

# Das Projekt Ethel - ein virtueller HiWi und mehr?

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Rektorat und AI Center



ETH AI CENTER

IHF Talk Series | Okt. 2024

In einer idealen  
Welt ...

... hat jeder Studierende ...



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# Individueller Tutor

- Ideal: 1-zu-1 Betreuung von Lernenden durch Tutoren
  - verfolgen den Lernfortschritt,
  - stellen sich individuell auf die Bedürfnisse ein und
  - erstellen individuell die nächsten Lektionen
- Problem: skaliert nicht
- Lösung (wie immer): Technologie!



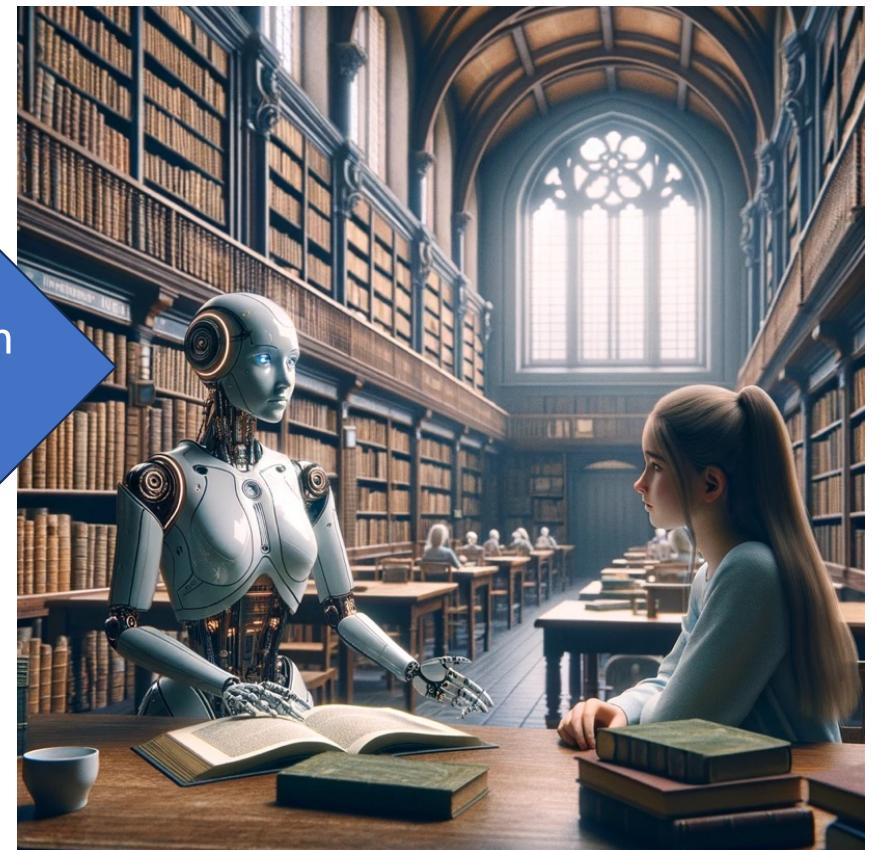
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# Individueller Tutor



Wie DALL-E sich  
das vorstellt



# Intelligent Tutoring Systems

- Was macht denn ein Tutor/HiWi?
  - Gesprächspartner
  - Gibt Feedback auf Übungen
  - Korrigiert Klausuren



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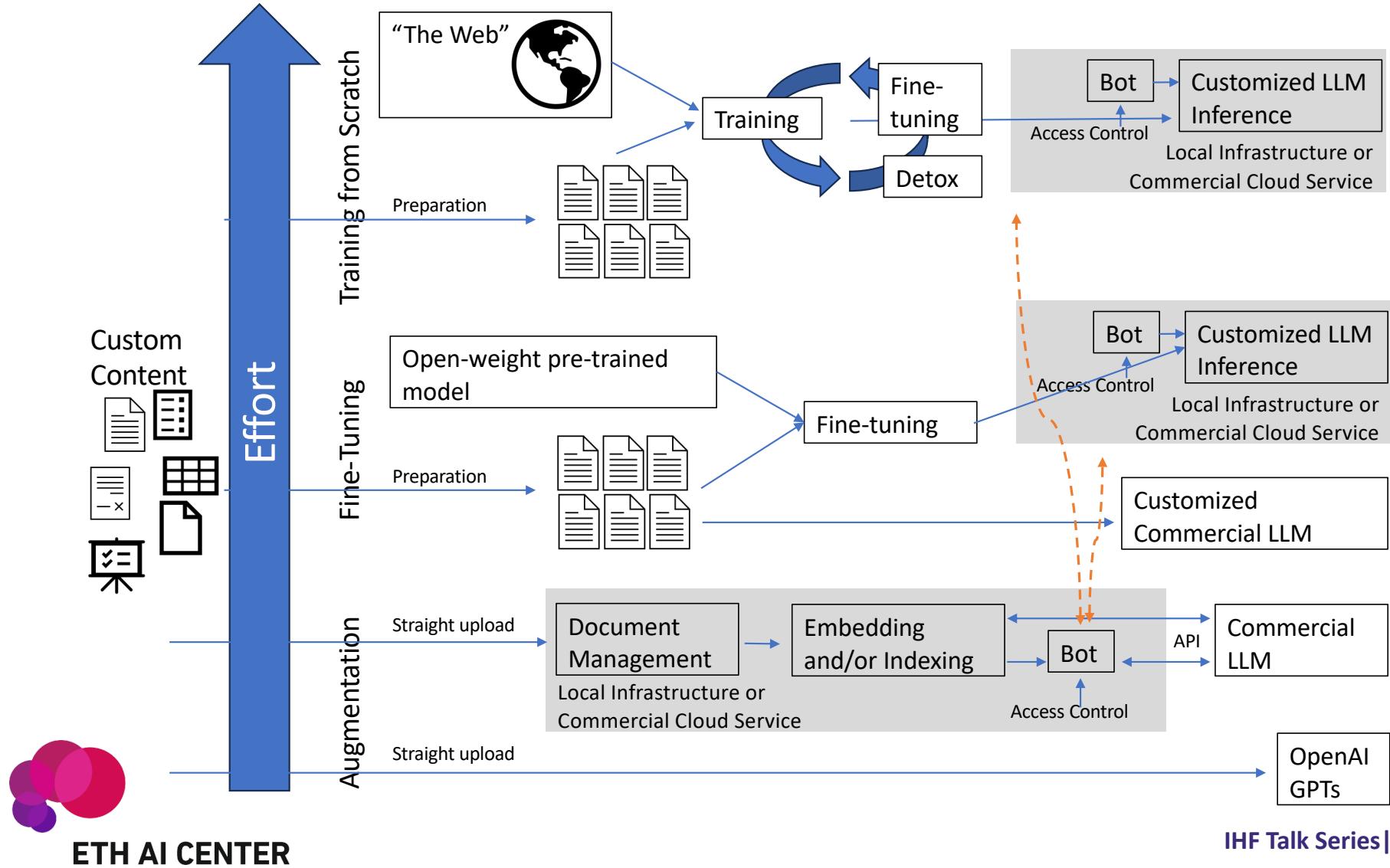
# Ethel

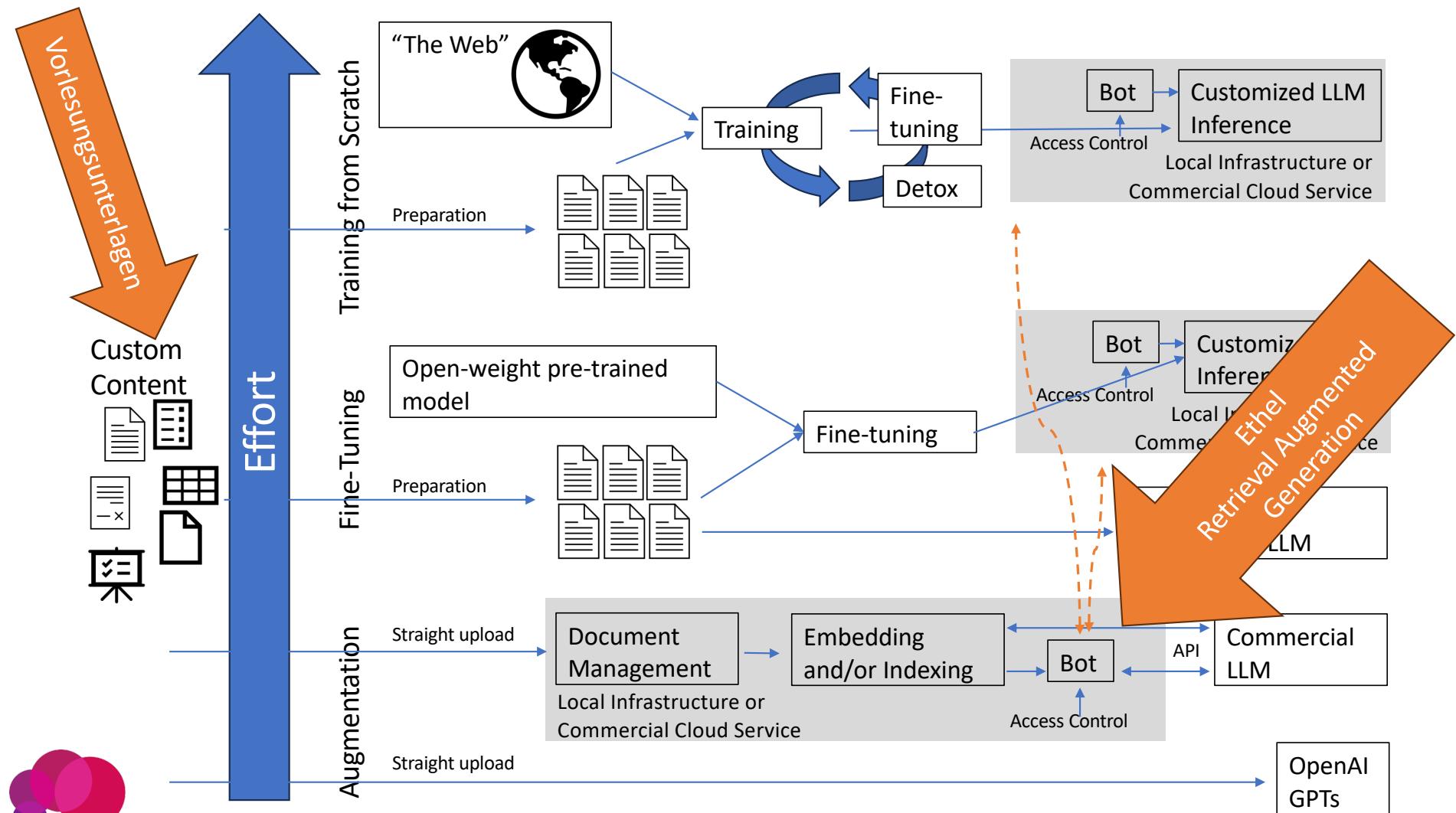
- Erste Experimente zum breiten Einsatz von LLMs an der ETH Zürich
  - Frühlingssemester 2024
- Sechs Kurse mit 1500 Studierenden
  - Grundlagenfächer Mathe und Physik
  - Computer Science
  - Examen: Thermodynamik, Mathematik
- Drei Funktionen:
  - Gesprächspartner -> Custom Chatbot
  - Gibt Feedback auf Übungen -> Hausübungsfeedback
  - Korrigiert Klausuren -> Assistenz bei Klausurkorrektur



## Custom Chatbot







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# Course Bots



**Ethel /'ɛθətl/**

## Custom Chatbots for Courses

You can leave thumbs-up and thumbs-down feedback. Note that while this will store information anonymously, it will record the complete dialogue, so do not reveal any private information. If you wish to know where Ethel got its information from, you can click on the book icon to see background information. Please note, retrieving this information may take some time.

