ScaDS.AI
DRESDEN LEIPZIG

CENTER FOR SCALABLE DATA ANALYTICS AND ARTIFICIAL INTELLIGENCE

Prompt Engineering & ChatBots

Robert Haase

Funded by

Bundesministerium
für Bildung
und Forschung

SACHSEN

Diese Maßnahme wird gefördert durch die Bundesregierung aufgrund eines Beschlusses des Deutschen Bundestages. Diese Maßnahme wird mitfinanziert durch Steuermittel auf der Grundlage des von den Abgeordneten des Sächsischen Landtags beschlossenen Haushaltes.

Robert Haase
@haesleinhuepf
BIDS Lecture 6/14
May 7th 2024

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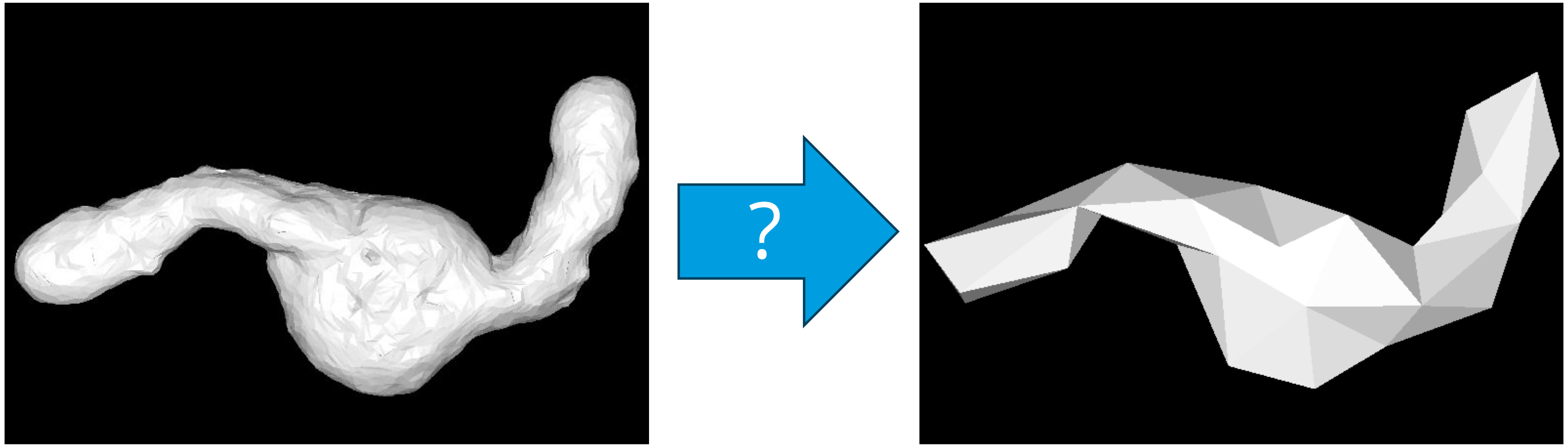
TECHNISCHE
UNIVERSITÄT
DRESDEN

UNIVERSITÄT
LEIPZIG

Quiz: Recap

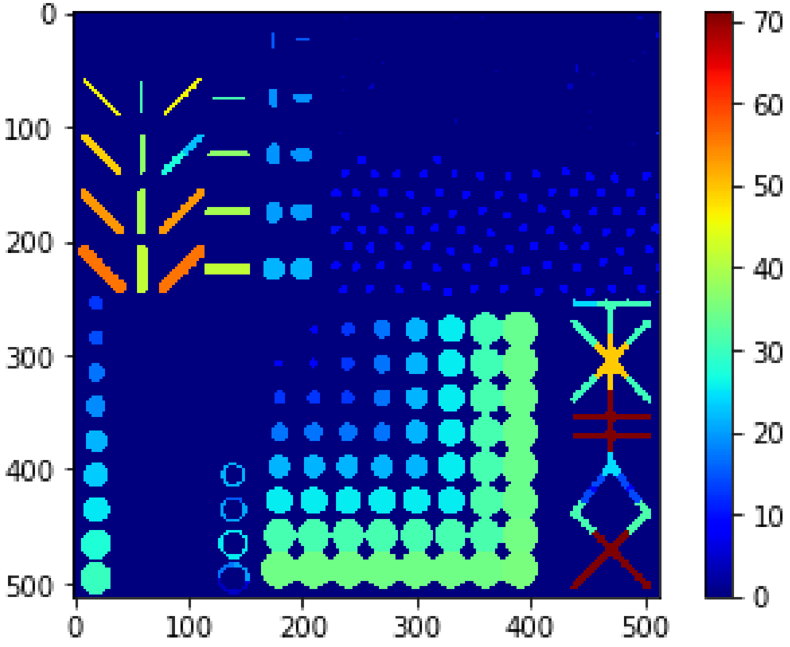
How is this operation called?



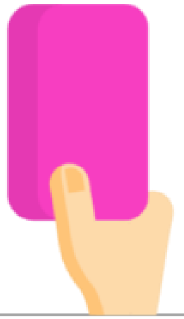
Simplifaction Smoothing Blurring Tresholding

Quiz: Recap

What does this parametric image show?

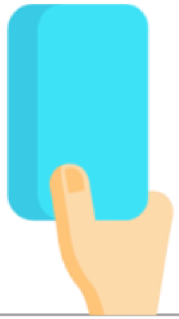


Area

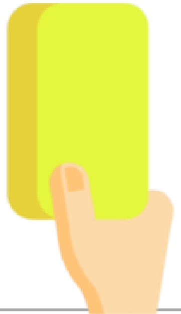


Aspect Ratio

Feret’s diameter



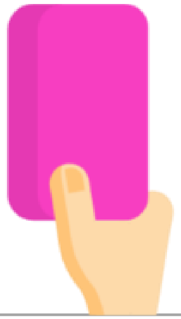
Temperature



Quiz: Code generators

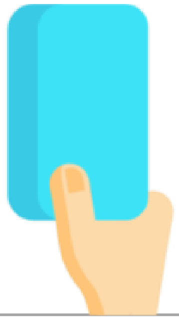
Who writes your code?

ChatGPT

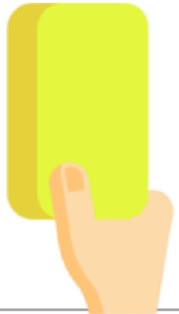


Github Copilot

Other LLMs



I myself



Artificial intelligence in daily programmer's life

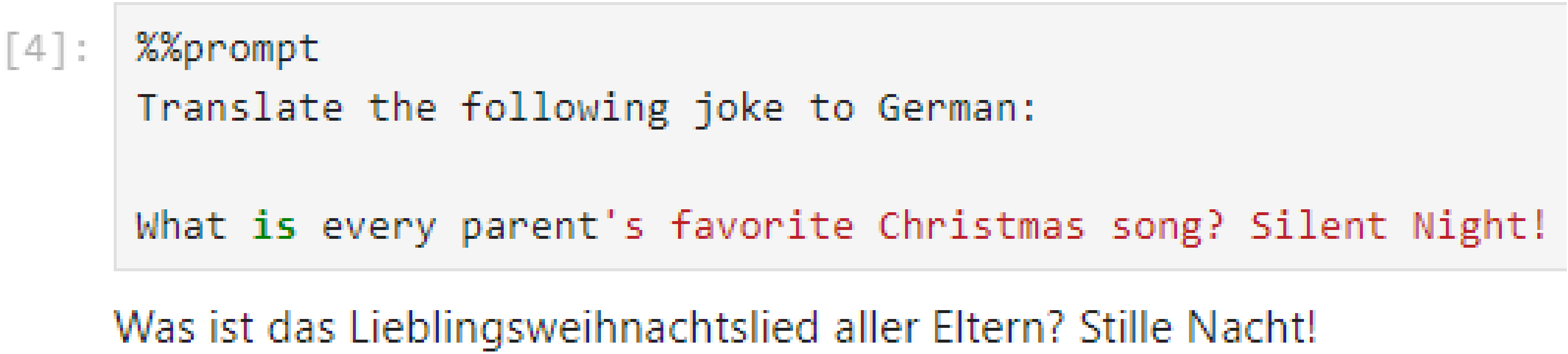
How it started

How it's going

(GitHub copilot)

What are large language models good in?

