

Arbeitskreis Blockchain

# Blockchains & AI?

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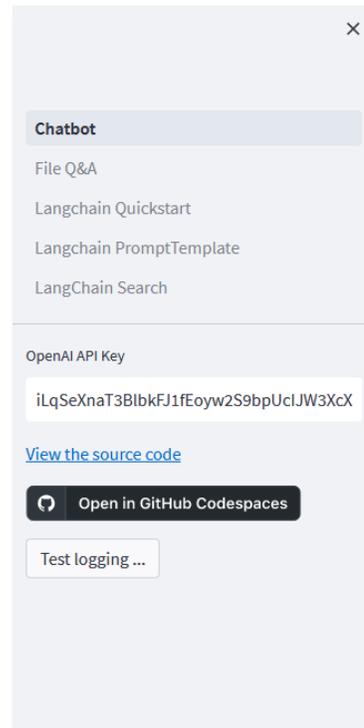


# Blockchains & AI

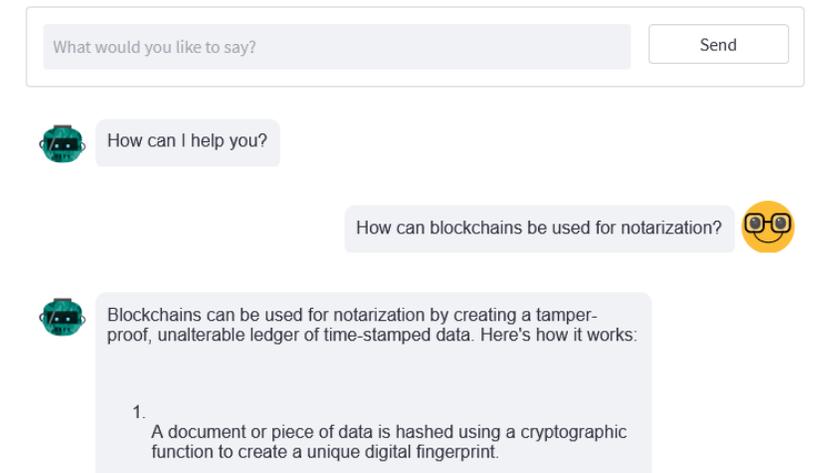
- Wie hängen diese Themen zusammen?
- Wie kann AI die Blockchain Technologie nutzen?
- Wie können Blockchains AI nutzen?
  
- „Blockchains und Notarisierung“?
- „AI, Blockchains und IoT“?
  
- Fragen wir einfach mal „die AI“ dazu ...

# Systemumgebung (AUSTRIAPRO TestLab)

- Eigene Webapp dazu
  - Basis: Streamlit Chatbot - <https://streamlit.io/>
- LLM: OpenAI „gpt-3.5-turbo“
- OpenAI API Key
- Wozu eigene Implementierung?
  - LLMs auswählen
  - Parameter definieren
  - Logging (Details)
  - Weitere Anwendungen



## Streamlit GPT - Test for AUSTRIAPRO



# Konkrete Fragen

- How can AI use blockchain technology?
- How would blockchains benefit from AI?
  
- How can blockchains be used for notarization?
- Does notarization work with AI?
- How can IoT benefit from AI?

# How can AI use blockchain technology?

AI and blockchain technology have the potential to work together in various ways to improve efficiency and security in a wide range of industries. Here are some ways AI can use blockchain technology:

- **Data Security:** AI algorithms operate on vast amounts of data, some of which may be sensitive or confidential. Blockchain technology can be used to store, manage, and secure data used by AI systems. The blockchain's **decentralized and tamper-proof** nature ensures that data is **trustworthy** while AI algorithms can be employed to **identify and prevent malicious activities** that can compromise data.
- **Decentralized AI Networks:** Instead of relying on centralized servers for AI data processing, blockchain technology can be used to create decentralized networks where **AI algorithms run on multiple nodes**. This can enhance the speed, scalability, and transparency of AI systems.
- **Data Sharing:** AI requires large amounts of diverse data to train machine learning models. Blockchain can facilitate the sharing of data between multiple parties without compromising data privacy through the use of smart contracts that enforce the terms of data sharing agreements.
- **AI Governance:** Finally, blockchain can be used to ensure transparent, ethical, and secure governance of AI systems. By introducing immutable and secure audit trails, blockchain can facilitate the monitoring, reporting, and auditing of AI systems.