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- [Programming for Engineers](#)



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## WELLENLEHRE, ELEKTRIZITÄT UND MAGNETISMUS

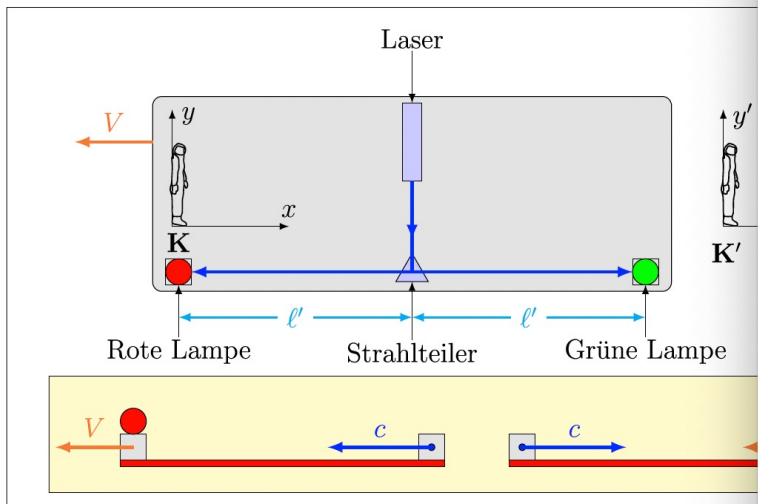


Abbildung 5.7: Der Tisch, wie er vom Beobachter  $\mathbf{K}'$  gesehen wird. Dass die rote Lampe sich vom Lichtstrahl entfernt, und dass die grüne Lampe den Lichtstrahl nähert.

**Beachte:** Wegen des Postulats der Lichtgeschwindigkeit breiten sich Lichtwellen in beide Richtungen des Tisches mit derselben Geschwindigkeit aus.

$$x_{\text{Licht}1} = ct'_1$$

$$x_{\text{Licht}2} = -ct'_2$$

Die Lichtstrahlen treffen zu den Zeiten  $t'_1$  bzw.  $t'_2$  bei den Lampen ein:

In that example of the table with the lights, which one comes on first?

In the example of the table with the lights, which light comes on first depends on the direction of the observer's motion relative to the table.

- If the observer's velocity  $\beta$  is positive (moving in the same direction as the light towards the green lamp), then the green lamp comes on first.
- If the observer's velocity  $\beta$  is negative (moving in the opposite direction towards the red lamp), then the red lamp comes on first.

Thus, the order in which the lamps come on is dependent on the direction of the observer's motion relative to the table, demonstrating the relativity of simultaneity.

Would not the red light appear green when I am moving toward it, so the observer would always see a green light coming on first?

The observation of the color of the light is a separate phenomenon from the order in which the lights come on. The color of light can indeed shift due to the Doppler effect, which describes the change in frequency of a wave in relation to an observer who is moving relative to the wave source. When moving towards a source of light (such as the red lamp), the light's frequency appears to increase, shifting towards the blue end of the spectrum (blue shift). Conversely, moving away from a light source



- Die Ausbreitungsgeschwindigkeit nimmt mit der  $\tilde{z}$  ist, desto schneller kehren die Massenelemente in
- Die Ausbreitungsgeschwindigkeit nimmt mit der  $\tilde{z}$  ist, desto langsamer kehren die Massenelemente in

Explain that example about waves on a rope; I don't get what that "dm" is about.

### 1.2.9 Energiedichte

Wir wollen uns nun der **Energiedichte**  $dW/dV$  von men. Diese setzt sich aus der **kinetischen Energiedichte**  $dE_{el}/dV$  zusammen, welche die poten der einzelnen Massenelemente des Mediums untereinat Mit den Ergebnissen aus dem vorherigen Abschnitt kö dichte einer transversalen Seilwelle  $\xi(x, t)$  herleiten.

Aus dem Physik I Kurs ist bekannt, das die kinetische der Welle gegeben ist durch

$$dT = \frac{1}{2}v^2 dm,$$

wobei  $v = \frac{\partial \xi(x, t)}{\partial t}$  die Geschwindigkeit des Masseneleme Mit der Beziehung für die Massendichte  $\rho = \frac{dm}{dV}$  folgt f

$$\frac{dT}{dV} = \frac{1}{2}\rho \left( \frac{\partial \xi}{\partial t} \right)^2$$

Wir werden nun die elastische Energiedichte  $dE_{el}/dV$  spannung  $S = F/A$  wirkt, ist die in einem um die Läng gescnichtete potentielle Energie gegeben durch  $dF = -$

The term "dm" in the context of the wave on a rope example represents a small mass element of the rope. When waves propagate in a medium like a rope, the energy of the wave is distributed among small pieces or elements of that medium.

In the given example, they're considering a small segment of the rope with mass "dm". This segment is small enough that it can be treated as a point mass for the purpose of calculations, but large enough that it contains a very large number of atoms so macroscopic quantities like mass can still be defined.

The kinetic energy of this mass element "dm" is given by the equation

$$dT = \frac{1}{2}v^2 dm,$$

where  $v = \frac{\partial \xi(x, t)}{\partial t}$  is the speed of the mass element, and  $\xi(x, t)$  is the displacement of the rope at position  $x$  and time  $t$ .

The kinetic energy density (kinetic energy per unit volume) is then obtained by dividing this kinetic energy by the volume of the mass element, which is  $dV$ . With  $\rho = \frac{dm}{dV}$  as the mass density of the rope, the kinetic energy density becomes

$$\frac{dT}{dV} = \frac{1}{2}\rho \left( \frac{\partial \xi}{\partial t} \right)^2.$$

I hope this clarifies the role of "dm" in the energy calculations for a wave on a rope. Let me know if you have any further questions!

The "v" in your answer seems different from the "v" we got out of the partial differential equation for eta(x,t) - is that the velocity of the wave?

Yes, the "v" in the context of the equation for  $\xi(x, t)$  is indeed the velocity of the wave, more specifically, the phase velocity. This is the speed at which a particular phase of the wave (for instance, the crest) propagates in space. It can be represented by the equation  $v = \frac{\omega}{k}$ , where  $\omega$  is the angular frequency of the wave and  $k$  is the wave number.

In the kinetic energy equation,  $v$  represents the speed of the small mass element "dm" of the rope, which is a function of time and position on the rope and is related to the displacement of the rope.

These two "v"s, while represented by the same letter, refer to different concepts. The context should make it clear which one is referred to.

- Die Ausbreitungsgeschwindigkeit nimmt mit der  $Z$  ist, desto schneller kehren die Massenelemente in
- Die Ausbreitungsgeschwindigkeit nimmt mit der  $Z$  ist, desto langsamer kehren die Massenelemente in

Explain that example about waves on a rope; I don't get what that "dm" is about.

### 1.2.9 Energiedichte

Wir wollen uns nun

men.  
Ener  
der ei  
Mit de  
dichte  
Aus den  
der Well



**WIKIPEDIA**  
Die freie Enzyklopädie

Hauptseite  
Themenportale  
Zufälliger Artikel  
Mitmachen  
Artikel verbessern

wobei  $v =$   
Mit der Bez

Funktioniert prima, aber im Moment einfach der ultimative Erklärbär

The term "dm" in the context of the wave on a rope example represents a small mass element of the rope. When waves propagate in a medium like a rope, the wave is distributed among small pieces or elements of that rope.

In the given example, they're talking about a rope. This segment is

Nicht angemeldet Diskussionsseite Beiträge Benutzerkonto erstellen Anmelden  
Lesen Bearbeiten Weitere ▾ Wikipedia durchsuchen Q

## Erklärbär

Die Figur des **Erklärbären** ist eine Kunstfigur, sprachlich ist es ein Homoioteleuton. Die Bezeichnung fand Eingang in den allgemeinen Sprachgebrauch als sprachliches Bild und beschreibt die häufige Wiederholung ausführlicher verbaler Darstellungen von Sachverhalten.<sup>[1]</sup> Einerseits kann die Bezeichnung abwertend verwendet werden, wie etwa in „Ich bin nicht dein Erklärbär, lies die Dokumentation“. Andererseits gibt es auch positive Verwendungen des Begriffs, um jemanden zu bezeichnen, der einen komplizierten Sachverhalt sehr gut erklären kann oder einen dauerhaften Einfluss auf die Gesellschaft hat. Letztere Verwendung findet sich

out of the partial differential

Wir werden nun die Spannung  $S = \frac{F}{A}$ , ist die in einem um die Länge  $\Delta L$  gespeicherte potentielle Energie gegeben durch  $dE_{el} = \frac{1}{2} \frac{\partial E_{el}}{\partial V} dV$ .

which is a function of time and position on the rope and is related to the displacement of the rope.

These two "v"s, while represented by the same letter, refer to different concepts. The context should make it clear which one is referred to.

