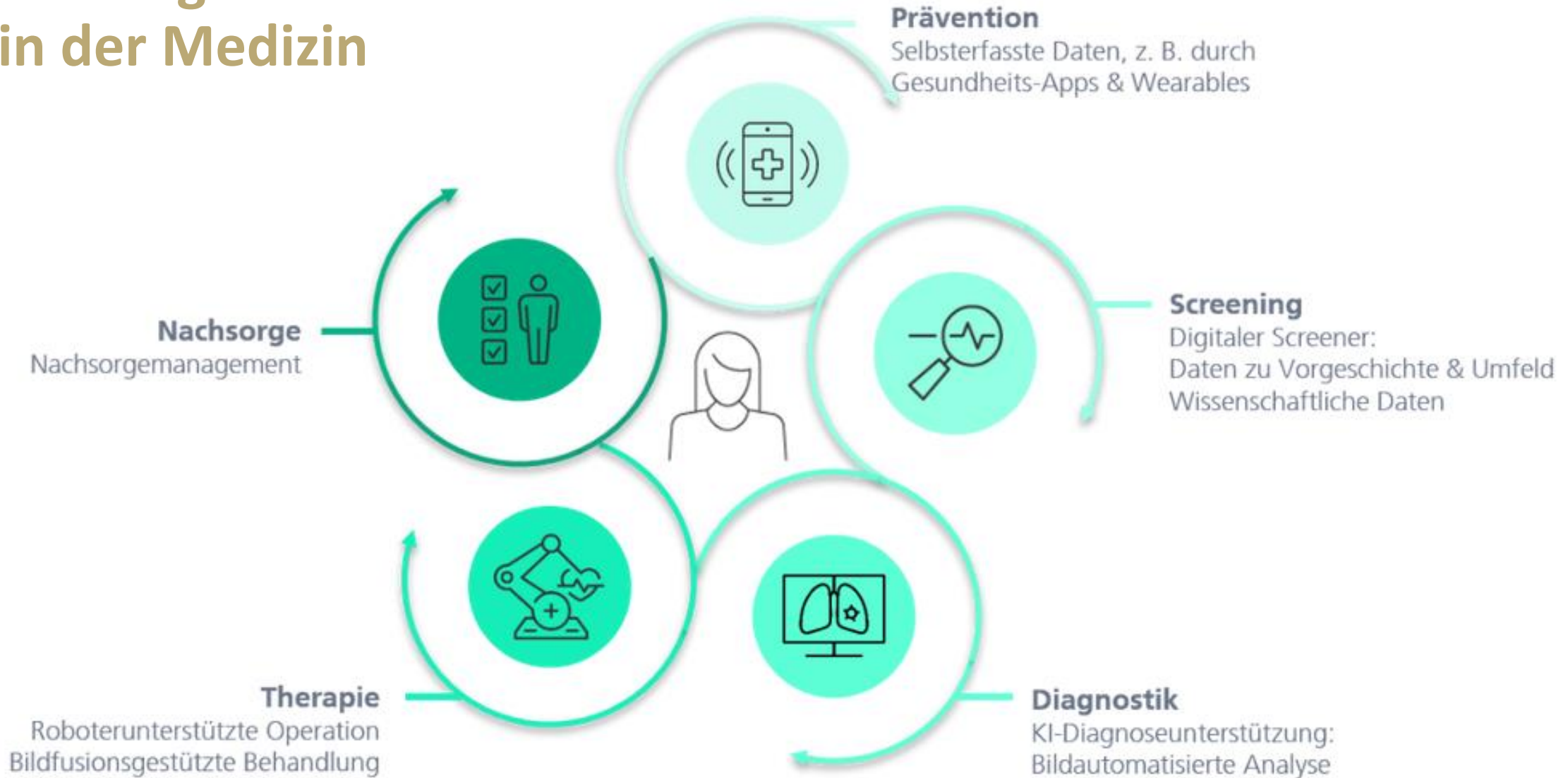
Agenda

Hintergrund KI in der Medizin

Hintergrund Curriculum

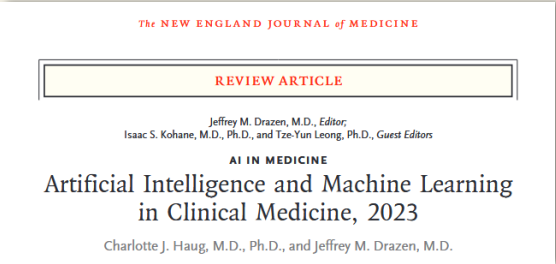
Einblick TüKITZMed

Einsatzgebiete von KI in der Medizin



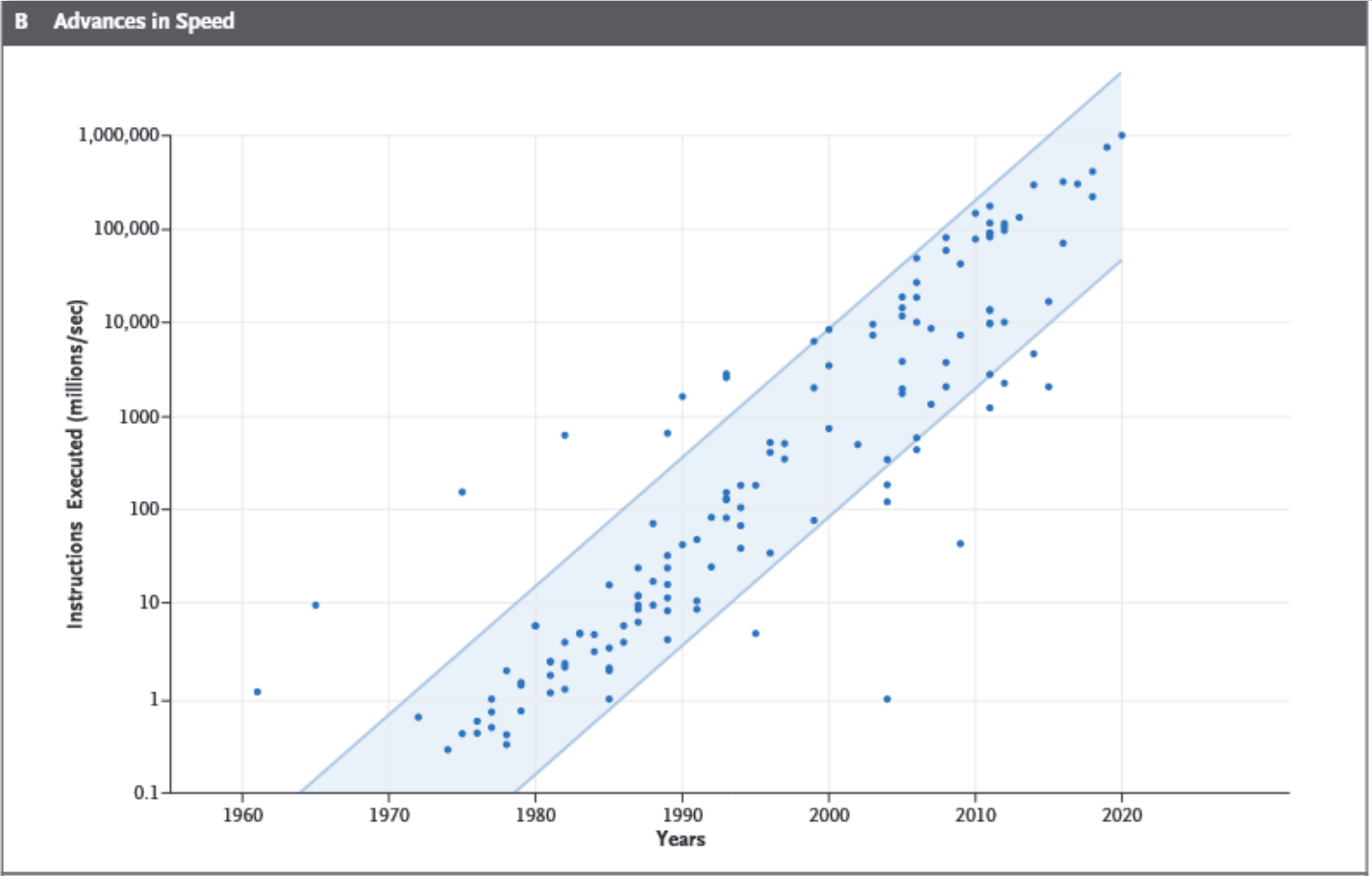
Entwicklungsschritte

Speicherkapazität



Entwicklungsschritte

Geschwindigkeit



Entwicklungsschritte

ChatBots

Joseph Weizenbaum
(Artificial Intelligence Laboratory of the
Massachusetts Institute of Technology),
1964 – 1966.

