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# RISE Crash Course: "Practical Basics of AI/LLM"

Sorin Marti, Lea Kasper (RISE & EIB), 02.10.2024



# Who is Research and Infrastructure Support (RISE)?



*“We support researchers in the humanities and social sciences at the University of Basel in the conception of computer-based research, the creation, analysis and user-oriented presentation of digital data, as well as in sustainable and open methods of data dissemination.”*

# Agenda

1. An Example
2. Large Language Models (LLMs)  
→ *Are AIs really intelligent?*
3. Underlying Technologies: Neural Networks  
→ *How do LLM's work?*
4. Prompt Engineering  
→ *How to interact with a machine?*
5. Examples
6. AI Applied in Research  
→ *What works? What doesn't?*
7. Conclusions
8. Discussion

# 1. An Example

LLMs can be talked to and they can give meaningful answers.

**But:** In (humanities) research we want to pass context (e.g. sources) and ask questions about them.

ChatGPT 4o, 01.10.24

Who threw who from windows in Prague as a protest?



The event you're referring to is the **Defenestration of Prague**, a significant historical event in European history. There were actually two famous defenestrations in Prague, both related to conflicts between religious and political factions in Bohemia (modern-day Czech Republic).

1. **First Defenestration of Prague (1419):** This occurred during the Hussite Wars, a series of conflicts that stemmed from religious reform movements initiated by Jan Hus. A group of radical Hussites, led by Jan Želivský, stormed the New Town Hall in Prague. They threw several Catholic city officials out of the windows in protest of their perceived opposition to religious reforms. The officials were killed when they fell to the street below.
2. **Second Defenestration of Prague (1618):** This was one of the key events that sparked the **Thirty Years' War**. Protestant nobles, angry with the Catholic Habsburg rulers for violating religious freedoms guaranteed in previous agreements, stormed Prague Castle and threw two Catholic governors (Jaroslav Bořita of Martinice and Vilém Slavata) and their secretary out of a third-story window. Remarkably, all three men survived the fall, landing in a pile of manure. This incident is considered one of the starting points of the long and devastating Thirty Years' War across Europe.

These acts of defenestration became symbolic of the political and religious tensions in Bohemia during the medieval and early modern periods.



# 1. An Example

Prompt:

*“Please give me the text on the image. Be accurate, don’t add information on your own.”*

Comparison:

Transkribus, *The Text Titan I*  
(Super model)

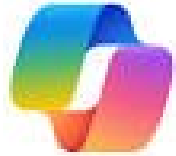


# 1. An Example

(19.09.2024)

Provider	Result	Fuzz-Ratio	Jaccard-Sim.
Original	Die durch gegenwärtigen Bund vereinigten Völkerschaften der zwei und zwanzig souveränen Kantone, als: Zürich, Bern, Luzern, Uri, Schwyz, Unterwalden (ob und nid dem Wald), Glarus, Zug, Freyburg, Solothurn	100	1
Claude (Anthropic)	Die durch gegenwärtigen Bund vereinigten Völkerschaften der zwei und zwanzig souveränen Kantone, als: Zürich, Bern, Luzern, Uri, Schwyz, Unterwalden (ob und nid dem Walde), Glarus, Zug, Freiburg, Solothurn,	99	0.74
ChatGPT (Open AI)	Die durch gegenwärtigen Bund vereinigten Völkerschaften der zwei und zwanzig souveränen Kantone, als: Zürich, Bern, Luzern, Uri, Schwyz, Unterwalden (ob und nid dem Wald), Glarus, Zug, Freiburg, Solothurn,	98	0.69
Gemini (Google)	Die durch gegenwärtigen Bund vereinigten Völkerschaften der zwei und zwanzig souveränen Kantone, als: Zürich, Bern, Luzern, Uri, Schwyz, Unterwalden (ob und nid dem Wald), St. Gallen, Zug, Freiburg, Solothurn,	94	0.59
Transkribus (Read-Coop)	Die durch gegenwärtigen Bund vereinigten Völkerschaften der zwei und zwanzig souveränen kanten, als: Zürich, Bern, Luzern, Ney, Schwyz, Unterwaldere (ob und indem Wals), Glarus, Zug, Freiburg, Holothurn	94	0.56