# Course Bots



**Ethel /'ɛθətl/**

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# Ethel

GPT-4

Tells you what to consider



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Design a replicating database with 20 nodes for multimedia objects with approximately 50 MB each and associated metadata.

Designing a replicating database for multimedia objects and their associated metadata involves considering several factors to ensure reliability, availability, and performance. Here is a step-by-step approach to designing such a database system with 20 nodes:

#### 1. Choose a Suitable Database System

For multimedia objects and metadata, a NoSQL database like Cassandra or MongoDB can be beneficial due to their scalability and flexibility with large volumes of unstructured data.

#### 2. Database Schema Design

- Multimedia Objects:** Store the actual multimedia files (e.g., images, videos) possibly in a distributed file system or as BLOBs (Binary Large Objects) within the database.
- Metadata:** Create a table or collection to store metadata associated with each multimedia object. This may include fields like `object_id`, `file_type`, `size`, `creation_date`, `owner`, and any other relevant attributes.

#### 3. Data Distribution

- Partitioning:** Use consistent hashing to distribute multimedia objects and metadata across the 20 nodes. This helps in evenly distributing the data and in scaling the system.
- Replication Factor:** Set a replication factor, for example, 3, meaning each piece of data (both multimedia object and metadata) is stored on 3 different nodes. This ensures high availability and fault tolerance.

#### 4. Replication Strategy

- Asynchronous Replication:** To improve write performance, use asynchronous replication among the

GPT-01

Makes design decisions

Design a replicating database with 20 nodes for multimedia objects with approximately 50 MB each and associated metadata.

Designing a replicating database with 20 nodes to store multimedia objects of approximately 50 MB each, along with their associated metadata, involves several steps. Let's walk through the design process step by step.

#### 1. Requirements Analysis

- Multimedia Objects:** Approximate size of each object is 50 MB.
- Metadata:** Associated with each multimedia object.
- Number of Nodes:** 20 nodes.
- Replication:** Required for fault tolerance and high availability.

#### 2. Choosing the Storage System

Given the size of the multimedia objects and the need for replication across multiple nodes, we can utilize a distributed file system. The **Hadoop Distributed File System (HDFS)** is a suitable choice because:

- It handles large files efficiently.
- It provides data replication for fault tolerance.
- It's designed to run on clusters of commodity hardware.

#### 3. Configuring Block Size

In HDFS, files are split into blocks for storage.

- Default Block Size:** 128 MB.
- Our Adjustment:** Since our files are 50 MB, we can set the block size to 64 MB to improve storage efficiency.

#### 4. Setting Replication Factor

Replication ensures that data is not lost if a node fails.

- Replication Factor ( $R$ ):** Set  $R = 3$ .
  - This means each block will have 3 replicas

# Ethel

- Betrieb kostete durchschnittlich

EUR 7.80

pro Studierender pro Kurs pro Semester für Inference durch GPT-4 via Azure AI Services

- Inference kostet **immer** Geld, auch bei Open-Weight Modellen!
  - Irgendwo müssen die ja laufen (wird immer vergessen!)



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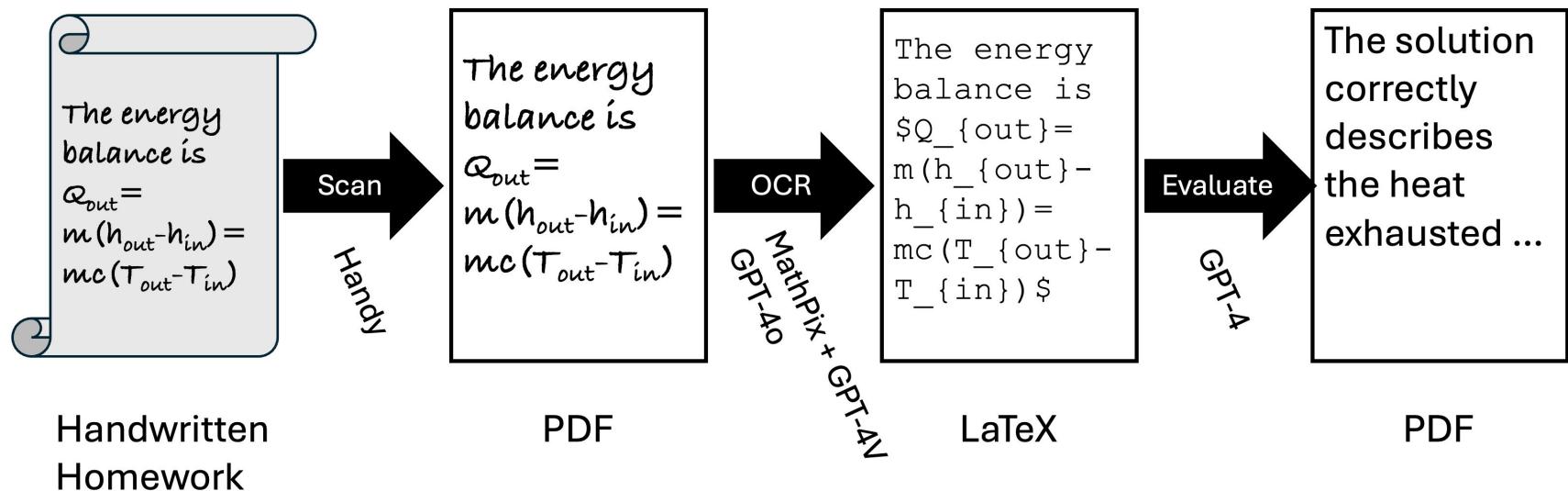
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## Hausübungsfeedback



# Hausübungsfeedback

- Studierende laden handschriftliche Hausübungen als Scans hoch
- System gibt Feedback



4 (Betrachte  $v$  stets grösser 0, falls  $v < 0$ , wechsle Vorzeichen von  $\beta$ )

Bez. Erde: Raumschiff schickt Signale mit freq  $f_0' = 1/\text{Jahr}$

Auf der Erde erhält er diese mit der freq:  $f_0 = \sqrt{1-\beta^2}/\alpha$

$$f_1 = \sqrt{\frac{1-\beta}{1+\beta}} f_0 = (1-\beta) f_0$$

#### 2.4 Problem 4

Mit der Summe  $S_1 = f_1 \cdot \frac{L_0}{v}$ :

Auf der Rückreise:

$$f_1' = \sqrt{\frac{1+\beta}{1-\beta}} f_0 = (1+\beta) f_0$$

The student's solution approaches the exercise correctly, but there are several discrepancies and wrong calculations.

a) The student correctly identifies the frequencies of the signals detected from brother A in both parts of the trip (when moving away and towards Earth). The Doppler shift formula is used accurately addressing both cases, however, the equalities

$$f_1 = (1 - \beta) f_0 \quad \text{and} \quad f_1' = (1 + \beta) f_0$$

are incorrect since the Doppler shift factor should be precisely

$$\sqrt{\frac{1 - \beta}{1 + \beta}} \quad \text{and} \quad \sqrt{\frac{1 + \beta}{1 - \beta}}$$

respectively, as correctly stated in the sample solution's equations (26) and (27).

Studentische Lösung

AI feedback



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# Hausübungsfeedback

Gab auch ein paar Problemchen mit GPT-4V:

Aus Sicht von ① ist jedoch  $d(①, ②) > d(②, ③)$ ,

FIG. 3. Example of a snippet of a student solution that GPT-4 refused to process with the error message “the response was filtered due to the prompt triggering Azure OpenAI’s content management policy.”



# Hausübungsfeedback

Behoben mit GPT-4o:

Aus Sicht von ① ist jedoch  $d(①, ②) > d(②, ③)$ ,  
*from the perspective of (1), however,  $d(1, 2) > d(2, 3)$*



# Hausübungsfeedback

- Studierendenfeedback auf Hausübungsfeedback:
  - Hilfreich, **obwohl** manchmal falsch
  - Größtes Problem: Handschrifterkennung
  - Vorwurf: hängt sich zu eng an der Musterlösung entlang
- Gesamtfazit jedoch einhellig: bitte weiterführen!!!



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## Assistenz bei Klausurkorrektur

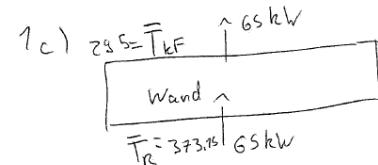


# Datensatz

- Thermodynamik-Klausur
  - 252 Studierende
  - Vier mehrteilige Aufgaben
- Handgeschrieben mit Formeln, Graphen, Diagrammen
- 3041 Seiten mit Handschrift
  - Durchschnittlich 12 Seiten pro Studierender
- Benotet auf Rubrik
  - 85 Rubrik-Items



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$$0 + \frac{65 \text{ kW}}{373,15 \text{ K}} - \frac{65 \text{ kW}}{295 \text{ K}} + \dot{s}_{\text{erz}} = 0$$

Entrapie bilanz um Wand:

$$\dot{s}_{\text{erz}} = 0,04615 \frac{\text{kW}}{\text{K}} = 46,15 \frac{\text{W}}{\text{K}}$$

$$\text{d) } \dot{m}_R = 0 \quad \text{Da iF:} \\ T_{R2} = 70^\circ\text{C} \quad T_{R1} = 100^\circ\text{C} \quad h \neq h_F \\ T_{\text{ein}} = 20^\circ\text{C} \quad U = U_F \\ Q_{\text{aus}} = 35 \text{ MJ}$$

Energie bilanz halboffenes system:

$$\Delta U = \Delta m_{\text{ein}} \cdot (h_{\text{ein}}) + Q_{\text{j}} \\ m_2 u_2 - m_1 u_1 = \Delta m_{\text{ein}} \cdot (h_{\text{ein}}) + Q_{\text{aus}}$$