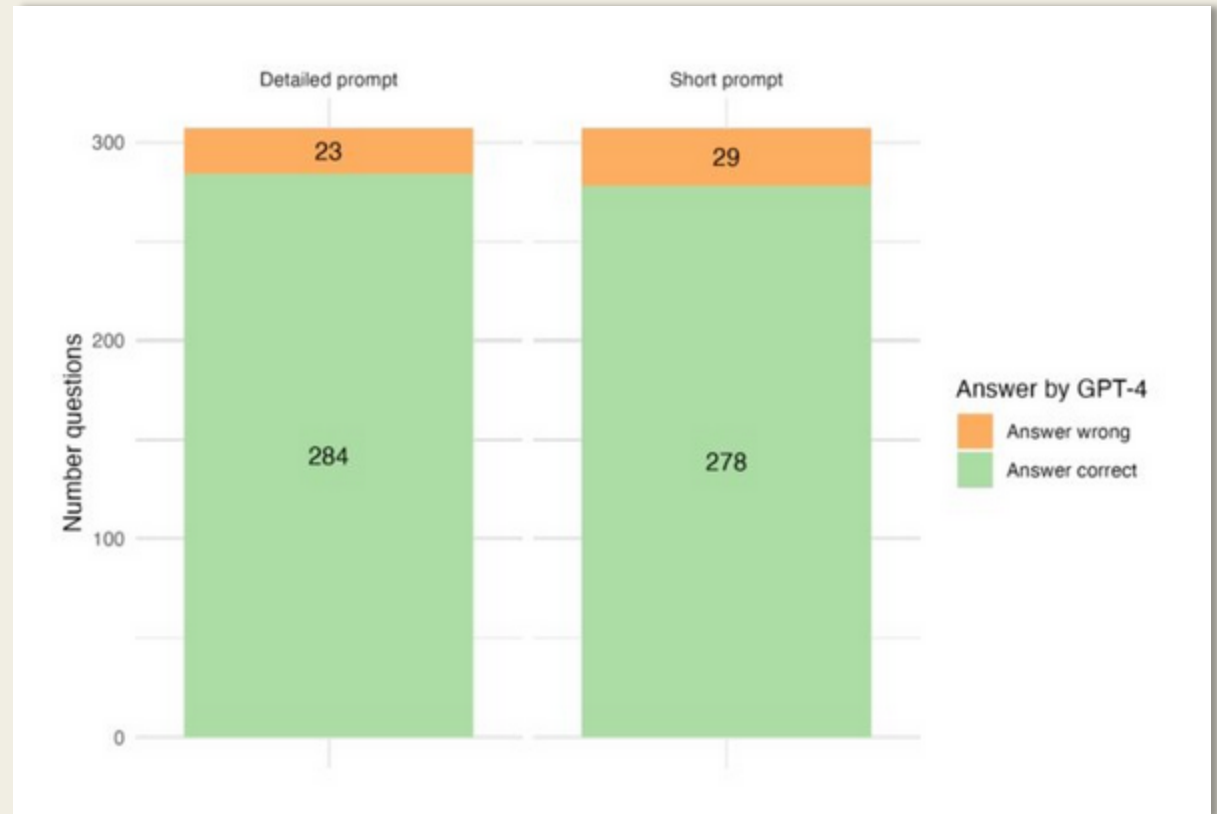


ChatGPT

1 Assessing ChatGPT's Mastery of 2 Bloom's Taxonomy using 3 psychosomatic medicine exam 4 questions

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6 Herschbach¹, Jan Griewatz¹, Ken Masters⁴, Stephan Zipfel², Moritz Mahling^{1,5}

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8 Tübingen, Germany



Large Language Models

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<https://doi.org/10.1007/s10439-022-03121-w>

BMES BIOMEDICAL
ENGINEERING
SOCIETY



Editorial

The Future of AI in Medicine: A Perspective from a Chatbot

(Received 12 December 2022; accepted 16 December 2022; published online 26 December 2022)

Author note Like many other technology users and enthusiasts, I have been captivated by the capabilities of ChatGPT, the new natural language chatbot utility developed by OpenAI and recently released for research testing. Testing ChatGPT and encouraging it to produce both useful, and humorous, responses that are remarkably well-written and human-like prompted me to wonder... have we reached the point in the evolution of technology where an AI-driven chatbot

AI has the potential to revolutionize the way we approach healthcare, by providing more efficient and effective solutions to some of the biggest challenges facing the medical industry. For example, AI can help doctors analyze large amounts of medical data, such as imaging scans or lab results, and identify patterns that might be missed by the human eye. This can help doctors make more accurate diagnoses and provide more targeted treatments for patients.



Mensch / Maschine

Wird KI perspektivisch Ärzt*innen ersetzen?



Die Zukunft von Beschäftigung

Computerisable				
Rank	Probability	Label	SOC code	Occupation
1.	0.0028		29-1125	Recreational Therapists
2.	0.003		49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers
...
15.	0.0042	0	29-1060	Physicians and Surgeons
...
48.	0.0095		25-3999	Teachers and Instructors, All Other
...
698.	0.99	1	13-2053	Insurance Underwriters
699.	0.99		15-2091	Mathematical Technicians
700.	0.99		51-6051	Sewers, Hand
701.	0.99		23-2093	Title Examiners, Abstractors, and Searchers
702.	0.99		41-9041	Telemarketers



It is unlikely that AI will completely replace professors for medical education in the near future. While AI can be used to supplement traditional



Mensch / Maschine

Werden Ärzt*innen, die KI nutzen, solche ersetzen,
die das nicht tun?



Mensch / Maschine

Werden Gesundheitssysteme KI erfolgreich annehmen?



Kollaboration von KI und Medizin – Anforderungen

Anforderungen

- Beidseitiges Verständnis von Zielen
- Zuvorkommendes Aufgabenmanagement
- Geteilten Fortschritt bei der Aufgabenbearbeitung



Einsatz von KI in der Medizin – Anforderungen

Grundvoraussetzung:

- notwendige technologische Entwicklung
- Qualifizierung von entsprechend involvierten Personen

Ziele:

- KI kompetent, verantwortungsbewusst und zielgerichtet einzusetzen
- Perspektivisch neue Einsatzmöglichkeiten und -bedarfe abzuleiten