# Different Models & Providers



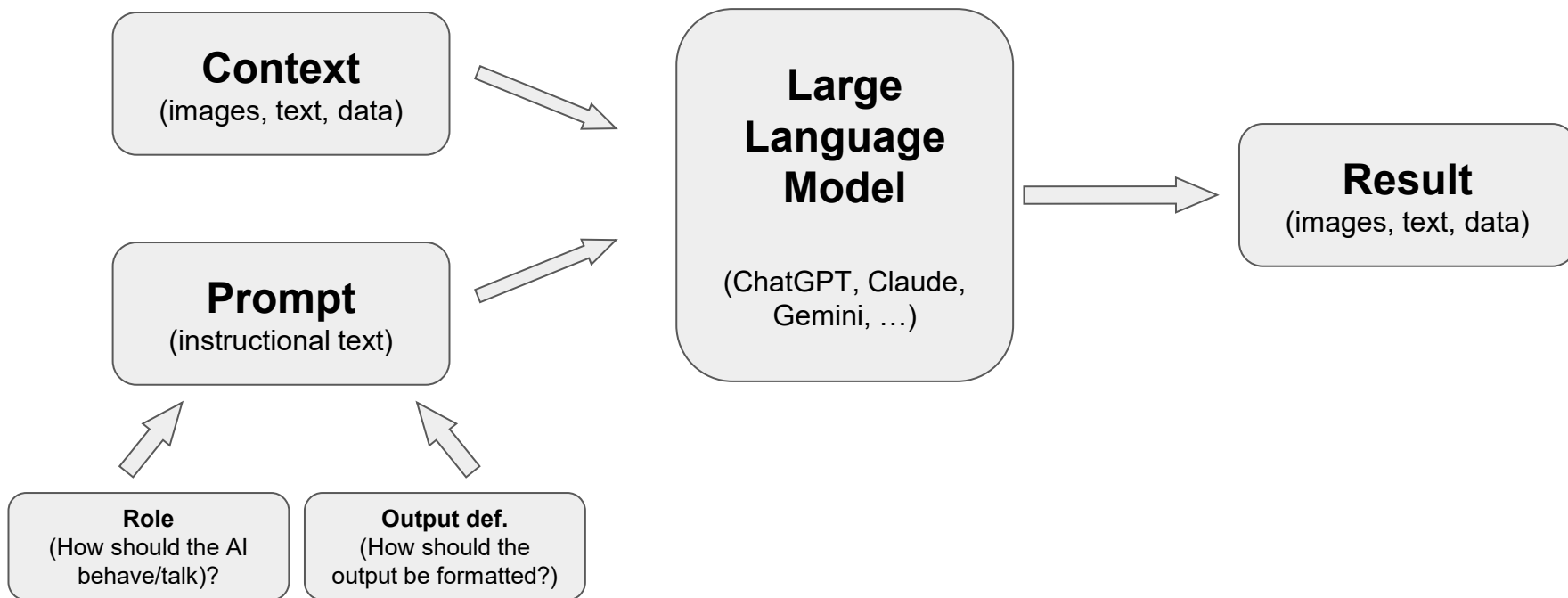
BY ANTHROPIC



**GitHub**  
Copilot



# Parts of an LLM request





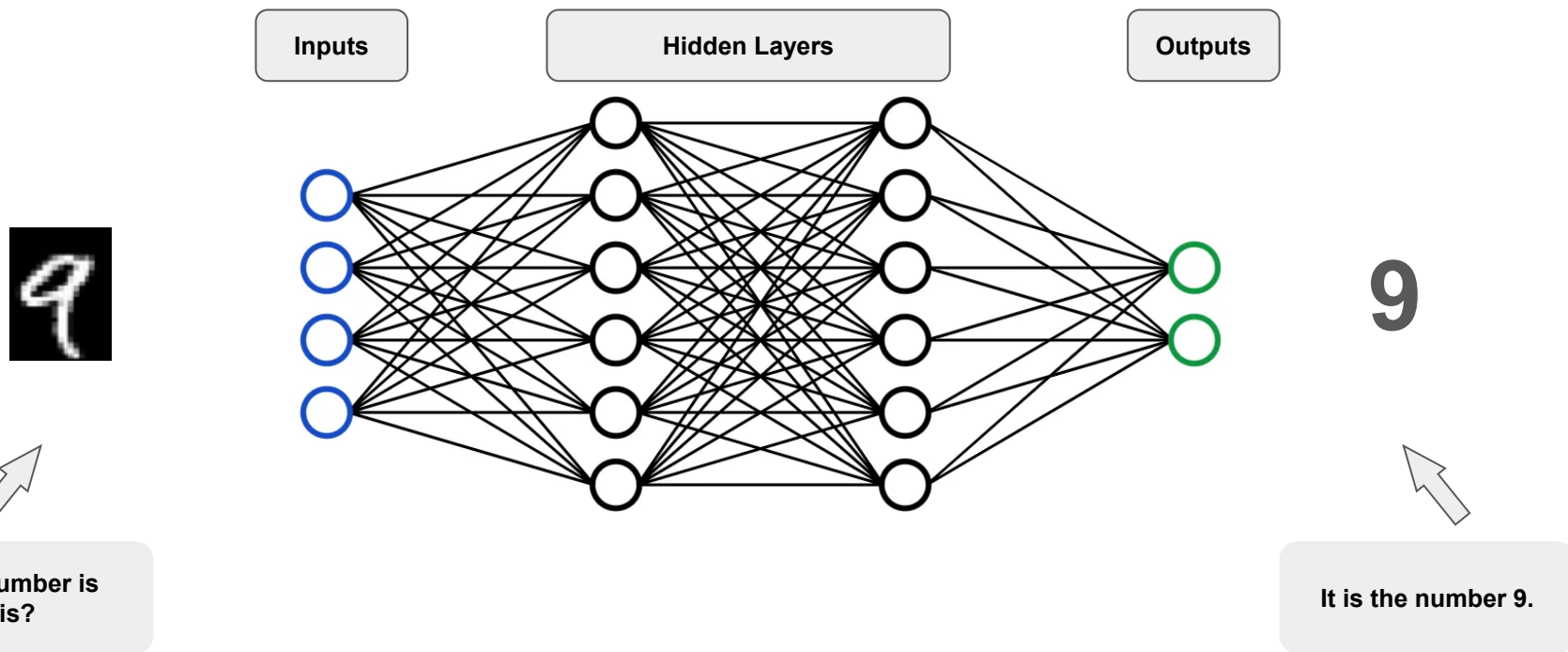
## 2. Large Language Models

*A **large language model** is a type of **artificial intelligence**.*

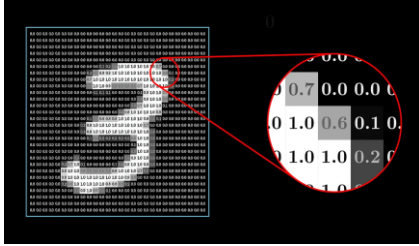