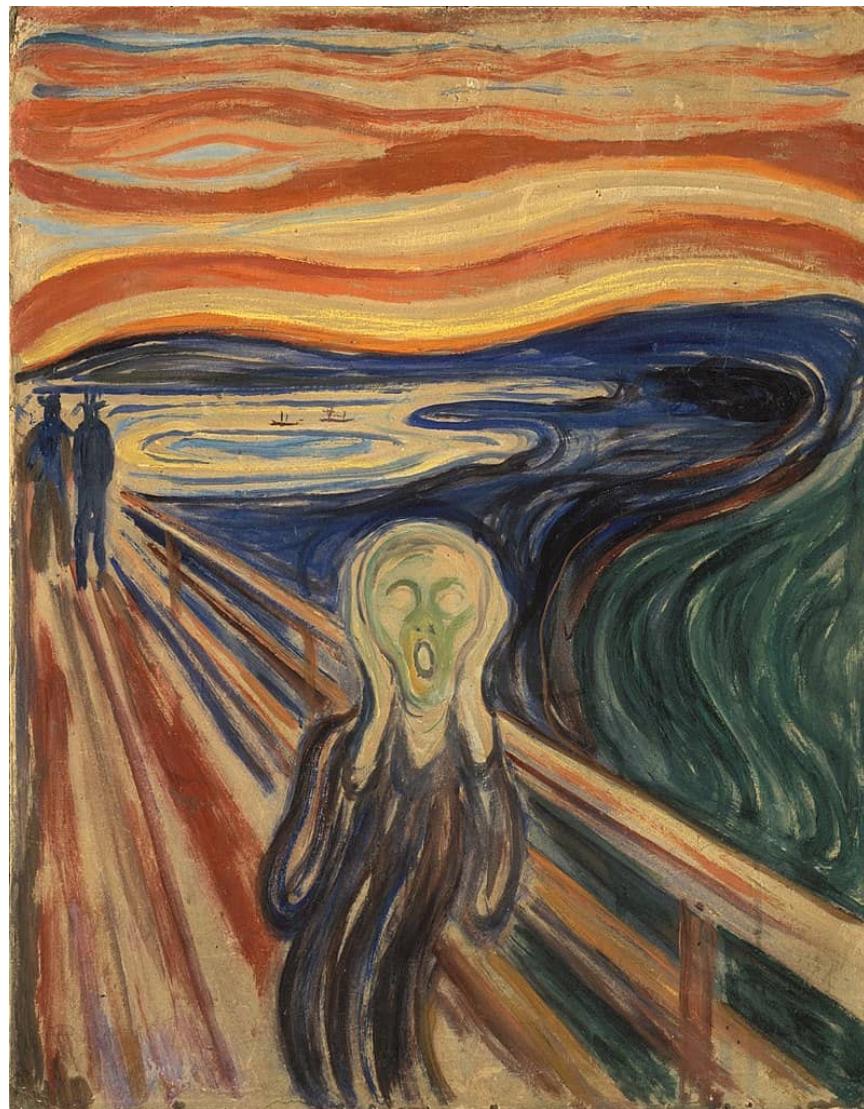
$$m_2 = m_1 + \Delta m_{\text{ein}}$$

$$m_1 = 5755 \text{ kg}$$

$$U_1 = 2506,5 \cdot 0,005 + (1-0,005) \cdot 478,94 = 429,38$$

$$U_2 = U(70^\circ\text{C}) = 292,95$$

$$h_{\text{ein}} = h(20^\circ\text{C}) = 83,96$$



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Copy URL

Part of [Chapter III: High-Risk AI System](#) → [Section 1: Classification of AI Systems as High-Risk](#)

## Article 6: Classification Rules for High-Risk AI Systems

Date of entry into force:

**2 August 2026 (2 August 2027 for Point 1)**

See here for a [full implementation timeline](#).

According to:

**Article 113**

SUMMARY

Annex III

(b) AI systems intended to be used to evaluate learning outcomes, including when those outcomes are used to steer the learning process of natural persons in educational and vocational training institutions at all levels;





[← Back to index](#)

Part of [Chapter III: High-Risk AI System](#) → [Section 2: Requirements for High-Risk AI Systems](#)

## Article 14: Human Oversight

Date of entry into force:  
**2 August 2026**

See here for a [full implementation timeline](#).

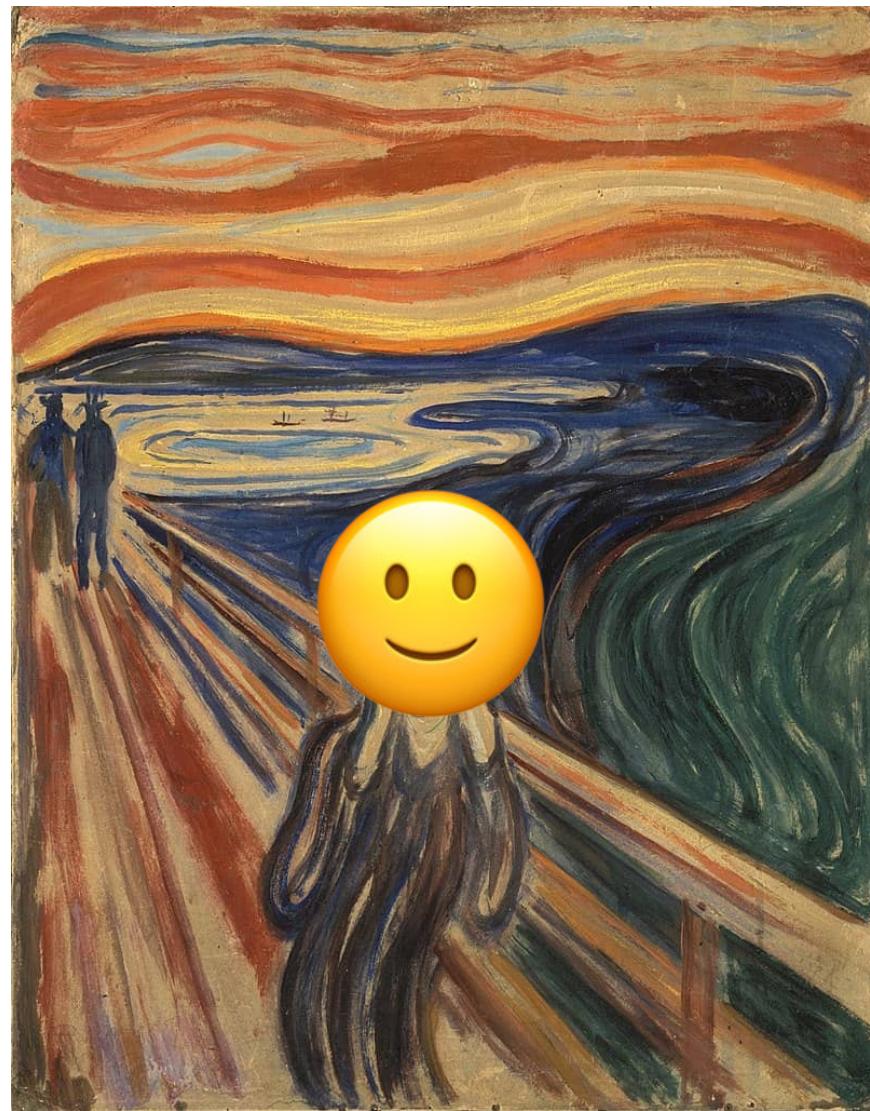
According to:  
**Article 113**

SUMMARY +

- High-risk AI systems shall be designed and developed in such a way, including with appropriate human-machine interface tools, that they can be effectively overseen by natural persons during the period in which they are in use.  
— used to evaluate learning outcomes, including when those persons are used to steer the learning process of natural persons in educational and vocational training institutions at all levels;