These are just a few examples of how AI can use blockchain technology to enhance performance, security, and transparency in various industries.

# Do you have more examples?

Sure, here are some more examples of how AI and blockchain technology can be applied together:

- **Supply chain management:** Blockchain can be used to track the movements of assets throughout a supply chain, while AI can be used to analyze this data and provide insights such as optimizing inventory levels and predicting supply chain disruptions.
- **Healthcare:** Blockchain can be used to securely store and manage sensitive patient data while AI can be used to analyze this data for diagnostic and treatment purposes.
- **Fraud detection:** Blockchain and AI can be combined to enhance fraud detection and prevention in various industries. AI algorithms can analyze patterns in data and transactions to identify potential fraud, while blockchain can store this data in a secure and tamper-proof manner.
- **Financial services:** Blockchain can be used to facilitate secure and transparent financial transactions while AI can be used to analyze market data and provide personalized investment advice.
- **Autonomous vehicles:** Blockchain can be used to enhance the security and transparency of data exchange between autonomous vehicles. AI can be used for decision-making algorithms used by autonomous vehicles.

These are just a few examples of the potential applications of combining AI and blockchain technology. As both technologies continue to evolve, we can expect to see even more innovative and impactful partnerships emerge.

# How would blockchains benefit from AI?

Blockchains could benefit from AI in several ways:

- **Smart Contracts:** AI algorithms can enhance the functionality of smart contracts by enabling them to be more adaptable to changing conditions. Smart contracts can be programmed to use AI algorithms to modify payment amounts, delivery schedules, or other parameters based on real-time data inputs.
- **Data Analysis:** Blockchains store a vast amount of data. AI can be used to analyze this data to uncover insights that can enhance operational efficiency, supply chain management, or marketing and sales strategies.
- **Predictive Maintenance:** Blockchains can store data from IoT and sensor devices that monitor equipment or machinery. AI algorithms can analyze this data to identify when maintenance is required or when equipment is likely to fail.
- **Fraud Detection:** Blockchains can be used to detect attempts at fraudulent transactions in real-time. AI algorithms can monitor transactional data to identify patterns of fraud and enhance fraud detection.
- **Recommendation Engines:** Blockchains can be used to store data on customers and user preferences. AI algorithms can use this data to develop recommendation engines that provide personalized product or service recommendations.

Combining AI and blockchain technology can lead to faster and more accurate decision-making, enhanced data analysis, and improved security and transparency. AI algorithms can provide new functionality to blockchains by making them more adaptable to changing conditions and unlocking new insights from stored data.

# How can blockchains be used for notarization?

Blockchains can be used for notarization by providing a **secure and tamper-proof way to verify the existence and authenticity of a document or any kind of digital asset at a certain point in time**. By storing a unique fingerprint (also known as “hash”) of the document on the blockchain, anyone can later verify that the document has not changed since it was notarized. Here are the basic steps involved:

- **Create a hash** of the digital asset that will be notarized: A hash is a unique fingerprint of a document. This can be done through various ways, but the most common technique is to use an algorithm called SHA-256.
- **Store the hash** of the document on the **blockchain**: Some blockchains provide notarization services, enabling users to upload the hash of a document onto the blockchain through a specific transaction.
- **Validate the existence and integrity** of the document: Anyone can compare the hash of the original document to the hash stored on the blockchain to verify its authenticity and that it has not been altered.

By using blockchains for notarization, users can dramatically reduce the **risk of fraud**, as it becomes extremely difficult to modify or fake transactions that have been recorded in multiple nodes of a distributed ledger.