*More precisely, it is a type of **neural network** based on **deep learning** techniques, often using **transformer architecture**.*

***GPT** (Generative Pretrained Transformer) is one example of an **LLM**.*

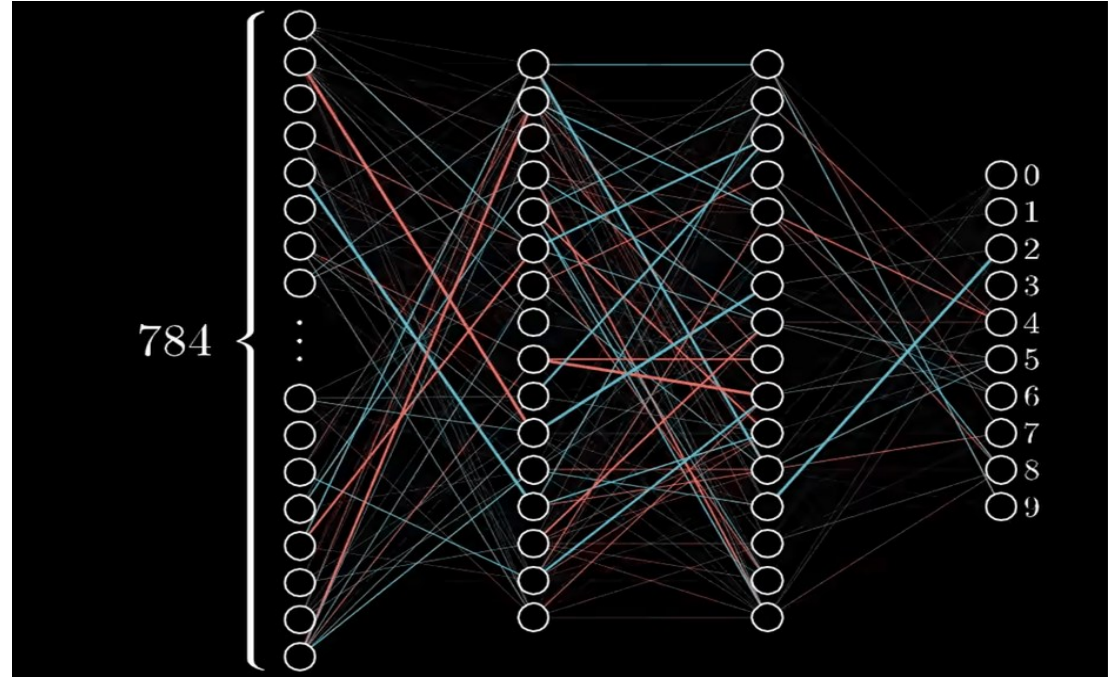
### 3. Underlying Technologies: Neural Networks