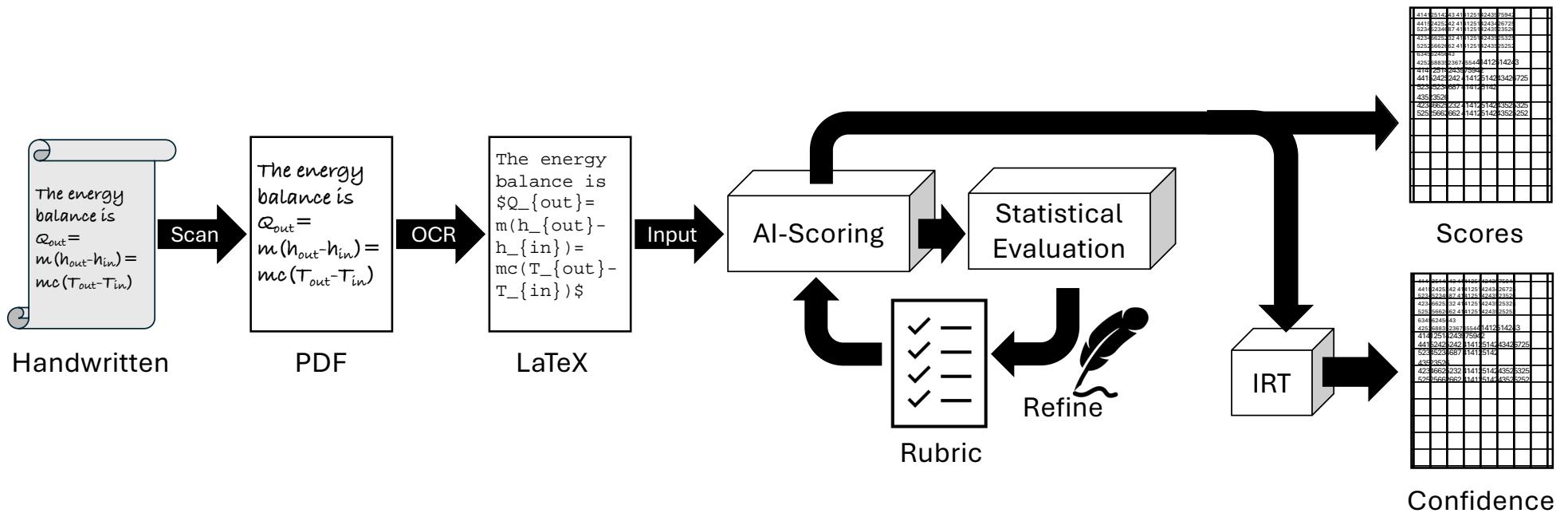
Kollaboration  
HiWi-KI



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# Workflow



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# Rubrik für Aufgabe 1

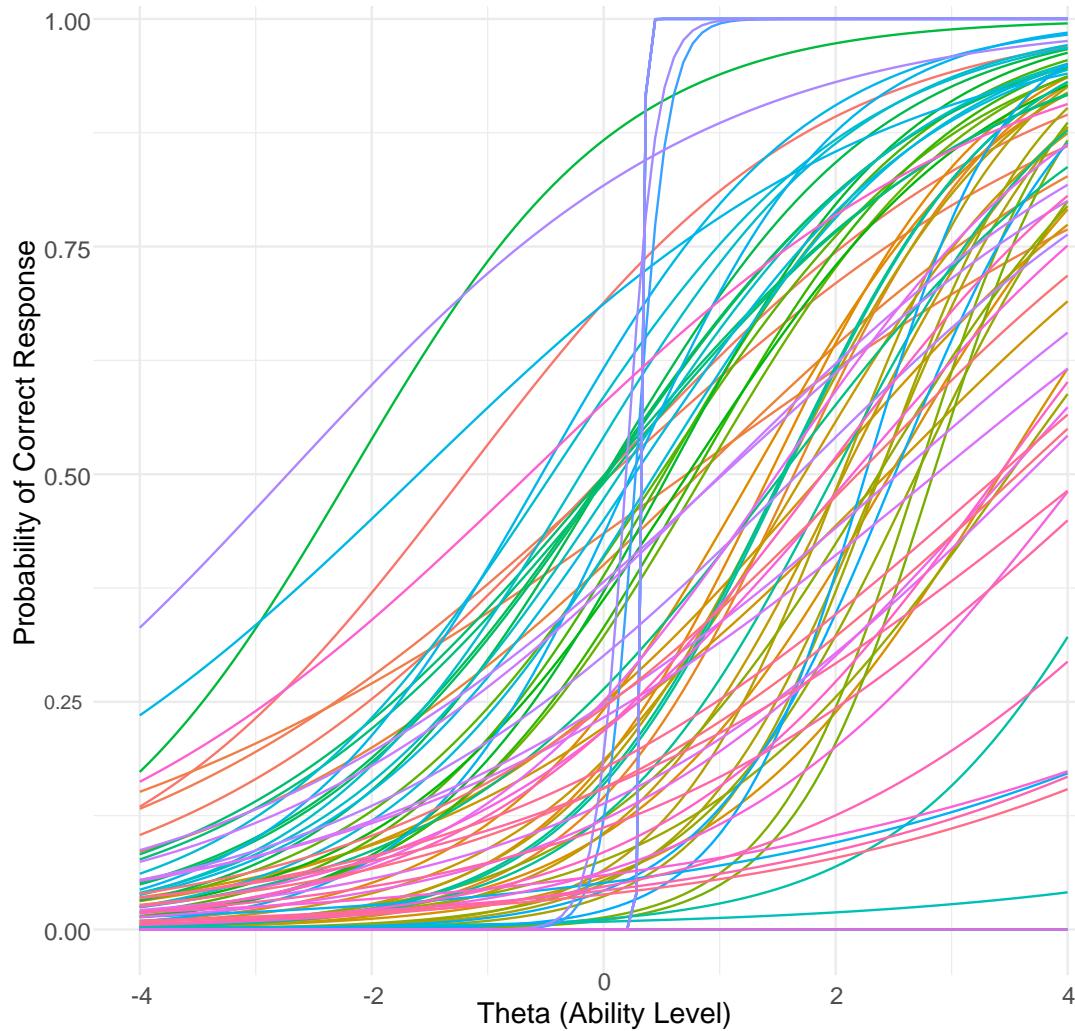


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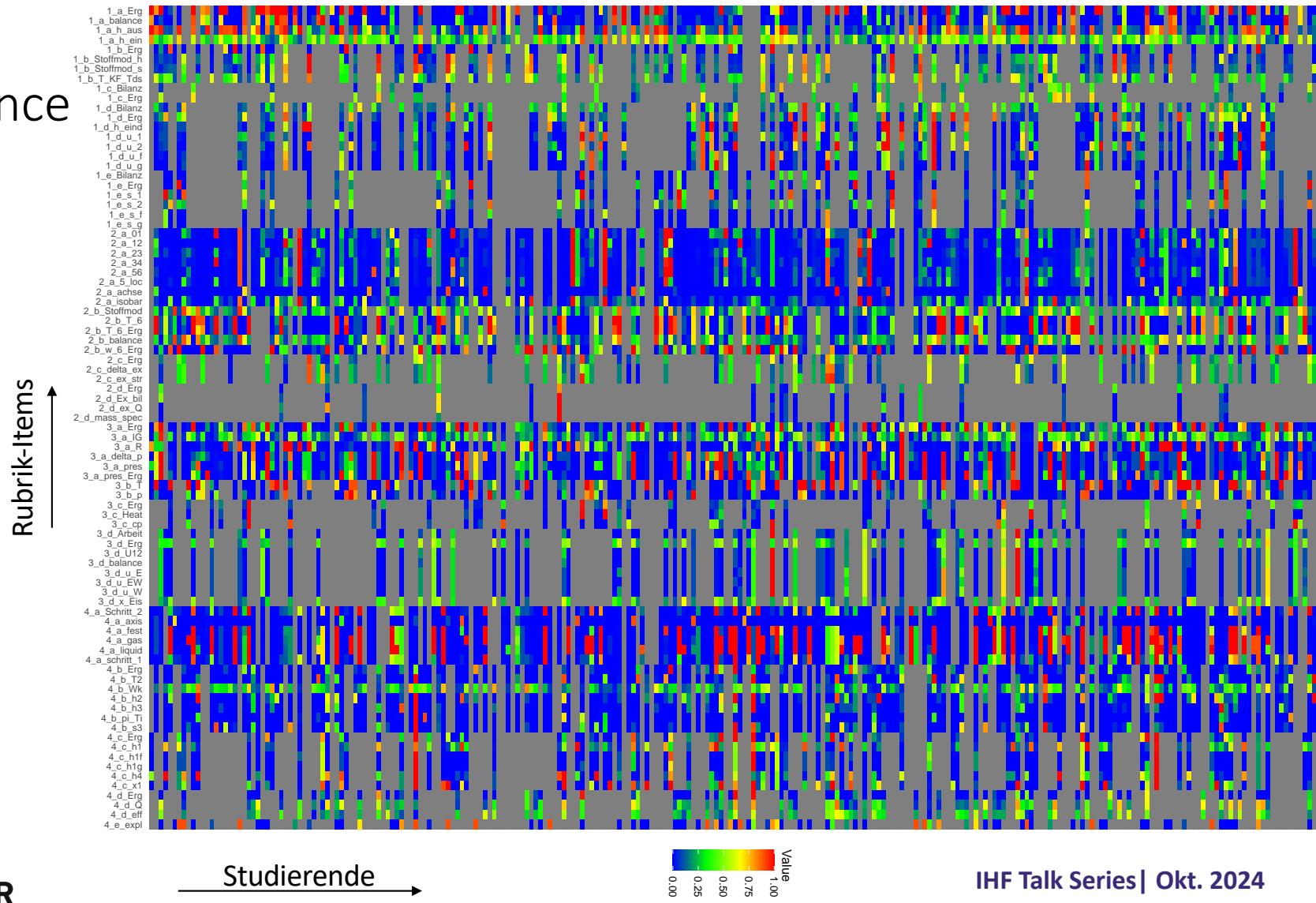
Item	Initial	First Refinement	Second Refinement
1_a_balance	Maximum credit (100%) for correct energy balance around the reactor to calculate the heat flow to the cooling jacket $\dot{Q}_{aus}$ . The correct equation is $0 = \dot{m}_{ein} \cdot h_{ein} - \dot{m}_{aus} \cdot h_{aus} + \dot{Q}_R - \dot{Q}_{aus}$ . Maximum credit can also be awarded for the simplified equation $\dot{Q}_{aus} = \dot{m} \cdot (h_{ein} - h_{aus}) + \dot{Q}_R$ . Maximum credit can also be given for equivalent equations. Less credit for minor errors.		
1_a_h_ein	Maximum credit (100%) for correctly calculated value of $h_{ein} = 292.98 \text{ kJ kg}^{-1}$ . Less credit for minor numerical errors.		
1_a_h_aus	Maximum credit (100%) for correctly calculated value of $h_{aus} = 419.04 \text{ kJ kg}^{-1}$ . Less credit for minor numerical errors.		
1_a_Erg	Maximum credit (100%) for correctly calculated value of $\dot{Q}_{aus} = 62.18 \text{ kW}$ . Less credit for minor numerical errors.		
1_b_T_KF_Tds	Maximum credit (100%) for correct derivation of the thermodynamic mean temperature of the cooling water flow $\bar{T}_{KF}$ . The correct equation is $\bar{T}_{KF} = \frac{q_{aus}}{s_{aus} - s_{ein}}$ . Maximum credit are also awarded if $q_{aus}$ is already exchanged with $h_{aus} - h_{ein}$ . Maximum credit can also be given for equivalent equations. Less credit for minor errors.		
1_b_Stoffmod_h	Maximum credit (100%) for correct usage of the ideal fluid model for the entropy to calculate $h_{aus} - h_{ein}$ . The correct equation is $h_{aus} - h_{ein} = c^if \cdot (T_{aus} - T_{ein})$ . Maximum credit can also be awarded if the equation is already inserted in the thermodynamic mean temperature equation from item 'b.T_KF_Tds'. Maximum credit can also be given for equivalent equations. Less credit for minor errors.		
1_b_Stoffmod_s	Maximum credit (100%) for correct usage of the ideal fluid model for the entropy to calculate $s_{aus} - s_{ein}$ . The correct equation is $s_{aus} - s_{ein} = c^if \cdot \ln \left( \frac{T_{aus}}{T_{ein}} \right)$ . Maximum credit can also be awarded if the equation is already inserted in the thermodynamic mean temperature equation from item 'b.T_KF_Tds'. Maximum credit can also be given for equivalent equations. Less credit for minor errors.		
1_b_Erg	Maximum credit (100%) for correctly calculated value of $\dot{T}_{KF} = 293.12 \text{ K}$ . Less credit for minor numerical errors.		
1_c_Bilanz	Maximum credit (100%) for correct entropy balance for calculation of entropy production due to heat transfer between reactor and cooling jacket. The correct equation is $0 = \frac{\dot{Q}_{aus}}{T_{Reaktor}} - \frac{\dot{Q}_{aus}}{\bar{T}_{KF}} + \dot{S}_{erz}$ . Maximum credit can also be given for equivalent equations. Less credit for minor errors.		