# Does notarization work with AI?

Notarization usually involves physical authentication of documents, such as a stamp or signature by a notary public. However, digital notarization can be achieved using **AI in combination with blockchain technology**. AI can be used to **verify the accuracy and integrity of documents in real-time**, and **blockchain can provide an immutable and transparent record of the notarization process**.

- AI can use **natural language processing (NLP)** and **optical character recognition (OCR)** tools to extract relevant data from documents to verify their authenticity. Additionally, AI can use image analysis to verify the presence of signatures, seals, or other data points that require authentication.
- For example, a digital notarization platform that uses AI could receive a digital document and **automatically extract relevant information** such as the document's date, time, and contents. It could then analyze the document to **check for any inconsistencies** or fraud.
- Once the document is validated by AI, a **smart contract** on a blockchain could be executed to record the document's authenticity and information about the notarization. Every time the document is accessed, this blockchain will provide the assurance that the document has not been modified since its original notarization.

In summary, while notarization is traditionally a physical process, **AI and blockchain technology can be used to achieve digital notarization by validating documents and then recording the notarization on a blockchain**.

# How can IoT benefit from AI?

IoT and AI are **complementary technologies** that can be used together to **unlock new insights and functionalities**. Here are some ways that IoT can benefit from AI:

- **Predictive Maintenance:** IoT devices collect vast amounts of data on equipment and machinery. AI algorithms can be used to analyze this data to identify patterns that predict when maintenance is required or when equipment may fail. This can help to reduce downtime and maintenance costs.
- **Operational Efficiency:** By analyzing data from IoT devices, AI algorithms can identify areas where operational efficiency can improve. For example, optimizing energy usage in buildings, managing inventory levels in warehouses, or predicting the stock level of product inventory in retail outlets.
- **Quality Control:** IoT devices collect data throughout the production process, from the assembly line to the finished product. This data can be analyzed by AI algorithms to identify quality control issues before products are shipped.
- **Personalized Customer Experience:** By collecting data from IoT devices worn by customers or installed in their homes, AI algorithms can develop personalized recommendations and services such as streaming music, news, or entertainment content to customers.
- **Safety:** IoT sensors and devices can detect safety hazards across different industries. AI can be used to analyze these data feeds to detect dangerous or unsafe conditions that may otherwise go unnoticed.

In summary, combining IoT and AI can lead to enhanced operational efficiency, improved safety, better quality control, predictive maintenance, and a personalized customer experience. With advances in IoT and AI technology, we can expect to see innovative applications emerge in the years ahead.

# Zusammenfassung 1

- Viele(?) buzzwords
  - 4%
- „jo eh ...“ Aussagen
- Aber: Präsentation (Formulierung)
  - Strukturiert
  - (Tlw. Gut) argumentiert
  - (Rechtschreibung gut)

## Buzzwords Detector

Buzzwords Words Found: 52 out of 1,412 (4%)

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These are just a few examples of how AI can use blockchain technology to enhance performance, security, and transparency in various industries.