Translation tasks

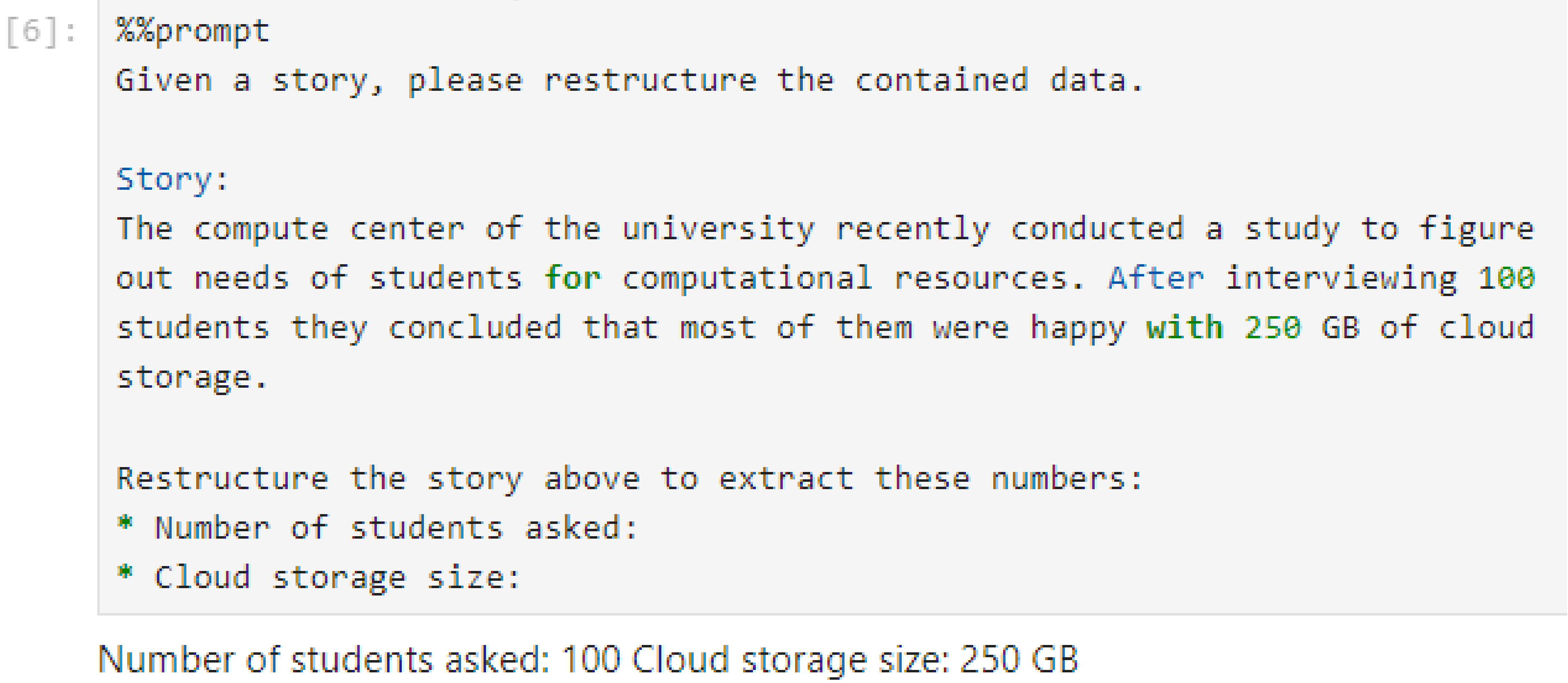


```
[4]: %%prompt
     Translate the following joke to German:

     What is every parent's favorite Christmas song? Silent Night!
```

Was ist das Lieblingsweihnachtslied aller Eltern? Stille Nacht!

What are large language models good in?

Restructuring data



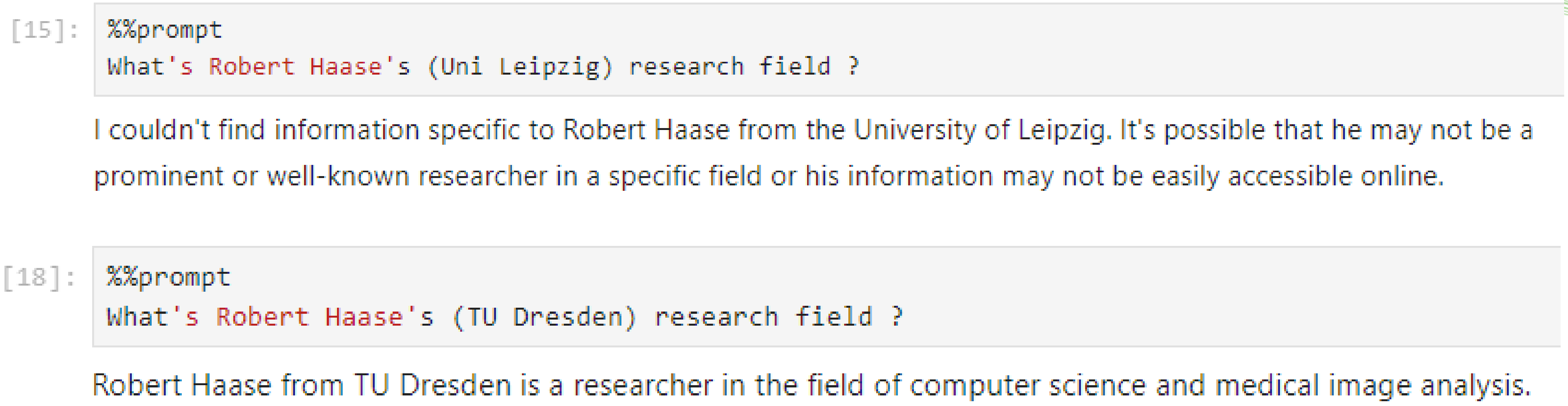
```
[6]: %%prompt
     Given a story, please restructure the contained data.

     Story:
     The compute center of the university recently conducted a study to figure
     out needs of students for computational resources. After interviewing 100
     students they concluded that most of them were happy with 250 GB of cloud
     storage.

     Restructure the story above to extract these numbers:
     * Number of students asked:
     * Cloud storage size:
```

```
Number of students asked: 100 Cloud storage size: 250 GB
```

https://scads.github.io/prompt-engineering-tutorial-2023/01_prompts/02_use_cases.html

What are large language models not so good in?