1_c_Erg	Maximum credit (100%) for correctly calculated value of $\dot{S}_{erz} = 0.0455 \text{ kW K}^{-1}$ . Less credit for minor numerical errors.		
1_d_u_f	Maximum credit (100%) for correctly calculated value of $u_f = 418.94 \text{ kJ kg}^{-1}$ . Less credit for minor numerical errors.		
1_d_u_g	Maximum credit (100%) for correctly calculated value of $u_g = 2506.5 \text{ kJ kg}^{-1}$ . Less credit for minor numerical errors.		
1_d_u_1	Maximum credit (100%) for correct equation for the inner energy $u_1$ . The correct equation is $u_1 = x_D \cdot u_g + (1 - x_D) \cdot u_f$ . Maximum credit can also be given for equivalent equations. Less credit for minor errors. The maximum credit can also be awarded if the correct value for $u_1 = 418.94 \text{ kJ kg}^{-1}$ were calculated. Less credit for minor numerical errors.		
1_d_u_2	Maximum credit (100%) for correctly calculated value of $u_2 = 292.95 \text{ kJ kg}^{-1}$ . Less credit for minor numerical errors.		
1_d_h_eind	Maximum credit (100%) for correctly calculated value of $h_{ein} = 83.96 \text{ kJ kg}^{-1}$ . Less credit for minor numerical errors.		
1_d_Bilanz	Maximum credit (100%) for correct energy balance in an open system for determining added water mass $\Delta m_{12}$ . The correct equation is $(m_{ges,1} + \Delta m_{12}) \cdot u_2 - m_{ges,1}u_1 = \Delta m_{12}h_{ein} - Q_{aus,12} + Q_{R,12}$ . Maximum credit can also be awarded for the simplified equation $(m_{ges,1} + \Delta m_{12}) \cdot u_2 - m_{ges,1}u_1 = \Delta m_{12}h_{ein}$ . Maximum credit can also be given for equivalent equations. Less credit for minor errors.		
1_d_Erg	Maximum credit (100%) for correctly calculated value of $\Delta m_{12} = 3756.84 \text{ kg}$ . Less credit for minor numerical errors.		
1_e_s_f	Maximum credit (100%) for correctly calculated value of $s_f = 1.3069 \text{ kJ kg}^{-1} \text{ K}^{-1}$ . Less credit for minor numerical errors.		
1_e_s_g	Maximum credit (100%) for correctly calculated value of $s_g = 7.3549 \text{ kJ kg}^{-1} \text{ K}^{-1}$ . Less credit for minor numerical errors.		
1_e_s_1	Maximum credit (100%) for correct equation for the entropy $s_1$ . The correct equation is $s_1 = x_D \cdot u_g + (1 - x_D) \cdot u_f$ . Maximum credit can also be given for equivalent equations. Less credit for minor errors. The maximum credit can also be awarded if the correct value for $s_1 = 1.3371 \text{ kJ kg}^{-1} \text{ K}^{-1}$ were calculated. Less credit for minor numerical errors.		
1_e_s_2	Maximum credit (100%) for correctly calculated value of $s_2 = 0.9549 \text{ kJ kg}^{-1} \text{ K}^{-1}$ . Less credit for minor numerical errors.		
1_e_Bilanz	Maximum credit (100%) for correct entropy balance. The correct equation is $\Delta S_{12} = (m_{ges,1} + \Delta m_{12}) \cdot s_2 - m_{ges,1} \cdot s_1$ . Maximum credit can also be given for equivalent equations. Less credit for minor errors.		
1_e_Erg	Maximum credit (100%) for correctly calculated value of $\Delta S_{12} = 1387.62 \text{ kJ K}^{-1}$ . Less credit for minor numerical errors.		