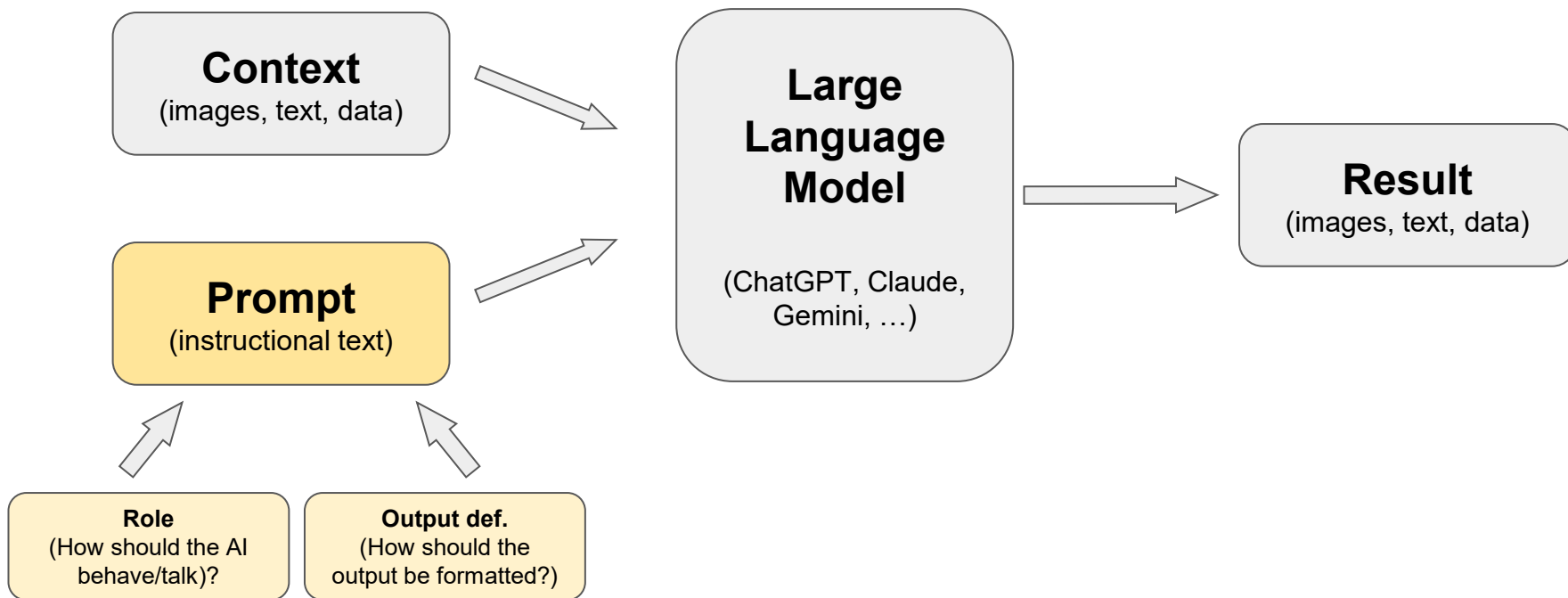
### 3. Underlying Technologies: Neural Networks



Source: 3blue1brown.com



## 4. Prompt Engineering



## 4. Prompt Engineering:

- Styling of Prompt

- Define what you expect from the AI and what purpose it serves.
- Precise requests lead to precise answers.
  - “Explain ... in simple terms for a class of around 10-year-olds.”
  - “Summarize ... in five bullet points.”
- Tone and Style
  - E.g. formal, informal, scientific ...

## 4. Prompt Engineering:

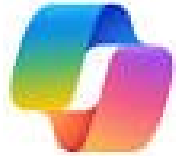
- Roles in LLM's
  - “You are a historian analyzing ...”
  - “You are a teacher explaining ...”