Agenda

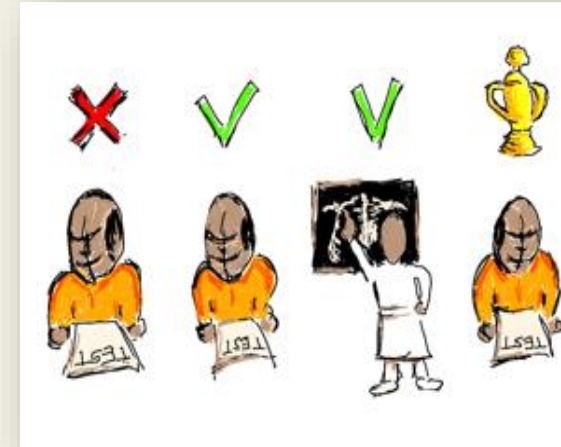
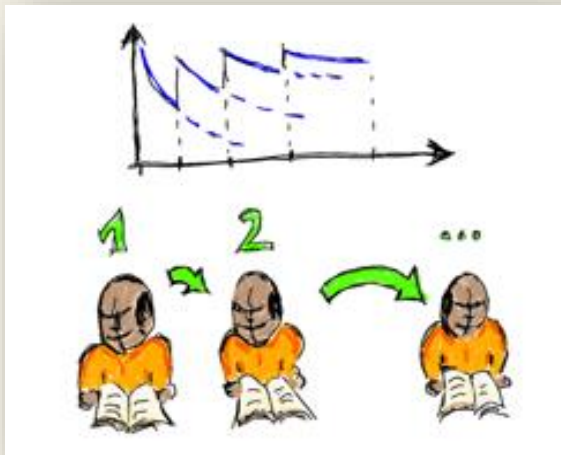
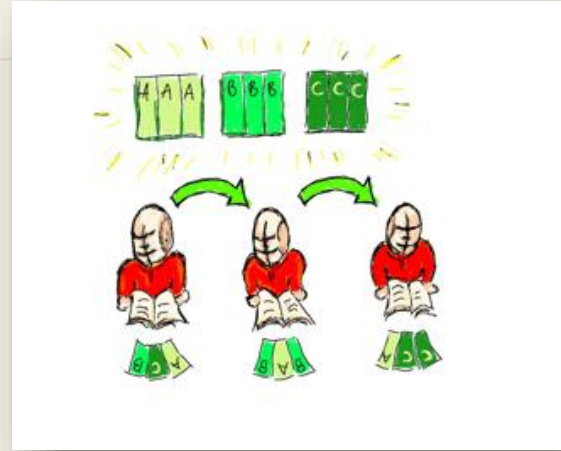
Hintergrund KI in der Medizin

Hintergrund Curriculum

Einblick TüKITZMed



Prinzipien des Lernens



Prinzipien des Lernens

Retrieval-
based
Learning

Interleaving

Meta-
cognition

Collaboration

Spaced
Repetition

Frequent
Testing

Self-
Explanation

And AI?



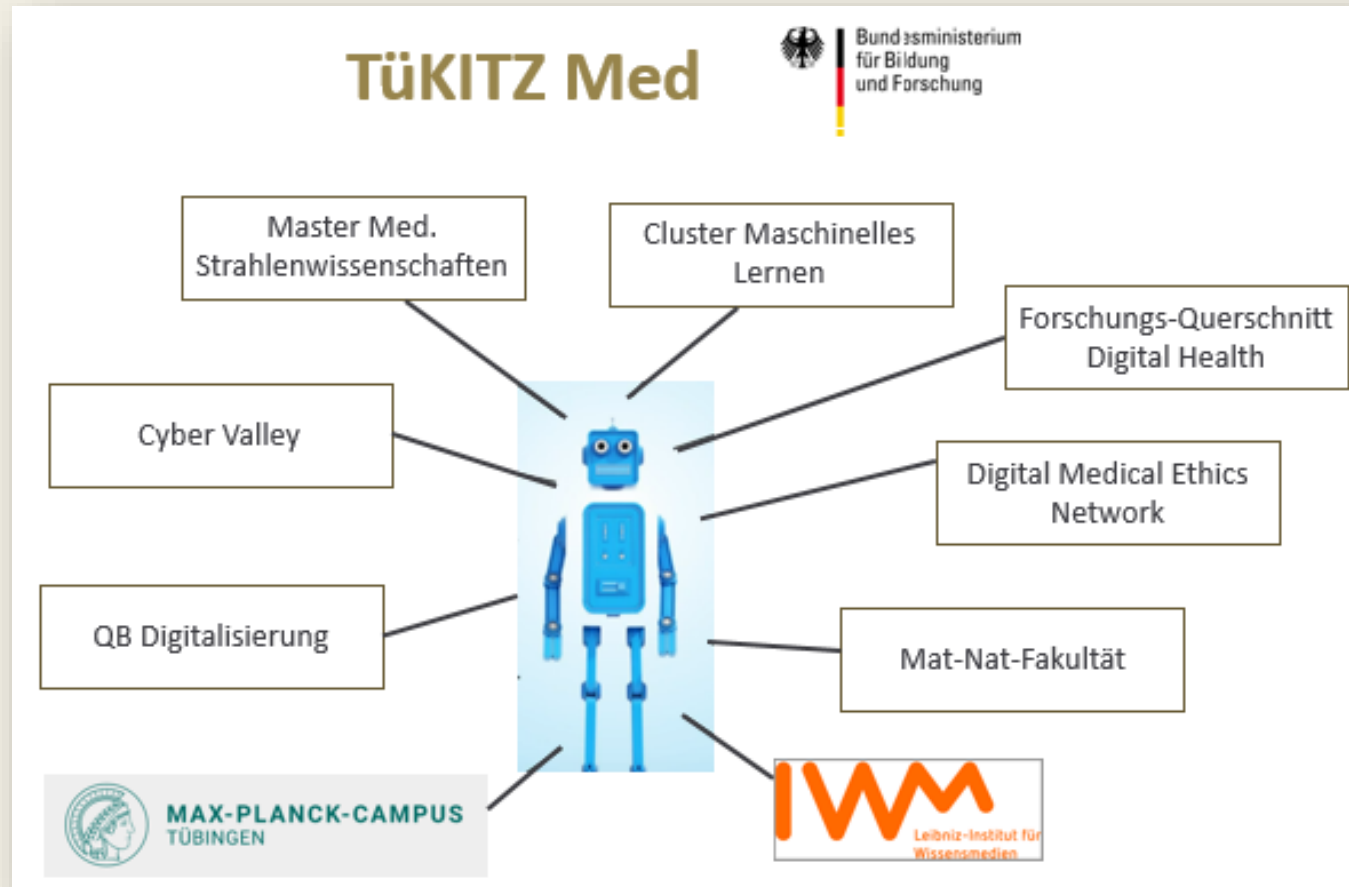
BMBF-gefördertes Verbundprojekt:

- Medizinische Fakultät, Universität Tübingen
- Mathematisch-Naturwissenschaftliche Fakultät, Universität Tübingen
- Praktische Begleitung und Zusammenarbeit mit dem Max-Planck-Institut Tübingen und dem Leibniz Institut für Wissensmedien (IWM) Tübingen

Geplante Laufzeit: 48 Monate (12/21 – 11/25)

Übergeordnetes Ziel: Implementierung eines fakultätsübergreifenden KI-Curriculums für Studierende der Medizin und medizinnahen Lebenswissenschaften

TüKITZMed – Tübinger KI-Trainingszentrum für die Medizin

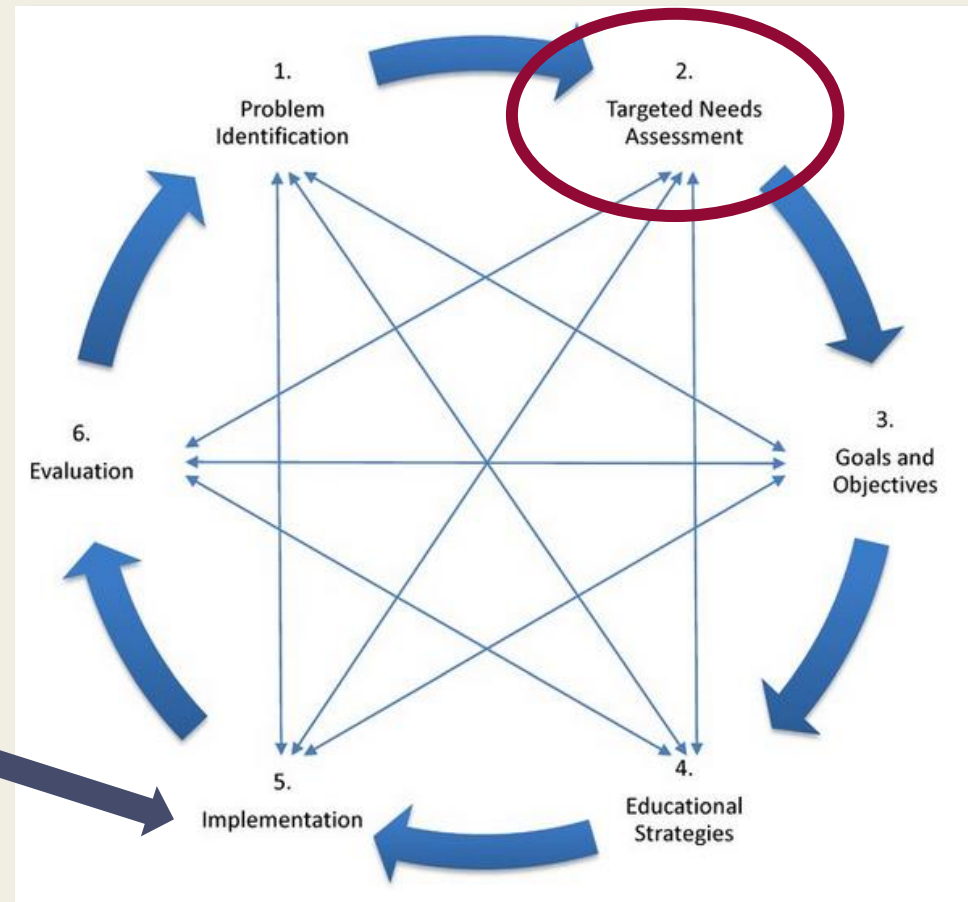


https://www.youtube.com/watch?embeds_referring_euri=https%3A%2F%2Fwww.medizin.uni-tuebingen.de%2F&source_ve_path=Mjg2NjQsMTY0NTAz&feature=emb_share&v=tBSuFnRyFUo