# Confidence

- Bayesian statistics
- Item Response Theory:
  - Wahrscheinlichkeit, dass ein Studierender mit “Ability” Theta einen bestimmten Rubrik-Item korrekt löst

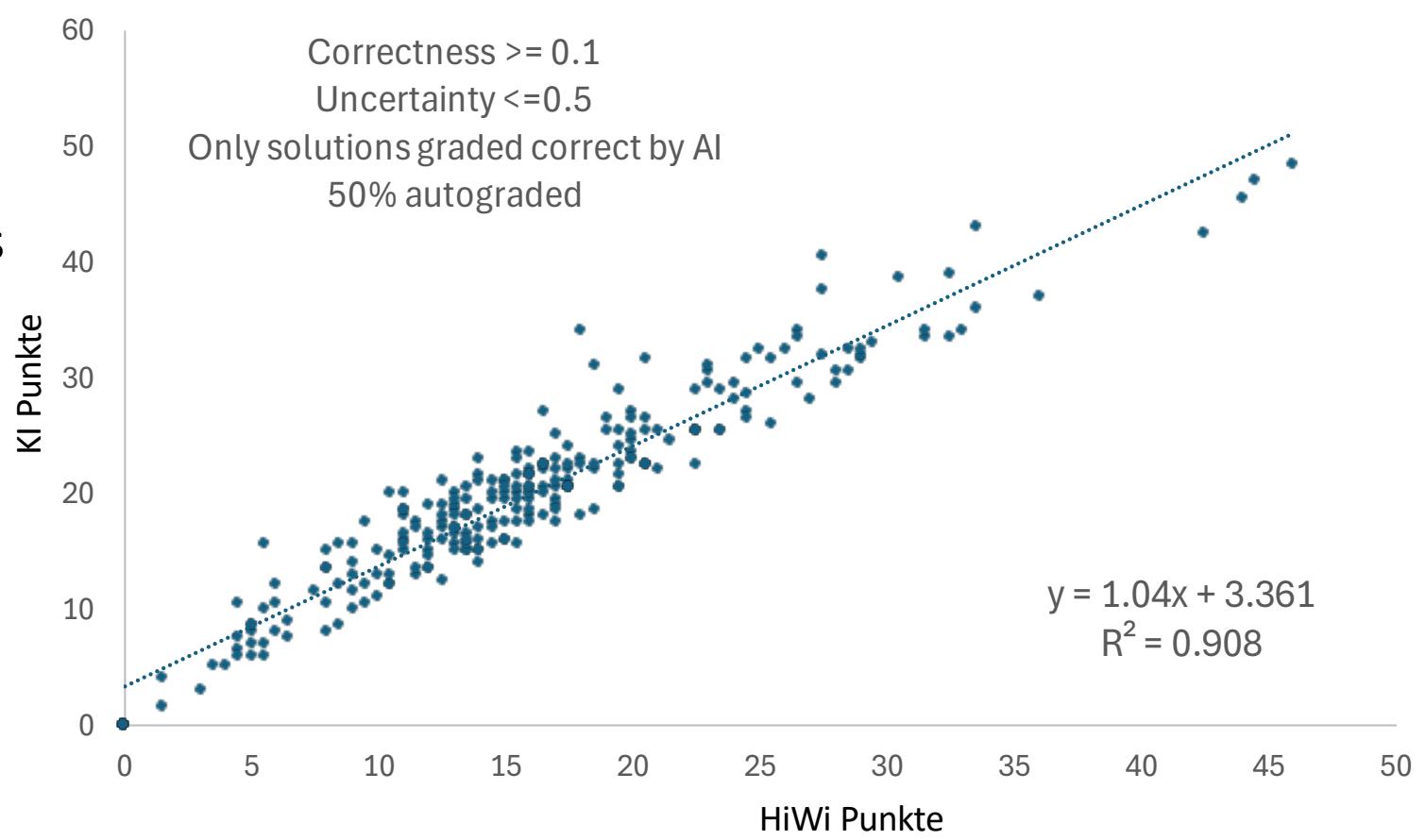


# Confidence Matrix



# Ergebnis

Kollaboration  
zwischen HiWis  
und KI

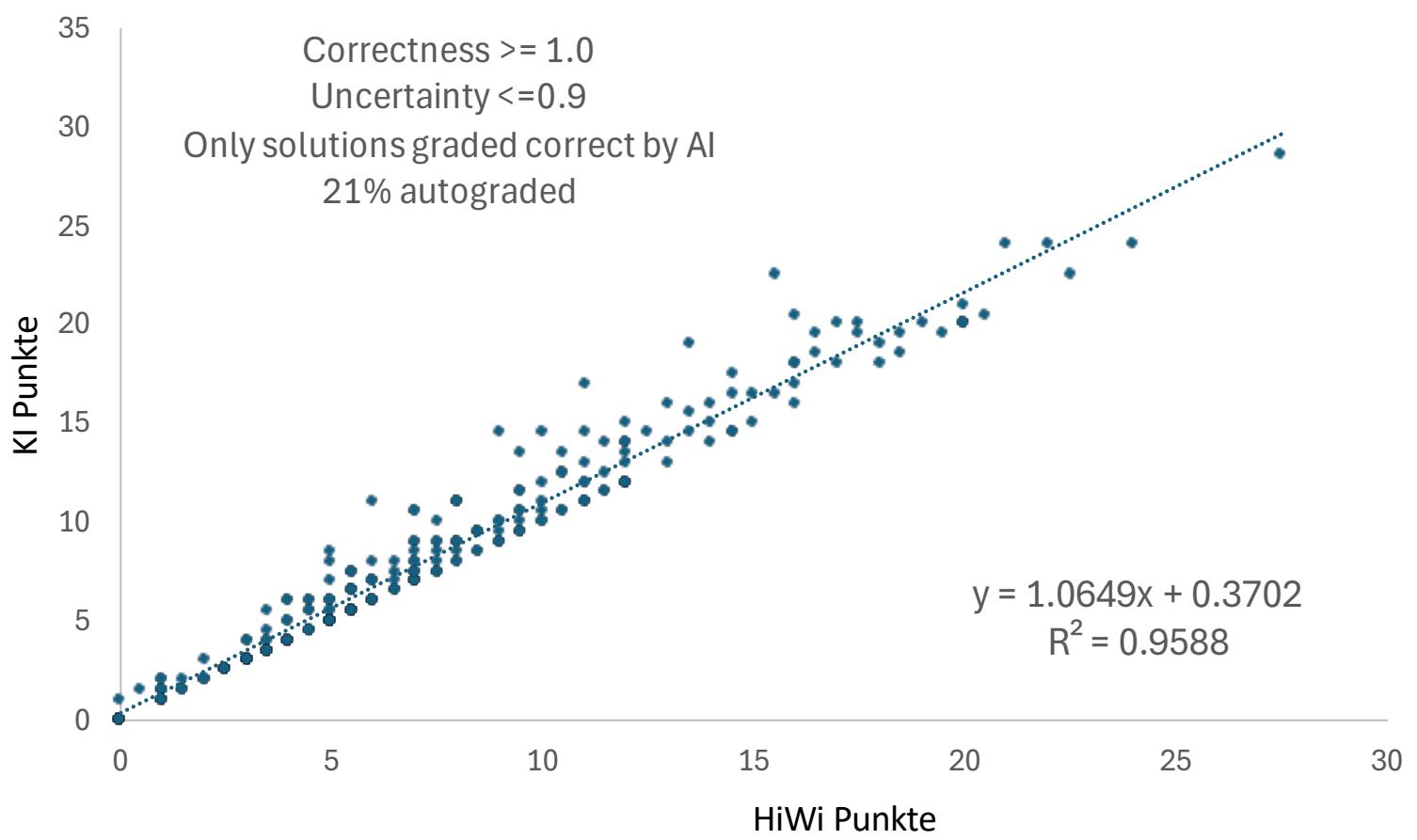


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# Ergebnis

Kollaboration  
zwischen HiWis  
und KI



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# Kosten

- Die Kosten betragen derzeit 7 Euro pro Prüfung.
  - Wenn nur 21% der Noten akzeptiert werden, sind das 35 Euro pro erfolgreicher Bewertung. 😞
  - ... aber das sind 10 Bewertungsdurchläufe ... übertrieben.
    - Es ist bereits klar, dass eine Anpassung der Anzahl der Durchläufe ausreicht, vielleicht: nach drei übereinstimmenden Durchläufen fortfahren
    - nach fünf nicht übereinstimmenden Durchläufen aufgeben und an einen Menschen weitergeben
- Andererseits:
  - Wie lange braucht ein HiWi, um 12 handgeschriebene Seiten mit einem 85-Punkte-Rubrik zu bewerten?
    - Was wird dem HiWi bezahlt?

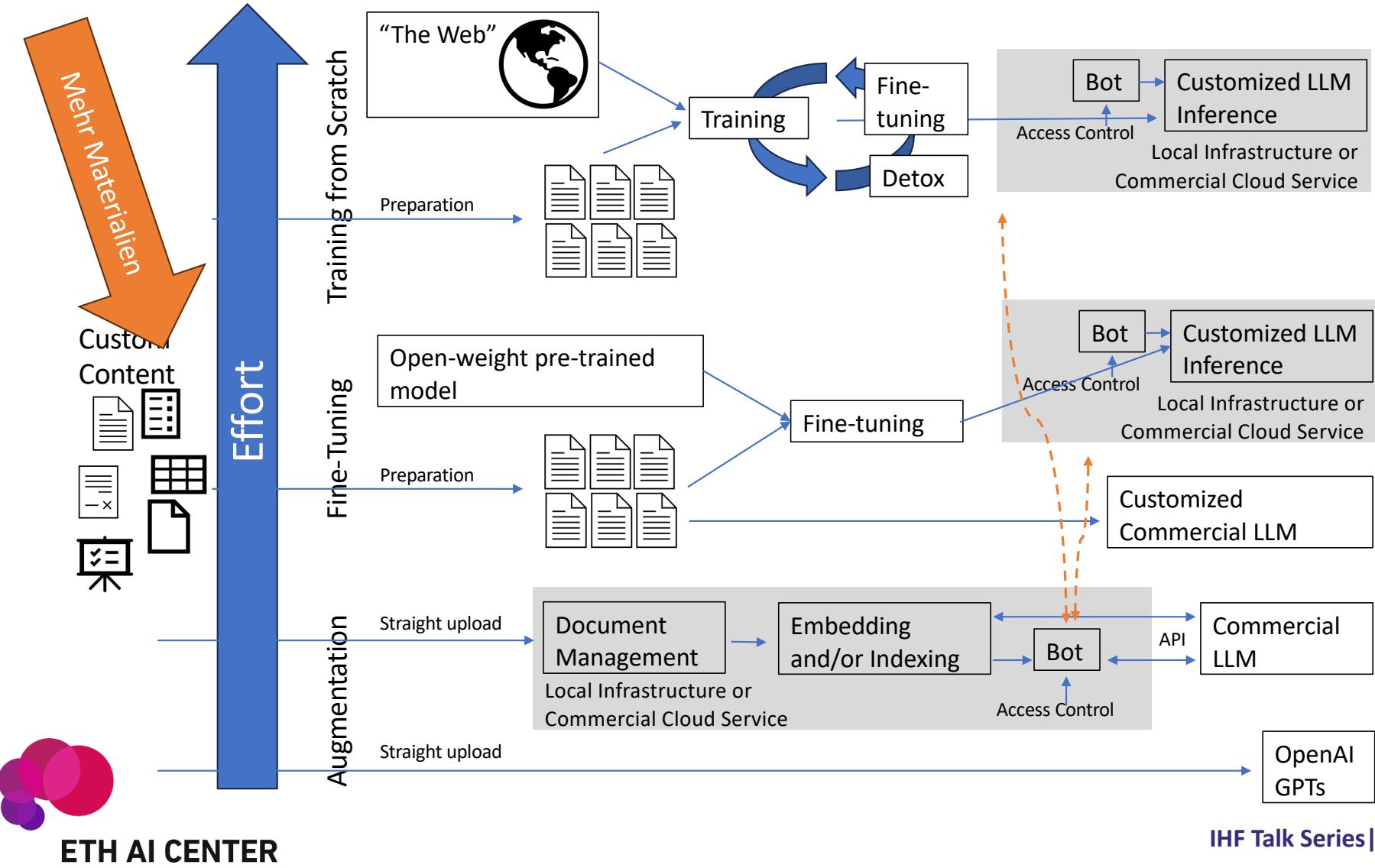


Was jetzt passiert



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# Masterarbeit

Beispiel 1

Verifiziere Stokes d.h.  $\oint_C \vec{F} \cdot d\vec{r} = \iint_S \text{rot } \vec{F} \cdot d\vec{S}$

für  $\vec{F}(x,y,z) = (z-y, x, -x)$   
 und  $S = \{(x,y,z) \mid x^2 + y^2 + z^2 = 4, z \geq 0\}$

Standardparam. von  $S$ :  $r(\varphi, \theta) = (2 \cos \varphi \sin \theta, 2 \sin \varphi \sin \theta, 2 \cos \theta)$   
 $\downarrow$   
 $\vec{n} = r_\varphi \times r_\theta = (-2 \sin \varphi \sin \theta, -2 \sin \varphi \cos \theta, 2 \cos \varphi)$ ,  $-\pi \leq \varphi \leq \pi$ ,  $0 \leq \theta \leq \frac{\pi}{2}$

Konsistente Param. von  $C$ :  $\tilde{r}(t) = (2 \cos t, 2 \sin t, 0)$ ,  $0 \leq t \leq 2\pi$

$\oint_C \vec{F} \cdot d\vec{r} = \int_0^{2\pi} \left( \begin{array}{c} 2 \sin t \\ 2 \cos t \\ -2 \cos t \end{array} \right) \cdot \left( \begin{array}{c} -2 \sin t \\ -2 \sin t \\ 0 \end{array} \right) dt = -8\pi$

## Beispiel 1

Verifiziere Stokes d.h.  $\oint_C \vec{F} \cdot d\vec{r} = \iint_S \text{rot } \vec{F} \cdot d\vec{S}$   
 für  $\vec{F}(x,y,z) = (z-y, x, -x)$   
 und  $S = \{(x,y,z) \mid x^2 + y^2 + z^2 = 4, z \geq 0\}$   
 Standardparam. von  $S$ :  $\mathbf{r}(\phi, \theta) = (2 \cos \phi \sin \theta, 2 \sin \phi \sin \theta, 2 \cos \theta)$   
 $\mathbf{n} = \mathbf{r}_\phi \times \mathbf{r}_\theta$ ,  $-\pi \leq \phi \leq \pi$ ,  $0 \leq \theta \leq \frac{\pi}{2}$   
 Konstante Param. von  $C$ :  $\mathbf{r}(t) = (2 \cos t, 2 \sin t, 0)$ ,  $0 \leq t \leq 2\pi$

$$\oint_C \vec{F} \cdot d\vec{r} = \int_0^{2\pi} \begin{pmatrix} -2 \sin t \\ 2 \cos t \\ -2 \cos t \end{pmatrix} \cdot \begin{pmatrix} -2 \sin t \\ 2 \cos t \\ 0 \end{pmatrix} dt = -8\pi$$

(Beschreibe hier die Grafik, die eine parametrisierte Fläche  $S$  und eine geschlossene Kurve  $C$  zeigt, sowie die Vektoren und Orientierung.)

An der Stelle des Kommentars "(Beschreibe hier die Grafik, ...)" solltest du eine Beschreibung der Grafik einfügen. Diese Grafik zeigt eine parametrisierte Oberfläche  $S$ , welche als Halbkugel mit Radius 2 dargestellt ist. Die geschlossene Kurve  $C$  entspricht dem Kreis am Äquator der Halbkugel, positiv orientiert (gegen den Uhrzeigersinn, wenn man von oben auf die x-y-Ebene blickt). Die Vektoren  $\mathbf{r}_\phi$  und  $\mathbf{r}_\theta$  sind Tangentialvektoren an die Fläche, und der Vektor  $\mathbf{n}$  zeigt senkrecht aus der Oberfläche heraus und dient als Normalenvektor.