## 4. Prompt Engineering:

- Output Format and Content
  - Tailor the output to your needs
    - Lists, tables, paragraphs, bullet points, numbered items, Json ...
    - “Provide the answer as a table with two columns: Cause and Effect.”
- Output Inconsistency
  - Outputs are never the same for identical inputs



# Different Models & Providers



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# Short Question-Break

**Questions so far?**

## 5. Examples

# Analyze Text



Leitfaden-KI-zitieren\_v2.2.pdf  
PDF

Fasse mir das Dokument in 5 Sätzen zusammen.



Der Leitfaden erklärt den Umgang mit KI-gestützten Tools in wissenschaftlichen Arbeiten. Es wird darauf hingewiesen, dass KI-generierte Inhalte, wie Texte oder Bilder, korrekt zitiert werden müssen, ähnlich wie andere Quellen. Die Universität erlaubt den Einsatz von KI-Tools, solange die Eigenständigkeit der Studierenden gewährleistet bleibt. Es wird empfohlen, ein Verzeichnis der eingesetzten KI-Tools während der Arbeit zu führen, um Transparenz zu schaffen. Schließlich werden konkrete Beispiele zur Zitierung solcher Inhalte gegeben, um den Studierenden klare Richtlinien zu bieten.

ChatGPT 4o, 30.09.24

# Analyze Images



How many people are on this image? Categorize them.

Total number of people in the image:

- 1 seated emperor (Henry VI)
- 1 standing chancellor (Conrad)
- 1 kneeling poet
- 2 armed guards

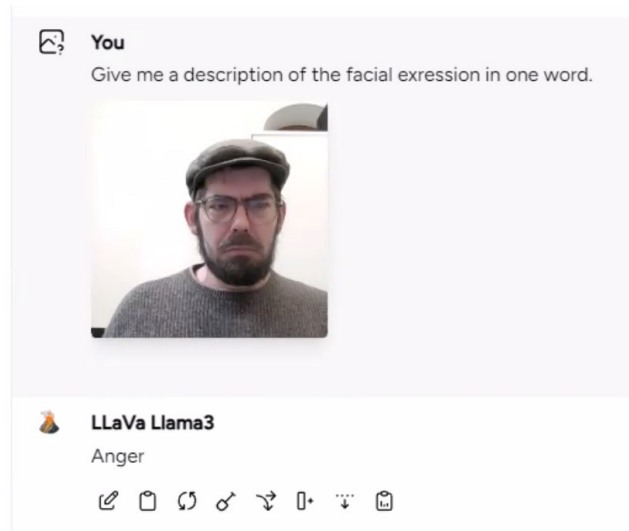
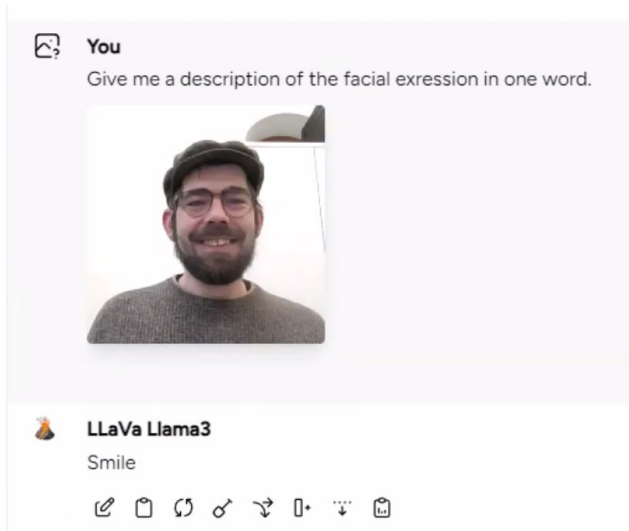
Thus, there are a total of 5 people in the image, categorized as follows:

- 1 emperor (seated)
- 1 chancellor/advisor (standing)
- 1 poet (kneeling)
- 2 guards (standing)



ChatGPT 4o, 30.09.24

# Analyze Images: Facial Expression Recognition



# Image Generation

Illustriere dieses Gedicht mit einem Aquarell:

DER PANTHER

IM JARDIN DES PLANTES, PARIS

Sein Blick ist vom Vorübergehn der Stäbe  
so müd geworden, daß er nichts mehr hält.  
Ihm ist, als ob es tausend Stäbe gäbe  
und hinter tausend Stäben keine Welt.

Der weiche Gang geschmeidig starker Schritte,  
der sich im allerkleinsten Kreise dreht,  
ist wie ein Tanz von Kraft um eine Mitte,  
in der betäubt ein großer Wille steht.