Querying knowledge (e.g. for recent information)



```
[15]: %%prompt
      What's Robert Haase's (Uni Leipzig) research field ?
```

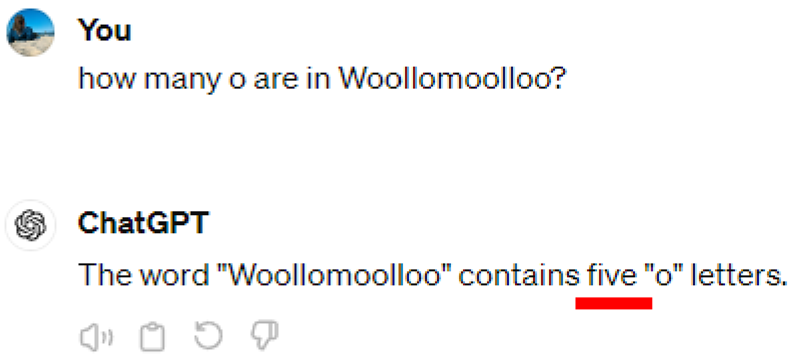
I couldn't find information specific to Robert Haase from the University of Leipzig. It's possible that he may not be a prominent or well-known researcher in a specific field or his information may not be easily accessible online.

```
[18]: %%prompt
      What's Robert Haase's (TU Dresden) research field ?
```

Robert Haase from TU Dresden is a researcher in the field of computer science and medical image analysis.

What are large language models not so good in?

Math (e.g. counting)



You

how many o are in Woollomoolloo?

ChatGPT

The word "Woollomoolloo" contains five "o" letters.

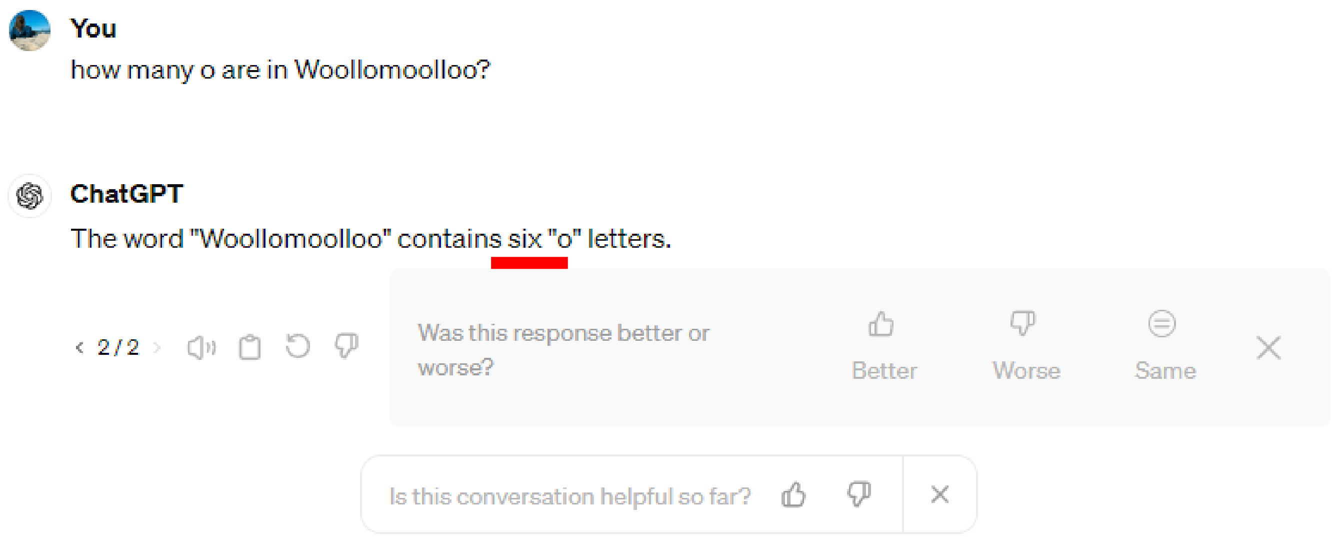
Woolloomooloo

New South Wales 2011

Australia

Partly cloudy · 23°C

9:24 PM



You

how many o are in Woollomoolloo?

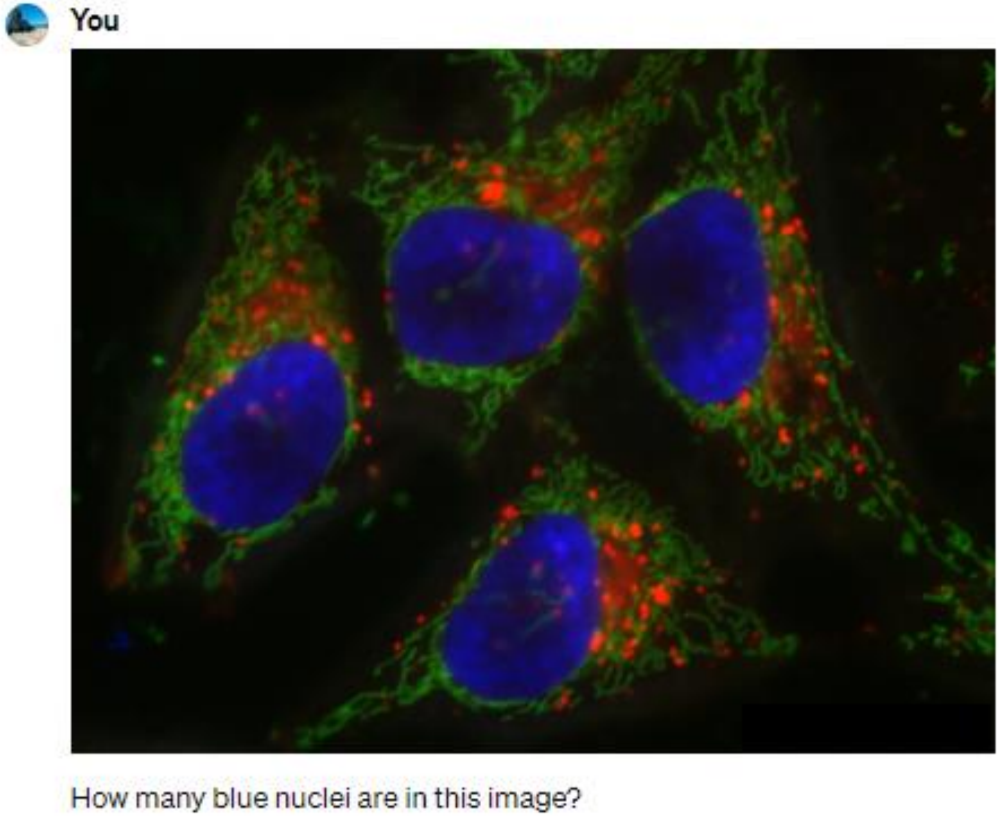
ChatGPT

The word "Woollomoolloo" contains six "o" letters.

‹ 2 / 2 ›
Was this response better or worse?
Better
Worse
Same
Is this conversation helpful so far?

What are large language models **not so good** in?

Math (e.g. counting)



You

How many blue nuclei are in this image?