Zielgruppen Bedarfsanalyse

13. Dezember 2023

Start Pilot



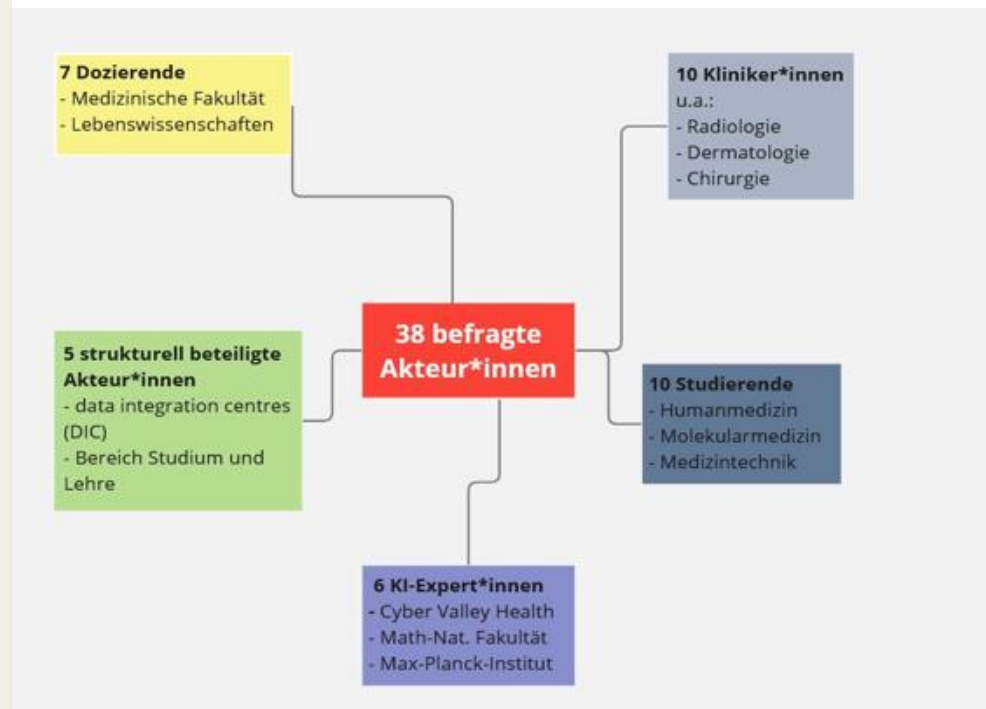


Journal of Medical Education and Curricular Development

Medical Students' Attitudes toward AI in Medicine and their Expectations for Medical Education

Journal:	<i>Journal of Medical Education and Curricular Development</i>
Manuscript ID	MDE-23-0166.R1
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Bedarfsanalyse von 38 Akteur*innen



Defining AI in medical curricula: An Examination of Stakeholder Perceptions and Expectations of AI in medicine"

Moldt, J-A¹; Festl-Wietek, T.1; Fuhl, W.²; Zabel, S²; Nieselt, K².; Herrmann-Werner, A.^{1,3}

¹TIME – Tübingen Institute for Medical Education, Medizinische Fakultät Universität Tübingen

²Interfakultäres Institut für Biomedizinische Informatik (IBMI), Universität Tübingen

³Abteilung Innere Medizin VI/Psychosomatische Medizin und Psychotherapie, Universitätsklinikum Tübingen

1.1 Introduction:

1.1 Background and significance of AI in medicine

In 1966, the architect Cedric Price posed the provocative question, 'Technology is the answer, but what was the question?' [1]with the intention of encouraging his lecture audience to explore, question, and reconsider the impact of technological progress. Now, more than 50 years later, this question remains as relevant as ever. In a similar vein, one might ask today, 'The answer is AI, but what was the question?'

Moldt et al., in production

TüKITZMed – Needs Assessment

	Kliniker*innen	Dozierende	Studierende	Expert*innen	Strukturelle Akteur*innen
Ethische Aspekte, Chancen & Grenzen von Technologien	X	X	X	X	X
Praktische Anwendungen und Anwendungsbeispiele	X	X	X	X	X
Kompetenzerwerb bzgl. Daten und Digitalisierung	X	X	X	X	X
Programmierkenntnisse	nur bedingt erforderlich	in Maßen erforderlich	nicht erforderlich	erforderlich (Grundkenntnisse)	nicht erforderlich



TüKITZMed – Needs Assessment

	Kliniker*innen	Dozierende	Studierende	Expert*innen	Strukturelle Akteur*innen
Nachvollziehbarkeit von KI gestützten Entscheidungen	X		X		X
Grundlagen Informatik & Mathematik		X		X	
Auswirkungen auf das Arzt-Patient-Verhältnis	X	X			
Juristische Hintergründe		X			
Überblick möglicher Anwendungsbereiche				X	