# Zusammenfassung 2

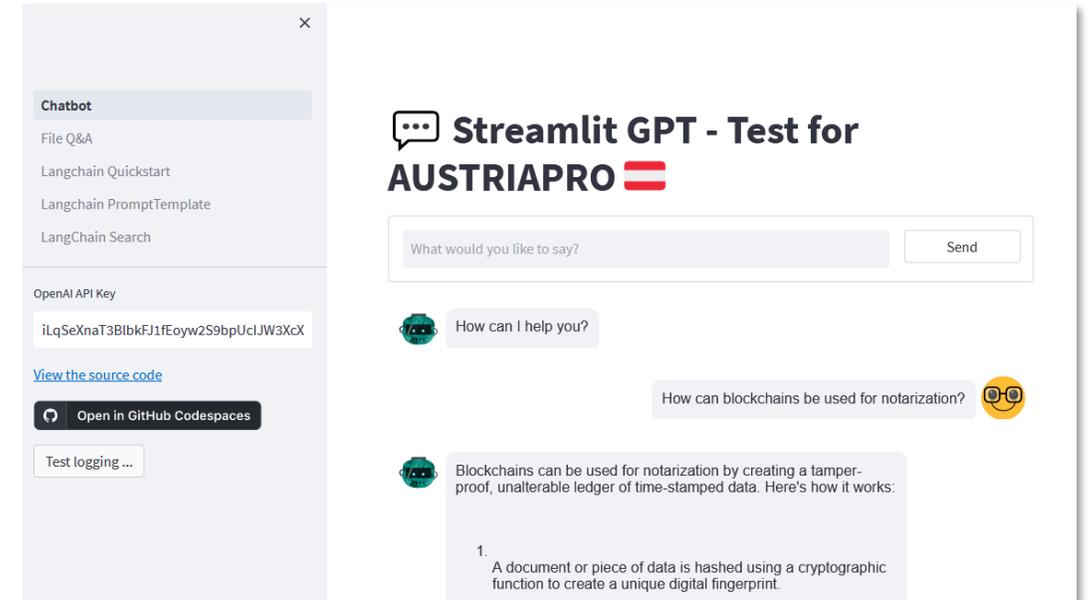
- Blockchain / AI
  - Blockchain
    - secure and tamper-proof way to verify the existence (of a digital asset) at a certain point in time
    - (smart contracts)
  - AI
    - verify (accuracy and integrity) data
    - validate documents
      - natural language processing
      - OCR
      - image analysis

# Zusammenfassung 3

- IoT / AI
  - IoT
    - collect (vast amounts) of data
      - equipment
      - machinery
      - environment
      - ...
  - AI
    - analyse data
    - detect patterns
    - predictions
    - ...

# Next Steps

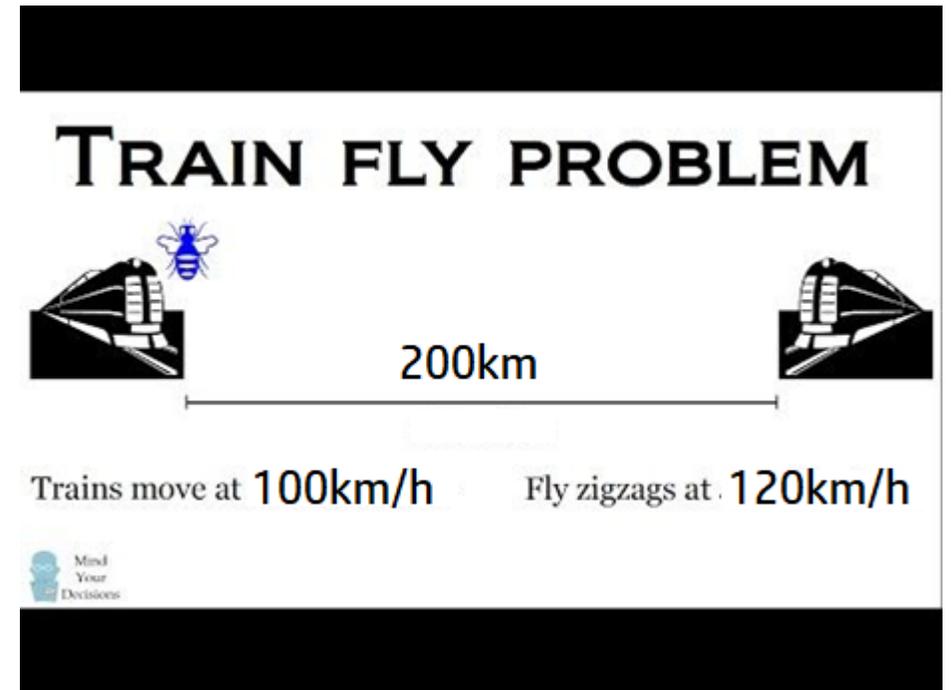
- Lab: Chatbot-Webapp
  - Erweitern, verfeinern, testen
  - Auf <https://github.com/austriapro> bereitstellen
  - (Für Mitglieder bereitstellen?)
- Usecase Blockchain & AI
  - Schwerpunkt „eigene Daten“
    - d.h. nicht-öffentlich, firmenintern
    - (vgl. „Talk to your blockchain“, letzter AK)
  - Definieren
  - Prototypisch implementieren
  - Ideen dazu?