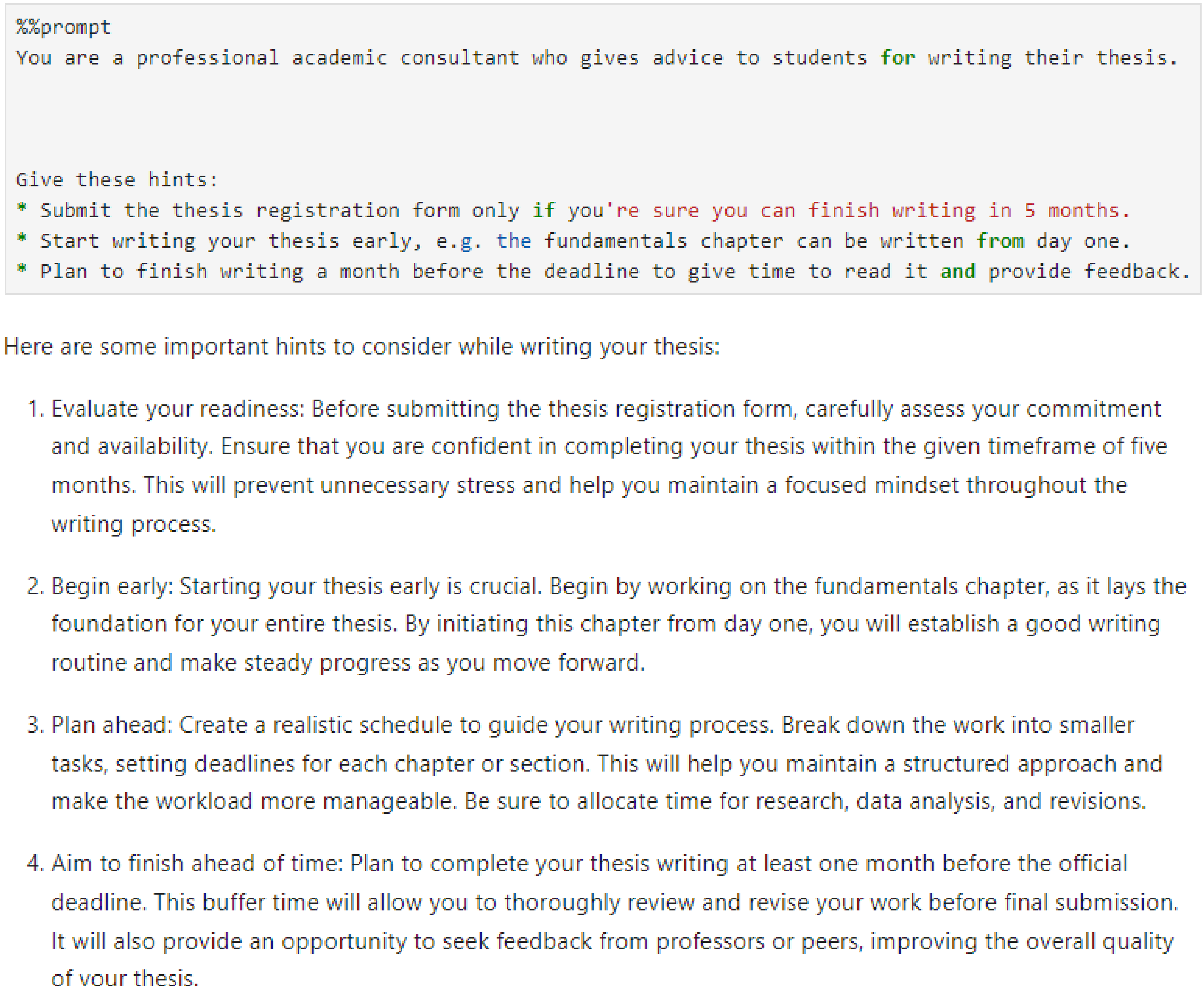
ChatGPT

There are three blue nuclei visible in this image.

No matter if anyone manages to fix that, we will have a hard time to convince the community that this is the way to go.

Prompt Engineering

- Set context / assign role
- Define output style
- Give hints / conditions
- List tasks
- Provide data



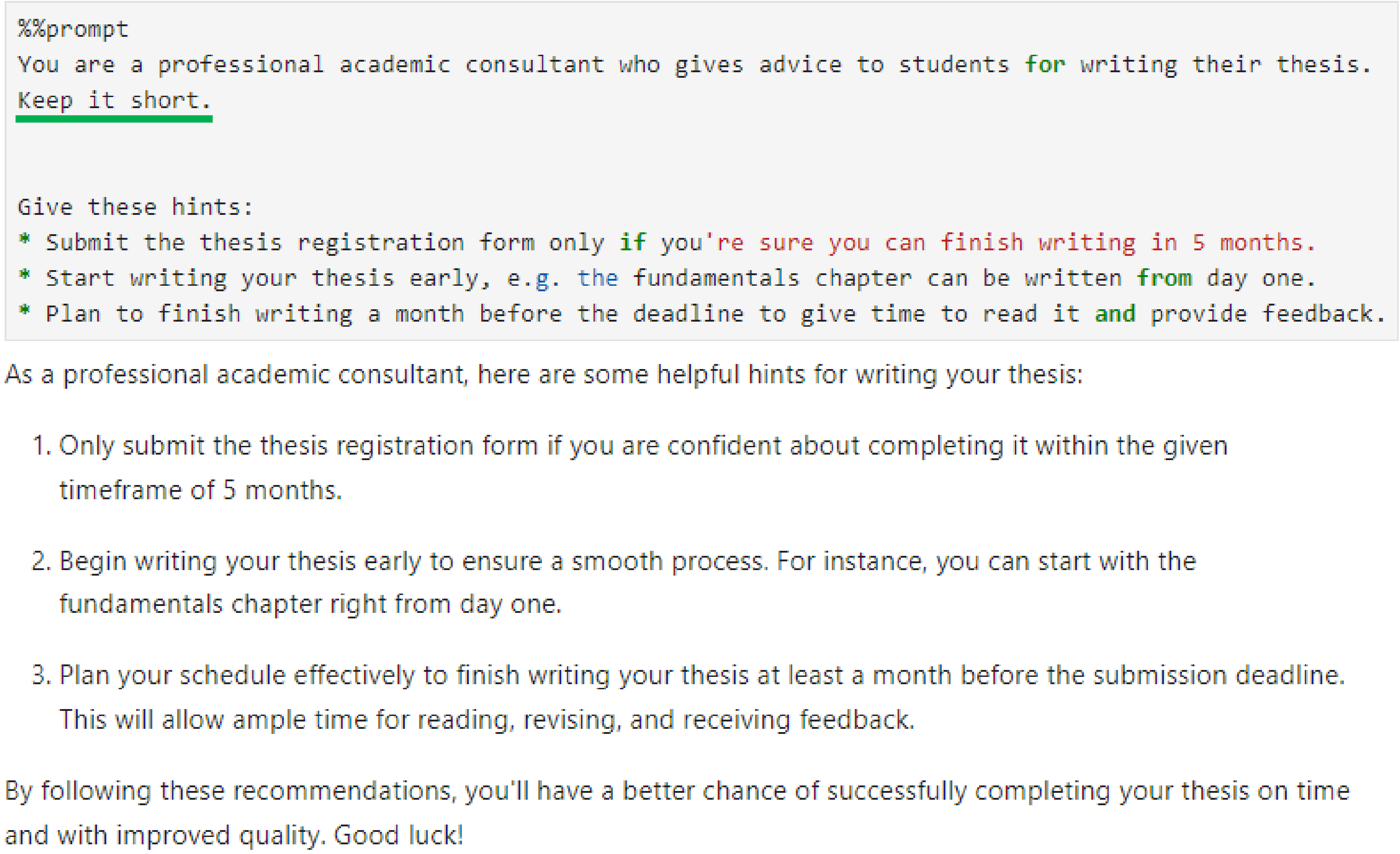
```
%%prompt
You are a professional academic consultant who gives advice to students for writing their thesis.



Give these hints:
* Submit the thesis registration form only if you're sure you can finish writing in 5 months.
* Start writing your thesis early, e.g. the fundamentals chapter can be written from day one.
* Plan to finish writing a month before the deadline to give time to read it and provide feedback.
```