Nur manchmal schiebt der Vorhang der Pupille  
sich lautlos auf –. Dann geht ein Bild hinein,  
geht durch der Glieder angespannte Stille –  
und hört im Herzen auf zu sein.



ChatGPT 4o, 30.09.24

# Use any Language

S

Bonjour! Do you care which language ich benutze? Puoi gestirlo if I switch Sprachen mitten in einem Satz? Por favor traduce estas líneas in jede Sprache, que usei aqui. Liste toutes les langues as bullet points.



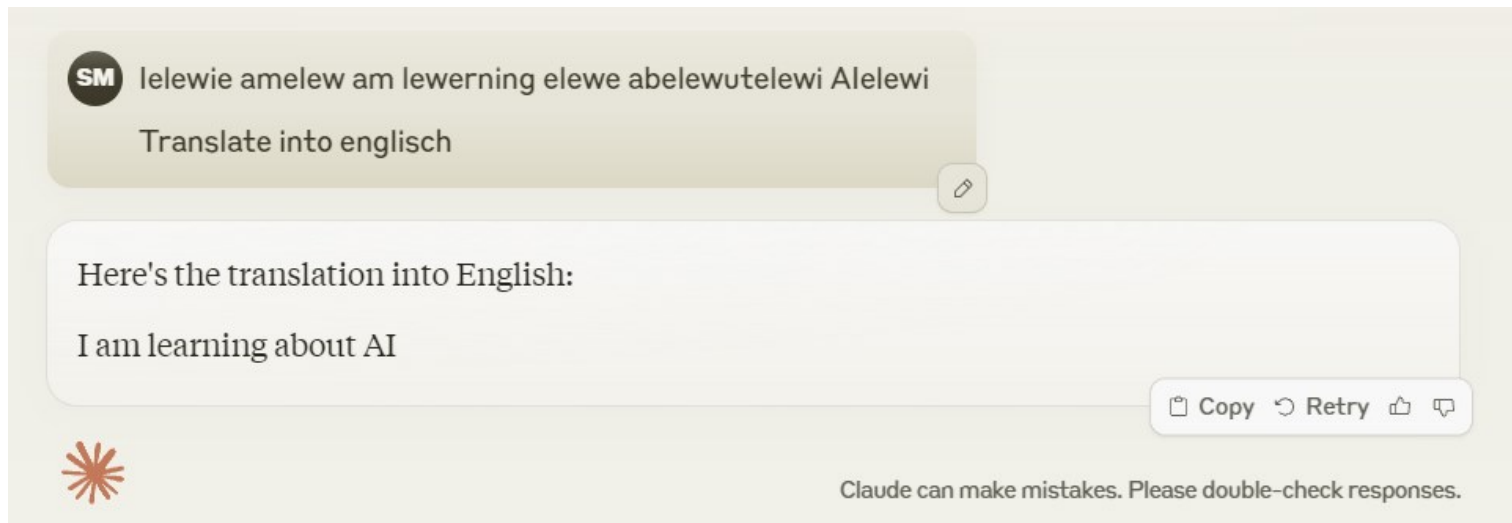
**Eine Liste aller Sprachen, die in deiner Anfrage verwendet wurden:**

- **Französisch**
- **Deutsch**
- **Italienisch**
- **Spanisch**
- **Englisch** (in den Fragen "Do you care which language ich benutze?" und "Puoi gestirlo if I switch Sprachen mitten in einem Satz?")

**Möchtest du, dass ich dir bei weiteren Übersetzungen helfe oder hast du andere Fragen zu Sprachen?**

*Gemini 1.5 Flash, 30.09.24*

# It's all about Patterns



The screenshot shows a chat interface with a light beige background. At the top, a user message in a rounded rectangle contains a black circular icon with 'SM' and the text 'lelewie amelew am lewerning elewe abelewutelewi Alelewi'. Below this, the instruction 'Translate into english' is displayed. To the right of the message is a small edit icon. The AI response is in a larger white rounded rectangle, starting with 'Here's the translation into English:' followed by 'I am learning about AI'. At the bottom right of the response box are buttons for 'Copy', 'Retry', 'Like', and 'Dislike'. In the bottom left corner of the interface is a red starburst icon. At the bottom right, a disclaimer reads 'Claude can make mistakes. Please double-check responses.'

**SM** lelewie amelew am lewerning elewe abelewutelewi Alelewi

Translate into english

Here's the translation into English:

I am learning about AI

Copy Retry Like Dislike

Claude can make mistakes. Please double-check responses.