# Achtung: AI und „Mathematik“

## Beispiel „The Fly and the Trains Problem“

Two trains leave at the same time, one from Milan station to Bologna and the other from Bologna station to Milan. These two trains do not make intermediate stops and it can be assumed that both are moving with a constant speed of **100 km/h**. At the same moment in which the two trains leave, a fly that had landed on the locomotive of the Milan train, frightened by the movement, takes off and begins to travel along the tracks that lead to Bologna, with a speed of **120 km/h**. The fly, terrified and dazed, continues its journey along the tracks, until it meets the train that left Bologna. At this point, the fly, seized by panic, reversed course and headed back towards Milan, always with the same speed. Subsequently, therefore, the fly continues its journey, reversing its direction every time it encounters one of the two trains. Due to a mistake on the railway switches, the two trains are destined to collide head-on (these days is not even that unusual), and consequently for the poor fly a bad end awaits. Assuming, with a small approximation, that the distance between Milan and Bologna is exactly **200 km**, what is the total distance covered by the fly before being squeezed between the two trains?



# Antwort von GPT-3.5 (Turbo) - 1

Let's break down the problem and try to solve it step by step.

We know that:

- The distance between Milan and Bologna is **200 km**.
- Both trains are traveling at a constant speed of **100 km/h**.
- The fly is flying at a speed of **120 km/h**.
- The fly flies back and forth between the two trains until it is eventually squished.

Let's assume that the trains start at position 0 and are traveling towards each other. The fly starts at position 0 on the Milan train. We can treat the fly as a point moving along the line of the tracks between the two trains.

The two trains will collide at the **midway point** between Milan and Bologna, which is **100 km** from Milan and 100 km from Bologna.

## Antwort von GPT-3.5 (Turbo) - 2

The fly will fly towards the Bologna train at 120 km/h until it meets the train after traveling for *100/120 hours*.

During this time, the fly covers a distance of:  $120 \times (100/120) = 100 \text{ km}$

Korrekt wäre:

$$s = v \cdot t \rightarrow t = s/v \rightarrow t = 200/220 = 100/110 \rightarrow 109,0909... \text{ km}$$

## Antwort von GPT-3.5 (Turbo) - 3

When the fly meets the Bologna train, the Milan train has traveled 100 km, so the fly is now 100 km away from the Milan train (towards the Bologna train).

The fly then immediately turns around and heads back towards the Milan train at 120 km/h. The Milan train is still 100 km away, so the fly covers another 100 km before it meets the Milan train after traveling for  $100/120$  hours.

The total distance covered by the fly up to this point is:

$$100 + 100 = 200 \text{ km}$$

When the fly meets the Milan train, the Bologna train has traveled 100 km towards the Milan train, so the fly is now 100 km away from the Bologna train (towards the Milan train).

The fly then turns around and heads towards the Bologna train at 120 km/h. The Bologna train is now 100 km away, so the fly covers another 100 km before it meets the Bologna train after traveling for  $100/120$  hours.

The total distance covered by the fly up to this point is:

$$200 + 100 = 300 \text{ km}$$

After this, the fly turns around and heads back towards the Milan train. The distance between the fly and the Milan train is now 100 km, so the fly covers another 100 km before it is squished between the two trains.

The total distance covered by the fly is:

$$300 + 100 = 400 \text{ km}$$

Therefore, the fly covers a total distance of **400 km** before it is squished between the two trains.

# Erkenntnis?

- Angabe in natürlicher Sprache ...
- ... wird korrekt erkannt.
  
- Einfachste physikalische Zusammenhänge ( $s = v \cdot t$ ) scheinen bekannt zu sein.
- Andere physikalische Fakten aber nicht
  - z.B.  $v(\text{relativ}) = v(\text{train}) + v(\text{fly}) = 100 + 120 = 220$
- -> **komplett falsches Resultat ...**
- ... aber toll (überzeugend) präsentiert ...

Ideen, Kommentare, Fragen?

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