Here are some important hints to consider while writing your thesis:

1. Evaluate your readiness: Before submitting the thesis registration form, carefully assess your commitment and availability. Ensure that you are confident in completing your thesis within the given timeframe of five months. This will prevent unnecessary stress and help you maintain a focused mindset throughout the writing process.
2. Begin early: Starting your thesis early is crucial. Begin by working on the fundamentals chapter, as it lays the foundation for your entire thesis. By initiating this chapter from day one, you will establish a good writing routine and make steady progress as you move forward.
3. Plan ahead: Create a realistic schedule to guide your writing process. Break down the work into smaller tasks, setting deadlines for each chapter or section. This will help you maintain a structured approach and make the workload more manageable. Be sure to allocate time for research, data analysis, and revisions.
4. Aim to finish ahead of time: Plan to complete your thesis writing at least one month before the official deadline. This buffer time will allow you to thoroughly review and revise your work before final submission. It will also provide an opportunity to seek feedback from professors or peers, improving the overall quality of your thesis.

Prompt Engineering

- Set context / assign role
- Define output style
- Give hints / conditions
- List tasks
- Provide data



```
%%prompt
You are a professional academic consultant who gives advice to students for writing their thesis.
Keep it short.


Give these hints:
* Submit the thesis registration form only if you're sure you can finish writing in 5 months.
* Start writing your thesis early, e.g. the fundamentals chapter can be written from day one.
* Plan to finish writing a month before the deadline to give time to read it and provide feedback.
```

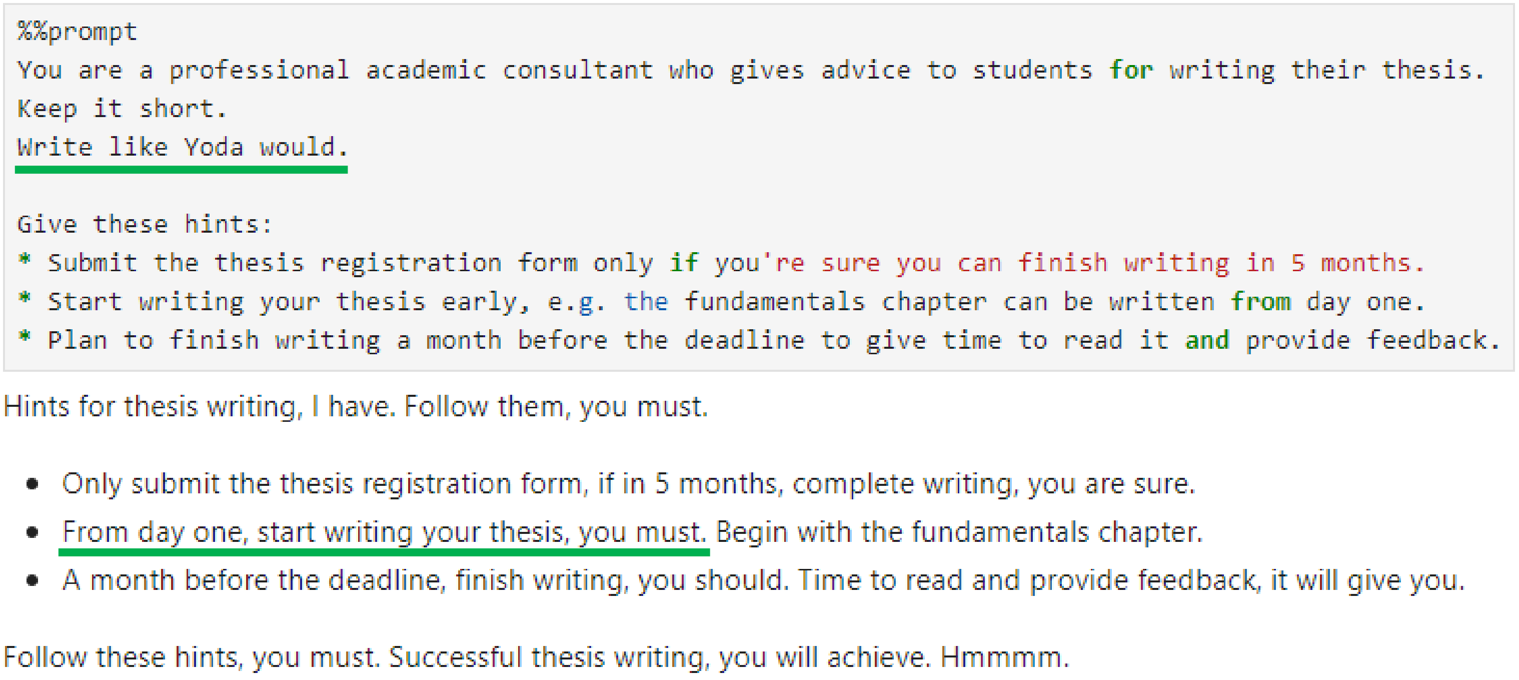
As a professional academic consultant, here are some helpful hints for writing your thesis:

1. Only submit the thesis registration form if you are confident about completing it within the given timeframe of 5 months.
2. Begin writing your thesis early to ensure a smooth process. For instance, you can start with the fundamentals chapter right from day one.
3. Plan your schedule effectively to finish writing your thesis at least a month before the submission deadline. This will allow ample time for reading, revising, and receiving feedback.

By following these recommendations, you'll have a better chance of successfully completing your thesis on time and with improved quality. Good luck!