*Claude 3.5 Sonnet, 30.09.24*



# Hallucinating | Bullshitting

*“ChatGPT Isn’t ‘Hallucinating’—It’s Bullshitting!”*

wir trinken sie morgens gedicht?



Das Gedicht, das du ansprichst, ist vermutlich „Wir trinken die Brühe des Morgens“ von Erich Kästner. Es geht in etwa so:

## **Wir trinken die Brühe des Morgens**

Wir trinken sie morgens. Wir trinken sie mittags. Wir trinken sie abends. Wir trinken sie nachts.

Wir trinken die Brühe des Lebens mit großer, mit mittlerer, mit kleiner und kleinster Geduld. Oft schmeckt sie nicht. Aber wir trinken sie trotzdem.

Es wär ja auch dumm, wenn wir das Löffelchen hinwürfen und sagten: „Es lohnt sich nicht mehr!“

Denn nur wer am Ball bleibt, gewinnt ab und zu mal ein Match.

*ChatGPT 4o, 30.09.24*

---

Kästner reflektiert hier auf das Durchhalten im Alltag, auch wenn es nicht immer leicht ist. Es ist eine Metapher für die Herausforderungen und die Geduld, die man im Leben aufbringen muss.

# Hallucinating | Bullshitting

*“ChatGPT Isn’t ‘Hallucinating’—It’s Bullshitting!”*

Gibt es dieses Gedicht von Kästner wirklich?

< 2/2 >



Entschuldigung für das Missverständnis! Tatsächlich gibt es kein Gedicht von **Erich Kästner** mit dem Titel „**Wir trinken die Brühe des Morgens**“ oder etwas Vergleichbares. Es scheint, dass ich hier eine falsche Information geliefert habe.

Das Gedicht, das du ursprünglich meintest, stammt von **Paul Celan** und ist die „**Todesfuge**“, die ich oben bereits zitiert habe. Kästner hat zwar viele bedeutende Gedichte geschrieben, aber keines, das in diese Richtung geht oder einen solchen Titel trägt.

Danke, dass du darauf hingewiesen hast!

ChatGPT 4o,  
30.09.24

# Named Entity Recognition

S

Please extract named entities. You are presented with a list where each line has the following structure: "number". "company", "location". "connections (comma separated)". Please read them and output them as json list.



Show drafts ▼

Gemini 1.5 Flash, 01.10.24



JSON

```
[
  {"company": "Abbott, Anderson & Abbott Ltd.", "location": "Harpender",
  {"company": "Abdulla & Co. Ltd.", "location": "London E 1.", "conne
  {"company": "Aberdare Cables Ltd.", "location": "London WC 1.", "cor
  {"company": "Aberdeen & Commonwealth Line", "location": "London EC 1.",
  {"company": "Abietsan Manufacturing Co. Ltd.", "location": "London S
  {"company": "Abril Corp. (Gt. Britain) Ltd.", "location": "Bridgend",
  {"company": "Abwood Tool & Engineering Co. Ltd.", "location": "Dartm
  {"company": "A. C.-Sphinx Sparking Plug Co. Ltd.", "location": "Duns
  {"company": "Accles & Pollock Ltd.", "location": "Oldbury, Birmingham",
  {"company": "Acheson Colloids Ltd.", "location": "London SW 1.", "co
  {"company": "Ackermann (Simon) Ltd.", "location": "Crewe.", "connect
  {"company": "Ackroyd Bros. Ltd.", "location": "Bradford.", "connect
  {"company": "Acme Transport Co. Ltd.", "location": "London EC 1.",
  {"company": "Acme Wringers Ltd.", "location": "Glasgow.", "connecti
  {"company": "Acton Bolt Ltd.", "location": "London NW 10.", "connect
  {"company": "Adams (Thomas) Ltd.", "location": "Nottingham.", "conne
  {"company": "Adams (W. J.) & Co. Ltd.", "location": "Manchester.",
  {"company": "Adamson (Daniel) & Co. Ltd.", "location": "Dukinfield.",
  {"company": "Adastra (Glenny & Hartley) Ltd.", "location": "London S
  {"company": "Addalloy Metal Co. Ltd.", "location": "Sheffield.", "co
  {"company": "Adeps Lanae Ltd.", "location": "Bradford.", "connection
  {"company": "Adrema Ltd.", "location": "London W 3.", "connections":
  {"company": "Adreman Ltd.", "location": "Bradford.", "connections":
```

# Large Inputs: Gemini

- Gemini takes up to 2 mio. tokens
- In this example, we inserted a scanned book with 294 pages: around 20k lines, 680K characters

*Gemini 1.5 Flash, 30.09.24*

S

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the:...