GPT-4V



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## Unfortunately, some minor hallucinations

Beispiel 1

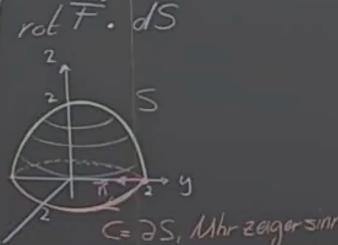
Verifiziere Stokes d.h.  $\oint_C \vec{F} \cdot d\vec{r} = \iint_S \text{rot } \vec{F} \cdot d\vec{S}$

für  $\vec{F}(x,y,z) = (z-y, x, -x)$   
 und  $S = \{(x,y,z) \mid x^2 + y^2 + z^2 = 4, z \geq 0\}$

Standardparam. von  $S$ :  $r(\phi, \theta) = (2 \cos \phi \sin \theta, 2 \sin \phi \sin \theta, 2 \cos \theta)$   
 $\downarrow$   
 $\vec{n} = r_\phi \times r_\theta = (-2 \sin \phi \sin \theta, -2 \sin \phi \cos \theta, 2 \sin \theta), -\pi \leq \phi \leq \pi, 0 \leq \theta \leq \frac{\pi}{2}$

Konsistente Param. von  $C$ :  $\tilde{r}(t) = (2 \cos t, -2 \sin t, 0), 0 \leq t \leq 2\pi$

$\oint_C \vec{F} \cdot d\vec{r} = \int_0^{2\pi} \begin{pmatrix} 2 \sin t \\ 2 \cos t \\ -2 \cos t \end{pmatrix} \cdot \begin{pmatrix} -2 \sin t \\ -2 \cos t \\ 0 \end{pmatrix} dt = -8\pi$



... then later complains that this should be  $8\pi$  instead of  $-8\pi$

## Beispiel 1

Verifiziere Stokes d.h.  $\oint_C \vec{F} \cdot d\vec{r} = \iint_S \text{rot } \vec{F} \cdot d\vec{S}$   
 für  $\vec{F}(x,y,z) = (z-y, x, -x)$   
 und  $S = \{(x,y,z) \mid x^2 + y^2 + z^2 = 4, z \geq 0\}$   
 Standardparam. von  $S$ :  $\mathbf{r}(\phi, \theta) = (2 \cos \phi \sin \theta, 2 \sin \phi \sin \theta, 2 \cos \theta)$   
 $\mathbf{n} = \mathbf{r}_\phi \times \mathbf{r}_\theta, -\pi \leq \phi \leq \pi, 0 \leq \theta \leq \frac{\pi}{2}$   
 Konstante Param. von  $C$ :  $\mathbf{r}(t) = (2 \cos t, 2 \sin t, 0), 0 \leq t \leq 2\pi$

$$\oint_C \vec{F} \cdot d\vec{r} = \int_0^{2\pi} \begin{pmatrix} 2 \sin t \\ 2 \cos t \\ -2 \cos t \end{pmatrix} \cdot \begin{pmatrix} -2 \sin t \\ -2 \cos t \\ 0 \end{pmatrix} dt = -8\pi$$

(Beschreibe hier die Grafik, die eine parametrisierte Fläche  $S$  und eine geschlossene Kurve  $C$  zeigt, sowie die Vektoren und Orientierung.)

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und dient als Normalenvektor. ?????

GPT-4V



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# Laufendes Projekt

- Situationsbedingter Rollen- oder sogar LLM-Wechsel:
  - Coach
  - Lecturer
  - Study-Buddy
- Wichtig: darf nicht durch unverhältnismäßige Pädagogik nerven!
  - GPT ist nur einen Mausklick entfernt!

Was Ethel im Moment macht

Coach Role

Lecturer Role

Why would it not matter if you put the axis in the center or attach it to the side?

Because it's the same object, so it has the same moment of inertia.

Think about the parallel axis theorem from lecture

Yeah, that was just some long derivation, no idea what that was about. Can you explain it to me?

The moment of inertia of any object about an axis through its center of mass is ...



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# Semesterprojekt

Give me an exercise on scalar derivatives of a vector

What is the derivative of

$$\begin{pmatrix} 4 t^3 \\ 8 t^8 \end{pmatrix}$$

with respect to  $t$ ?

You need to multiply with the original exponent.

**Submit Answer**

**Incorrect. Tries 1**



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Basierend auf LON-CAPA

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# Laufendes Projekt

- Feedback zu Hausübungen als Jupyter Notebook



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## Part B

Aufgabe B (3 Punkte)  
Schneiden Sie das DataFrame `df` auf den Bereich zu, in dem die Einträge der Spalte 'Parameter' dem Wert 'RainDur', d.h. Regendauer, entsprechen und wo die Einträge der Spalte 'Standort' der Messstation 'Zch\_Rosengartenstrasse' entsprechen. Legen Sie die Spalte 'Datum' als Index fest. Hierdurch wandeln Sie das DataFrame in eine Zeitserie um. Geben Sie das umgeformte DataFrame unter der Variable `df_regen` zurück.

```
def aufgabe_b(df):
    ...
    # Wandelt das DataFrame df so um, dass es nur Einträge vom Parameter-Typ 'RainDur' und vom Standort 'Zch_Rosengartenstrasse' enthält. Setzt das Datum als Zeitindex fest.
    Eingabe:   (pd.DataFrame) = Eingabe-DataFrame
    Ausgabe:   df_regen (pd.DataFrame) = Ausgabe-DataFrame
    ...
    # Beschreiken Sie das DataFrame auf den Bereich,
    # in dem 'Parameter' den Wert 'RainDur' und 'Standort' den Wert 'Zch_Rosengartenstrasse' hat
    df_regen = df_wetter[(df_wetter['Parameter'] == 'RainDur') & (df_wetter['Standort'] == 'Zch_Rosengartenstrasse')]
    # Legen Sie die Spalte 'Datum' als Index fest
    df_regen = df_regen.set_index('Datum')

    return df_regen

# Funktion aufrufen
df_regen = aufgabe_b(df_wetter.copy(deep=True))
display(df_regen)
```

The student's code for **Aufgabe B** aims to manipulate a given DataFrame by filtering and reformatting it according to specific criteria outlined in the problem statement. Here's an assessment of how the provided code matches the requirements:

### Code Analysis and Requirements Check

#### 1. Filtering DataFrame:

- The code uses a conditional filter: `df[(df['Parameter'] == 'RainDur') & (df['Standort'] == 'Zch_Rosengartenstrasse')]` to narrow down the DataFrame to only include entries where the 'Parameter' column has the value 'RainDur' and the 'Standort' column has the value 'Zch\_Rosengartenstrasse'. This meets the requirement to filter the data based on specified conditions.

#### 2. Setting the Index:

- The `df_regen = df_regen.set_index('Datum')` line sets the 'Datum' column as the DataFrame index, converting the DataFrame into a time series format. This aligns with the requirement to use the date as the index.

#### 3. Returning the Modified DataFrame:

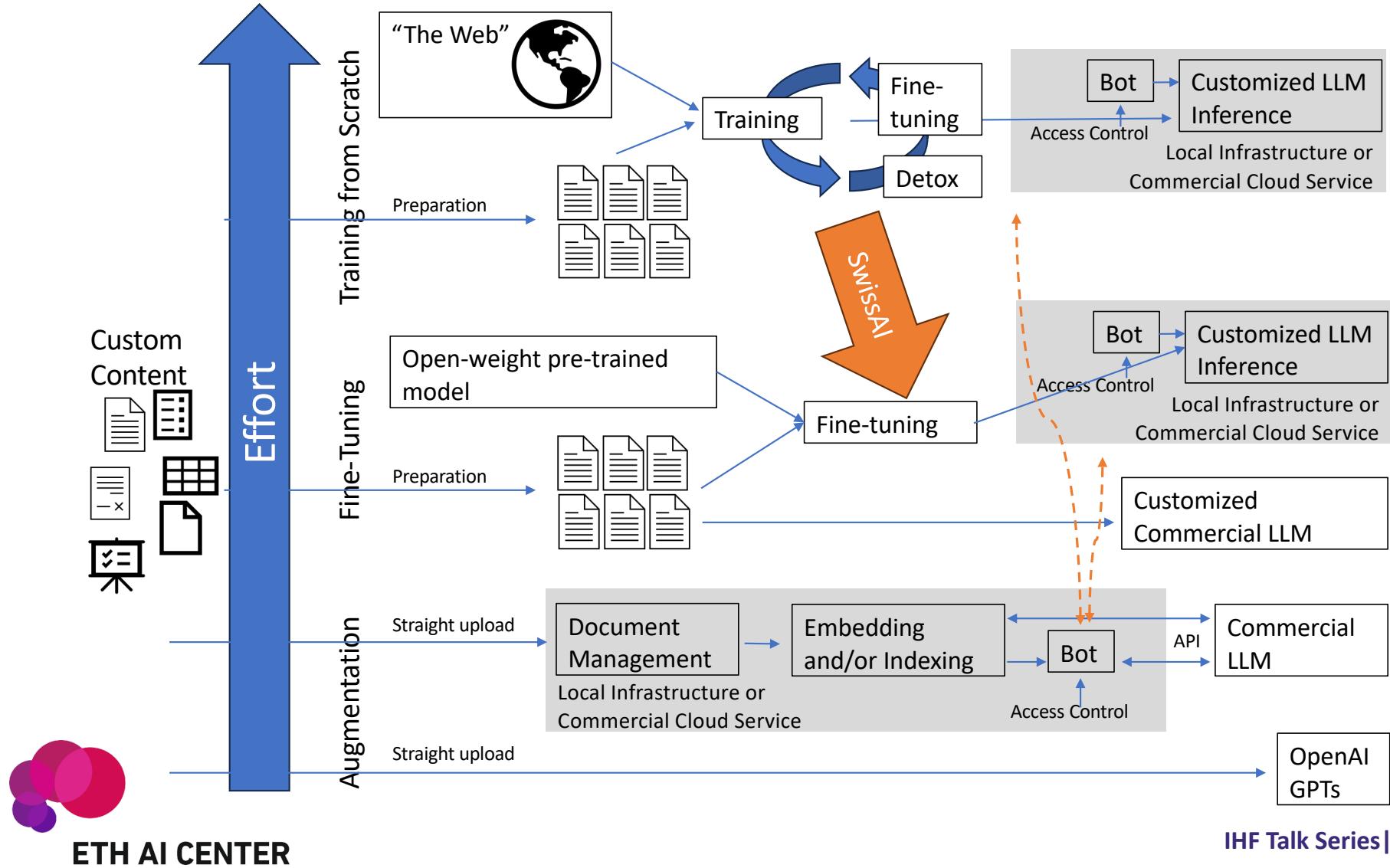
- The function correctly returns the modified DataFrame `df_regen`, which only includes the relevant entries based on the specified conditions and has the date set as the index.

### Code Corrections Needed

The code itself appears functionally correct for the specified task, but there are a couple of issues to address:

#### • Variable Reference:

- The student uses `df_wetter` inside the function `aufgabe_b`, but the input parameter is named `df`. This might be a typographical error, and the variable used inside the function should match the function's parameter. So, `df_wetter` should be replaced with `df`.



# Laufendes Projekt

- Fine-Tuning basierend auf Llama 3.1 und Vorlesungsauszeichnungen



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16/14



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