Prompt Engineering

- Set context / assign role
- <u>Define output style</u>
- Give hints / conditions
- List tasks
- Provide data



```
%%prompt
You are a professional academic consultant who gives advice to students for writing their thesis.
Keep it short.
Write like Yoda would.

Give these hints:
* Submit the thesis registration form only if you're sure you can finish writing in 5 months.
* Start writing your thesis early, e.g. the fundamentals chapter can be written from day one.
* Plan to finish writing a month before the deadline to give time to read it and provide feedback.
```

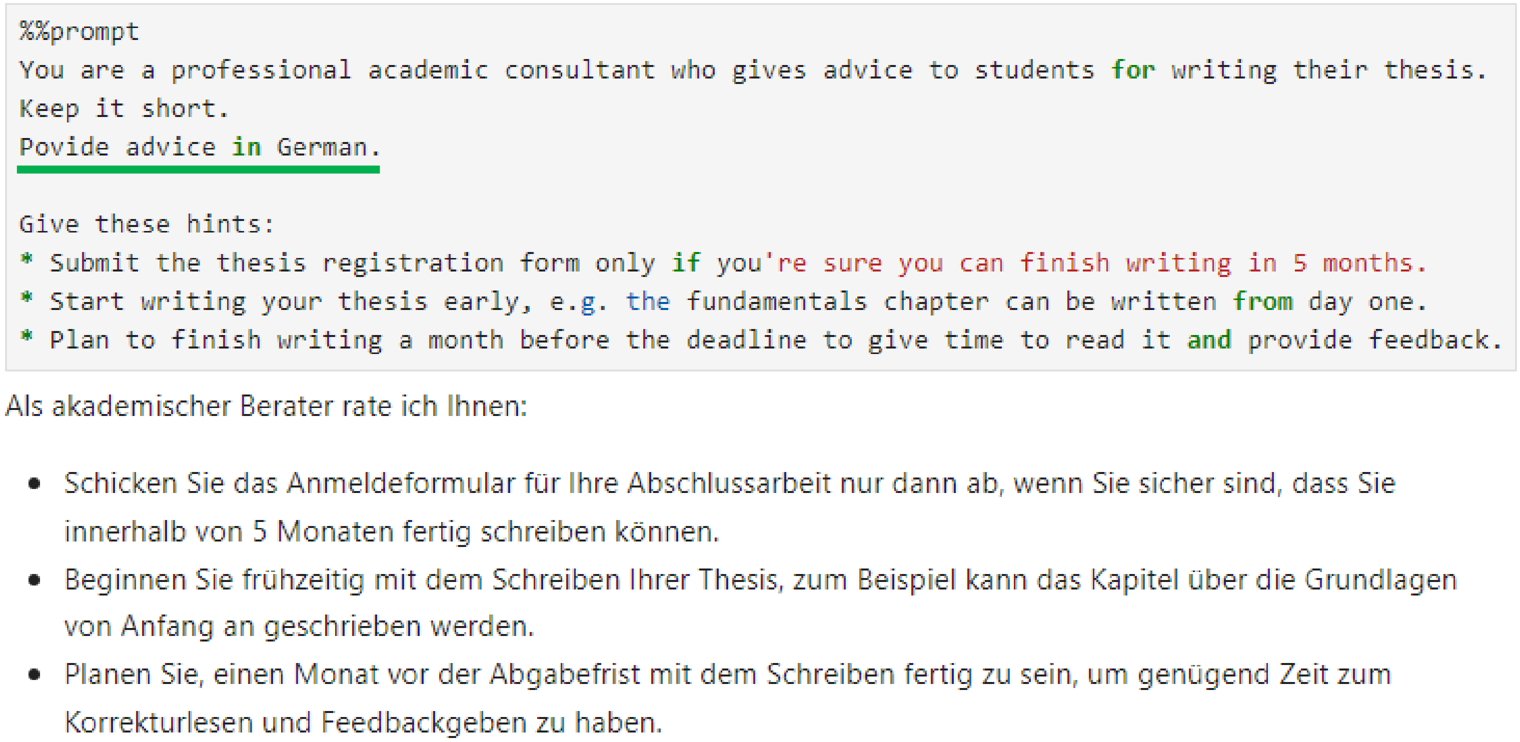
Hints for thesis writing, I have. Follow them, you must.

- Only submit the thesis registration form, if in 5 months, complete writing, you are sure.
- From day one, start writing your thesis, you must. Begin with the fundamentals chapter.
- A month before the deadline, finish writing, you should. Time to read and provide feedback, it will give you.

Follow these hints, you must. Successful thesis writing, you will achieve. Hmmmm.

Prompt Engineering

- Set context / assign role
- Define output style
- Give hints / conditions
- List tasks
- Provide data



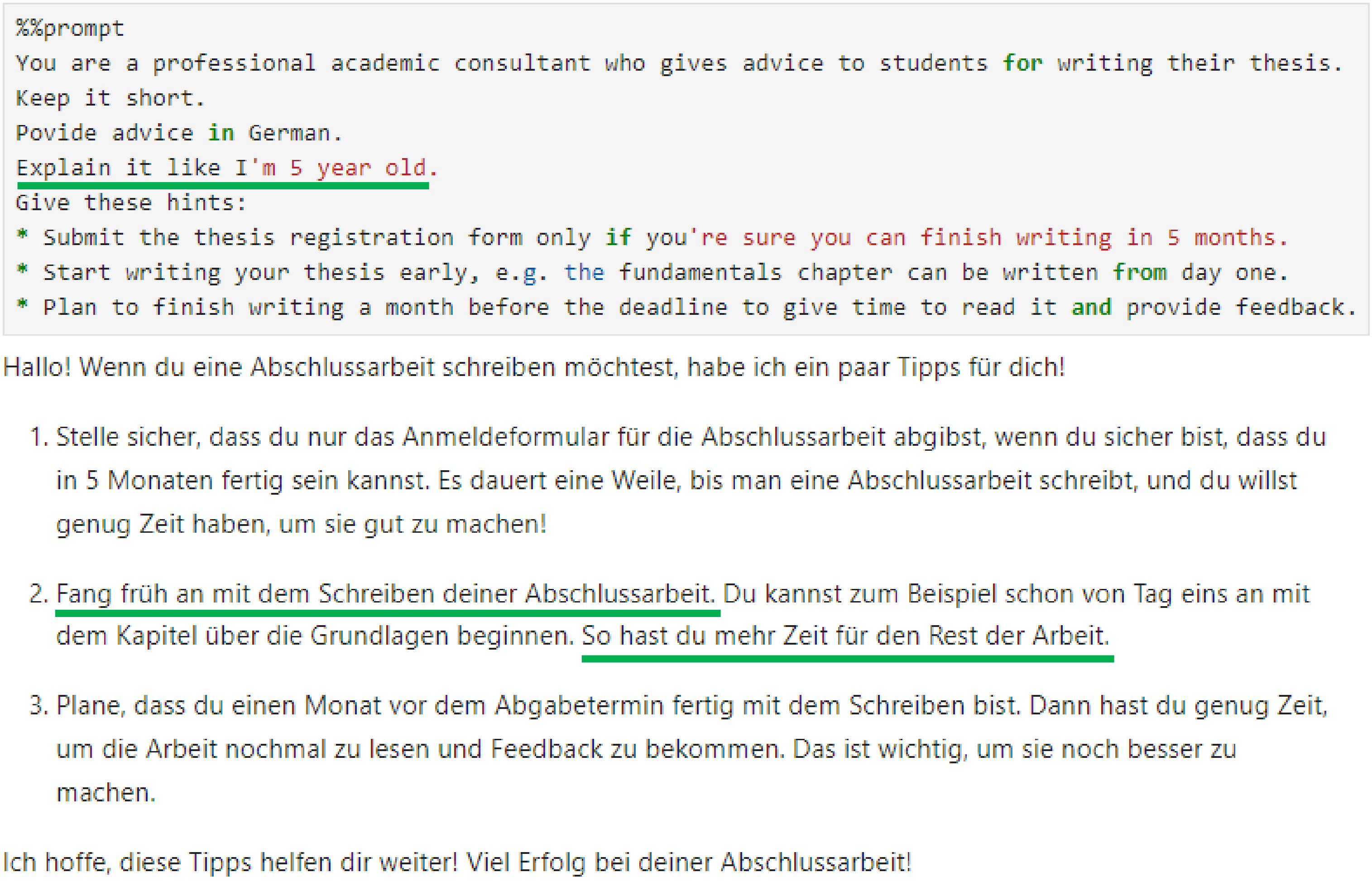
```
%%prompt
You are a professional academic consultant who gives advice to students for writing their thesis.
Keep it short.
Povide advice in German.

Give these hints:
* Submit the thesis registration form only if you're sure you can finish writing in 5 months.
* Start writing your thesis early, e.g. the fundamentals chapter can be written from day one.
* Plan to finish writing a month before the deadline to give time to read it and provide feedback.
```