▼

Show drafts ▼ 🔊

✦ **This is the China Directory for 1863, not 1883**

The scanned image you provided is actually the title page and preface of the "The Chronicle & Directory for China, Japan, & the Phillippines" for the year 1863. It was published by A. Shortrede & Company in London.

This directory contains information about various locations in East Asia, including:

- Cities and ports (Canton, Amoy, Shanghai, etc.)
- Foreign residents
- Businesses and merchants
- Government departments
- Consulates
- Public services (hospitals, post offices, etc.)
- Religious missions
- Communication (steam navigation companies)
- And more

# Memory-Function: ChatGPT

We have been working together on TWF. Please create 5 bullet points of the main features.



- **Document and Metadata Management:** Users can organize documents and pages, tagging them and managing metadata, with the ability to export data in JSON, CSV, or Excel formats.
- **Customizable Export Configurations:** Export configurations for documents and pages are flexible, allowing dynamic field access and nested JSON handling for metadata extraction.
- **Task Handling with Celery:** Background tasks like data export run using Redis and Celery, with task monitoring implemented for tracking and resuming tasks.
- **Collection Building:** Users can create and save collections from documents or sections, organizing research data efficiently for future reference.
- **Docker-based Deployment:** The app is deployed using Docker, with a Next.js frontend, providing an easy-to-manage development and deployment setup.

*ChatGPT 4o, 30.09.24*

# Formatted Output

- Tell the AI how to format Output.
- In this example, we told Claude AI to extract named entities and save them to a data structure

*Claude 3.5 Sonnet, 30.09.24*

SM

Create a list of actors in this poem. Structure it as JSON data. Include name and role.

"Humpty Dumpty sat on a wall,  
Humpty Dumpty had a great fall;  
All the king's horses and all the king's men  
Couldn't put Humpty together again."



Here's a JSON representation of the actors in the poem:

json

Copy

```
{
  "actors": [
    {
      "name": "Humpty Dumpty",
      "role": "Main character who falls from the wall"
    },
    {
      "name": "King's horses",
      "role": "Attempted rescuers"
    },
    {
      "name": "King's men",
      "role": "Attempted rescuers"
    }
  ]
}
```

This JSON structure lists the main actors mentioned in the nursery rhyme "Humpty Dumpty." Each actor has a name and a brief description of their role in the poem.

## 6. AI Applied in Research

12. Ackroyd Bros. Ltd., Bradford. B 248, C 1079, 1080, 1081, 1082.  
12a. Acme Transport Co. Ltd., London EC 1. B 288, C 1458.  
13. Acme Wringers Ltd. Glasgow. B 781, C 1329.  
14. Acton Bolt Ltd., London NW 10. B 99, C 755.

- Rule-Based Approach

- Process Transparency
- Time-Consuming Implementation
- Specific (learnable) Skills Required
  - Learning-Curve!

- LLMs

- Short Timeframe
- Control Mechanisms Needed
- Results Rely on the Training Material
- Time-Consuming Correction Process

```
"transcription": {  
  "original": "13. Acme Wringers Ltd., Glasgow. B 781, C 1329.",  
},  
"name": {  
  "transcription": "Acme Wringers Ltd.",  
},  
"scheme": {  
  "identifier": "A13",  
},  
"organizations": [  
  {  
    "transcription": "Waag (Charles)",  
    "affiliation": "trading partner",  
    "inferred": true,  
    "scheme": {  
      "identifier": "B781",  
    },  
  },  
]
```

## 7. Conclusions

- AI Systems are excellent pattern predictors/recognizers; but they are not intelligent.
- AI Systems never produce the same answer twice
- Answers heavily rely on user input; good prompt engineering is very important
- The AI's output can be styled in various ways; LLMs not only can produce text but also data structures.
- There are a vast array of applications and providers; each has its strengths and weaknesses.
- AI moves the workload from algorithm design to output quality control.
- AI Systems change fast. Persistent workflows are a challenge.
- Today we talked about Browser-based LLM access; for research we work with APIs to tackle large datasets.





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# **Thank you for Listening!**

## **Questions?**



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**More crash courses and workshops about AI:**

<https://rise.unibas.ch/en/news-events/>