Chancen

Arbeits- und Personalentlastung

Unterstützung medizinischen Personals bei administrativen Aufgaben
Abmilderung von Personalengpässen

Ausbau und Erarbeitung einer flächenübergreifenden Daten-Infrastruktur

Standardisierung von Daten
Effizientes Datenmanagement

Steigerung der Effizienz

Höhere Effizienz durch Automatisierung
Schnellere und validere Diagnose

Qualitäts- und Sicherheitsgewinn für Patient*innen

Höhere Genauigkeit bei der Mustererkennung
Erkennen von komplexen Zusammenhängen

Future Skills KI und Data Literacy

Grundlagen KI
und Data Literacy

Fortgeschrittene
Themen der KI

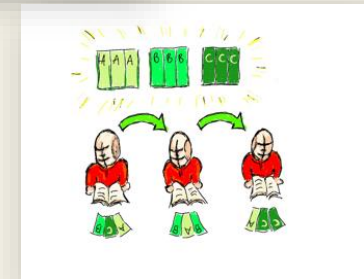
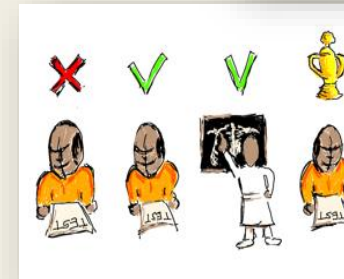
Anwendungen
von KI in der
Medizin

Ethische und
rechtliche
Dimensionen von
KI

Begleitende praktische Übungen

Zusätzliche Features:

- Eingangs-Einstufung
- Leistungsüberprüfung am Ende jeden Moduls
- Begleitende Lern- und Reflexionsfragen
- Vorschlag für Lernpfade
- KI generierter Support (AI Tutoring System)