Als akademischer Berater rate ich Ihnen:

- Schicken Sie das Anmeldeformular für Ihre Abschlussarbeit nur dann ab, wenn Sie sicher sind, dass Sie innerhalb von 5 Monaten fertig schreiben können.
- Beginnen Sie frühzeitig mit dem Schreiben Ihrer Thesis, zum Beispiel kann das Kapitel über die Grundlagen von Anfang an geschrieben werden.
- Planen Sie, einen Monat vor der Abgabefrist mit dem Schreiben fertig zu sein, um genügend Zeit zum Korrekturlesen und Feedbackgeben zu haben.

Prompt Engineering

- Set context / assign role
- Define output style
- Give hints / conditions
- List tasks
- Provide data



```
%%prompt
You are a professional academic consultant who gives advice to students for writing their thesis.
Keep it short.
Povide advice in German.
Explain it like I'm 5 year old.
Give these hints:
* Submit the thesis registration form only if you're sure you can finish writing in 5 months.
* Start writing your thesis early, e.g. the fundamentals chapter can be written from day one.
* Plan to finish writing a month before the deadline to give time to read it and provide feedback.
```

Hallo! Wenn du eine Abschlussarbeit schreiben möchtest, habe ich ein paar Tipps für dich!

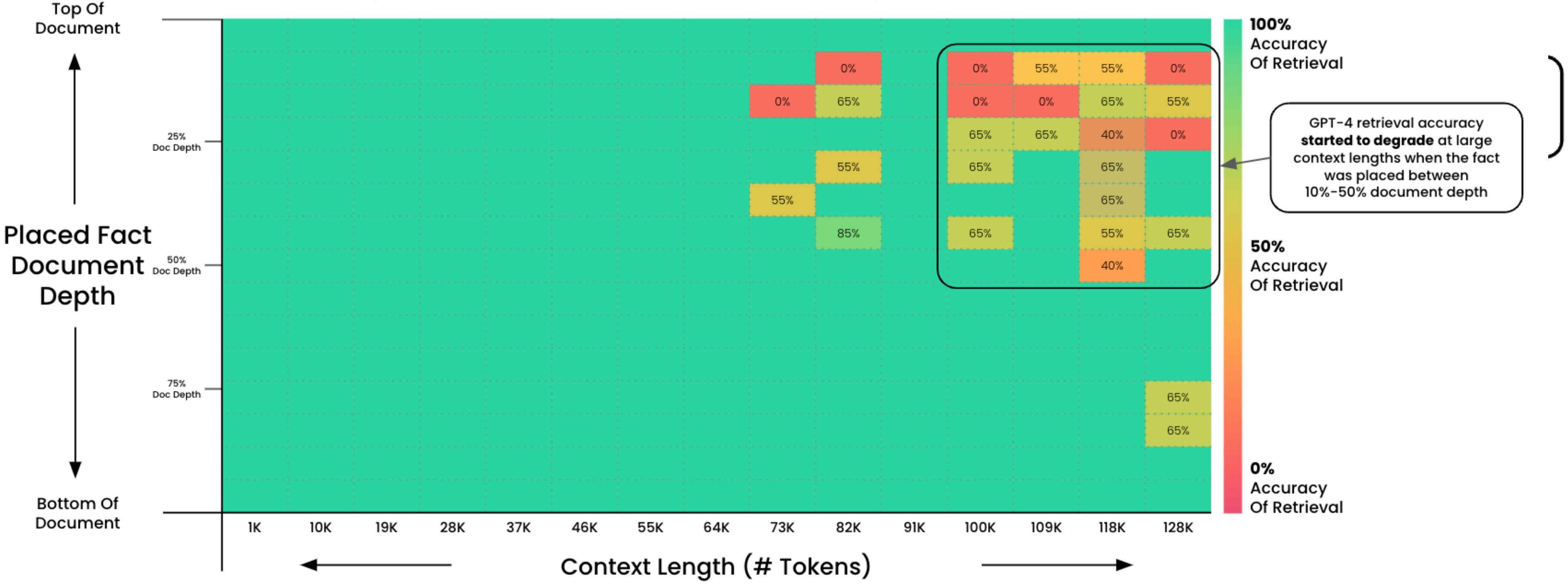
1. Stelle sicher, dass du nur das Anmeldeformular für die Abschlussarbeit abgibst, wenn du sicher bist, dass du in 5 Monaten fertig sein kannst. Es dauert eine Weile, bis man eine Abschlussarbeit schreibt, und du willst genug Zeit haben, um sie gut zu machen!
2. Fang früh an mit dem Schreiben deiner Abschlussarbeit. Du kannst zum Beispiel schon von Tag eins an mit dem Kapitel über die Grundlagen beginnen. So hast du mehr Zeit für den Rest der Arbeit.
3. Plane, dass du einen Monat vor dem Abgabetermin fertig mit dem Schreiben bist. Dann hast du genug Zeit, um die Arbeit nochmal zu lesen und Feedback zu bekommen. Das ist wichtig, um sie noch besser zu machen.

Ich hoffe, diese Tipps helfen dir weiter! Viel Erfolg bei deiner Abschlussarbeit!

Context length

Pressure Testing GPT-4 128K via "Needle In A HayStack"