Agenda

Hintergrund KI in der Medizin

Hintergrund Curriculum

Einblick TüKITZMed



Lernplattform

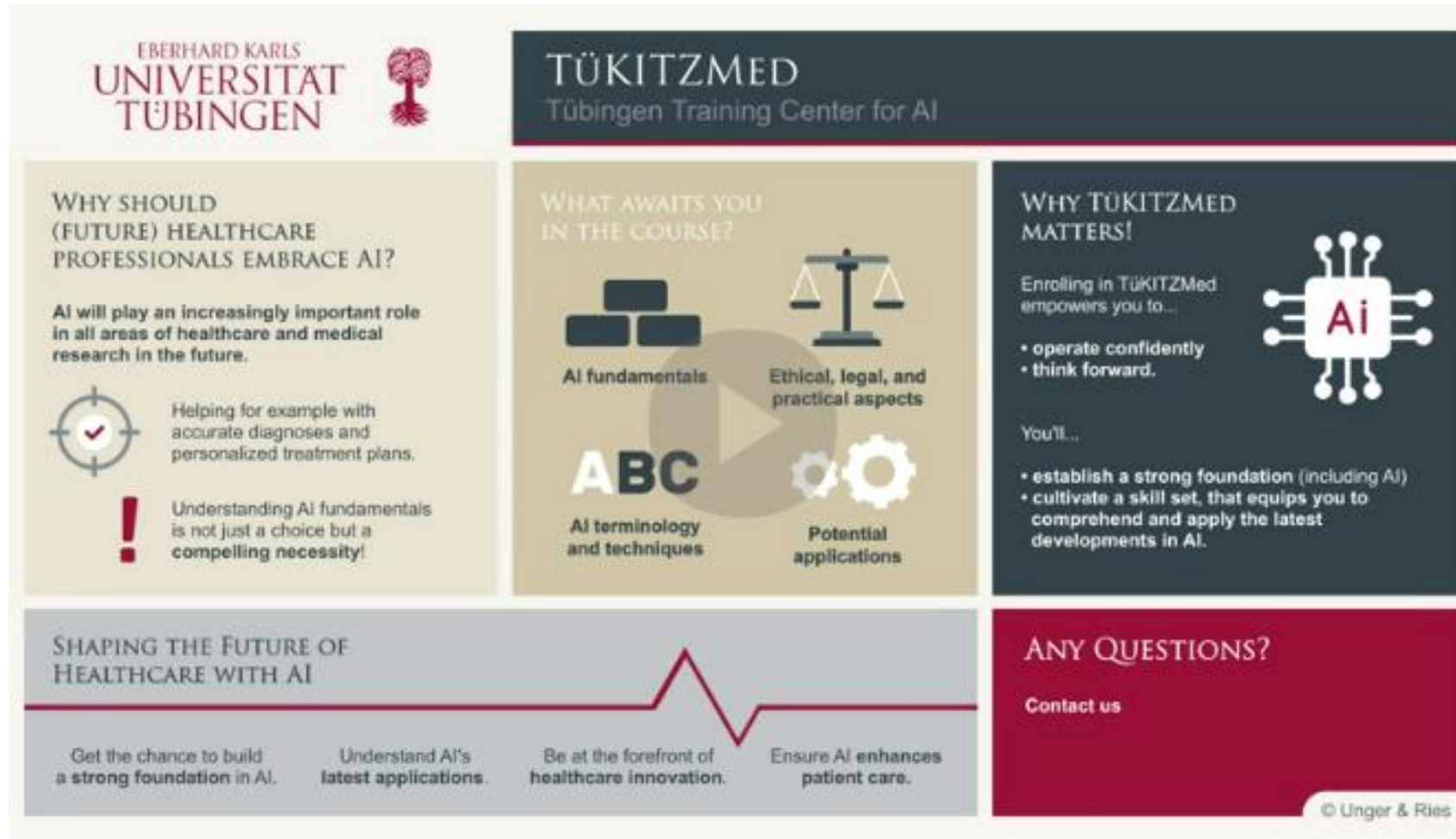



Welcome to the Tübingen AI Training Center for Medicine!

On this learning platform, medical students with different levels of knowledge can find educational material in mathematics, machine learning, and data literacy. This material is complemented by a collection of examples of how doctors and researchers from Tübingen apply machine learning methods to medical data. In this context, socially relevant issues of ethics, law, and privacy are also discussed.



Lernplattform – Navigationsvideo





EBERHARD KARLS UNIVERSITÄT TÜBINGEN 

TÜKITZMED
Tübingen Training Center for AI

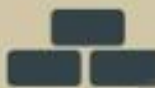
WHY SHOULD (FUTURE) HEALTHCARE PROFESSIONALS EMBRACE AI?


AI will play an increasingly important role in all areas of healthcare and medical research in the future.


 Helping for example with accurate diagnoses and personalized treatment plans.


 Understanding AI fundamentals is not just a choice but a **compelling necessity!**

WHAT AWAITS YOU IN THE COURSE?

 AI fundamentals

 Ethical, legal, and practical aspects

 **ABC**
AI terminology and techniques

 Potential applications


WHY TÜKITZMED MATTERS!

Enrolling in TÜKITZMed empowers you to...

- operate confidently
- think forward.

You'll...

- establish a strong foundation (including AI)
- cultivate a skill set, that equips you to comprehend and apply the latest developments in AI.



SHAPING THE FUTURE OF HEALTHCARE WITH AI

Get the chance to build a **strong foundation** in AI.

Understand AI's **latest applications**.

Be at the forefront of **healthcare innovation**.

Ensure AI enhances **patient care**.

ANY QUESTIONS?

Contact us

© Unger & Ries



Lernplattform – Grundlagen

Grundlagen Mathematik	
<input type="checkbox"/>	▶ 1. Linear Algebra
<input type="checkbox"/>	▶ 2. Real and Complex Analysis
<input type="checkbox"/>	▼ 3. Probability Theory and Statistics
<input type="checkbox"/>	3.1 Random Variables
<input type="checkbox"/>	3.2 Standard Distributions
<input type="checkbox"/>	3.3 Standard Distributions Multinomial
<input type="checkbox"/>	3.4 Conditional Joint Distributions
<input type="checkbox"/>	3.5 Bayes Theorem
<input type="checkbox"/>	3.6 Probability Rules Axioms
<input type="checkbox"/>	3.7 Variance Expectation
<input type="checkbox"/>	3.8 Maximum Likelihood Estimation
<input type="checkbox"/>	3.9 Moment Generating Functions
<input type="checkbox"/>	▶ 4. Information Theory

START

START

START



Lernplattform – Anwendungen



Application of DL to medical data

Online Training

START



Application of ML to medical data

Online Training

START



Lernplattform – Anwendungsbeispiel ML

The screenshot displays a learning platform interface. At the top, a navigation bar includes a hamburger menu icon, the word "TRAINING", and a progress indicator "Gesamtfortschritt: 17 %" circled in red. The Eberhard Karls Universität Tübingen logo is visible in the top right. Below the navigation bar, the video player features the title "Machine Learning Enables New Haptic Sensors" and the name "Prof. Georg Martius". The video content includes a 3D exploded view of a haptic sensor, a colorful circular interference pattern, and a portrait of Prof. Martius. A red "START" button is circled in red on the right side of the interface. The video player controls at the bottom show a play button, volume icon, progress bar, and a timestamp of -12:35.

Lernplattform – Anwendungsbeispiel ML

The screenshot shows a learning platform interface. At the top, there is a navigation bar with a hamburger menu icon on the left, a 'TRAINING' tab, and a progress indicator 'Gesamtfortschritt: 67 %' with left and right navigation arrows. Below the navigation bar is the Eberhard Karls Universität Tübingen logo. The main content area features a video player with the title 'Annotation of Medical Images' and subtitle 'Application of Artificial Intelligence in Medicine' by Daniela Thorwarth. A play button is visible in the center of the video player. To the right of the video player, there is a 'Kontakt' link, the user name 'Teresa Festl-Wietek', and a language dropdown 'DE'. Below this is a 'Zurück zur Liste' link. At the bottom right of the main content area, there is a red 'START' button.

T:IME

Tübingen Institute
for Medical Education

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Dr. Teresa Festl-Wietek, M.Sc.



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