Asking GPT-4 To Do Fact Retrieval Across Context Lengths & Document Depth



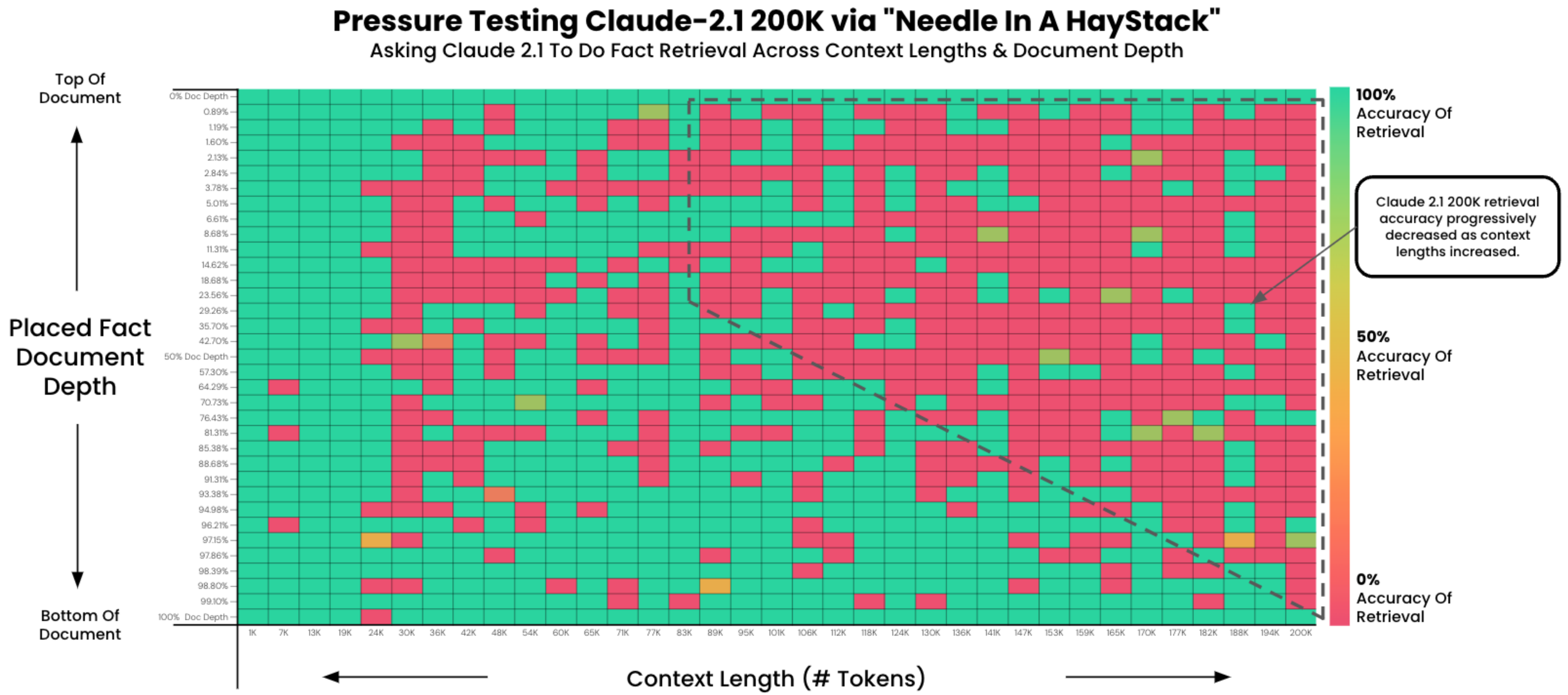
GPT-4 retrieval accuracy **started to degrade** at large context lengths when the fact was placed between 10%-50% document depth

Goal: Test GPT-4 Ability To Retrieve Information From Large Context Windows

A fact was placed within a document. GPT-4 (1106-preview) was then asked to retrieve it. The output was evaluated for accuracy. This test was run at 15 different document depths (top > bottom) and 15 different context lengths (1K >128K tokens). 2x tests were run for larger contexts for a larger sample size.

Visualization by Greg Kamradt, Licensed MIT (modified), Source: https://github.com/gkamradt/LLMTest_NeedleInAHaystack

Context length



Pressure Testing Claude-2.1 200K via "Needle In A HayStack"

Asking Claude 2.1 To Do Fact Retrieval Across Context Lengths & Document Depth

Claude 2.1 200K retrieval accuracy progressively decreased as context lengths increased.

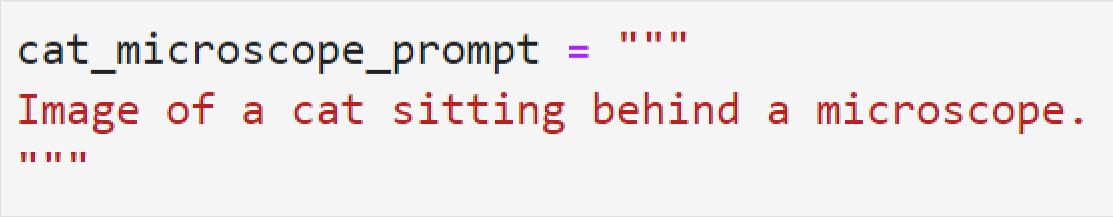
Goal: Test Claude 2.1 Ability To Retrieve Information From Large Context Windows

A fact was placed within a document. Claude 2.1 (200K) was then asked to retrieve it. The output was evaluated (with GPT-4) for accuracy.
This test was run at 35 different document depths (top > bottom) and 35 different context lengths (1K >200K tokens).
Document Depths followed a sigmoid distribution

Visualization by Greg Kamradt, Licensed MIT (modified), Source: https://github.com/gkamradt/LLMTest_NeedleInAHaystack

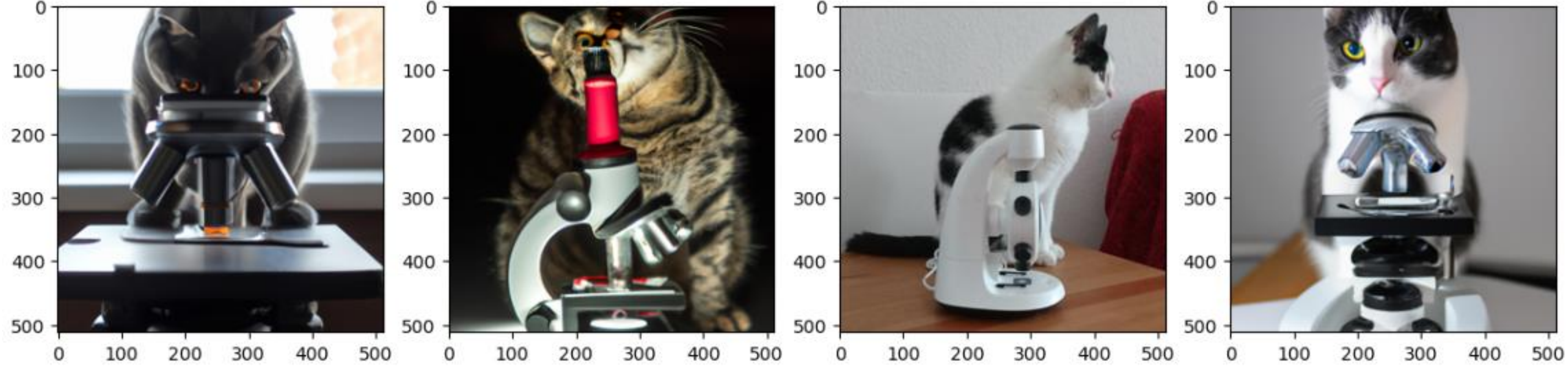
Generating images

Prompts can be used to write code, but also to generate images, e.g. with DALL-E.
One can generate quite realistic images given a detailed prompt.



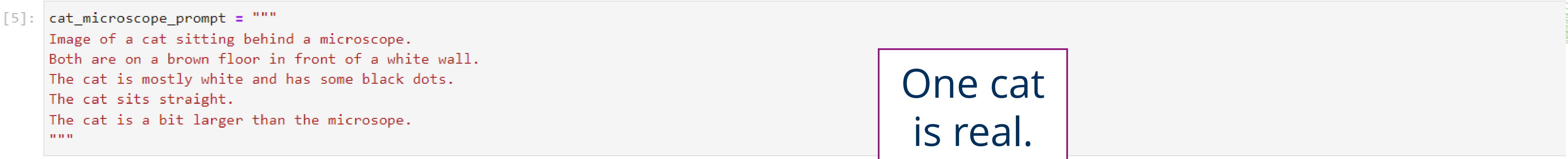
```
cat_microscope_prompt = """
Image of a cat sitting behind a microscope.
"""
```

One cat is real.

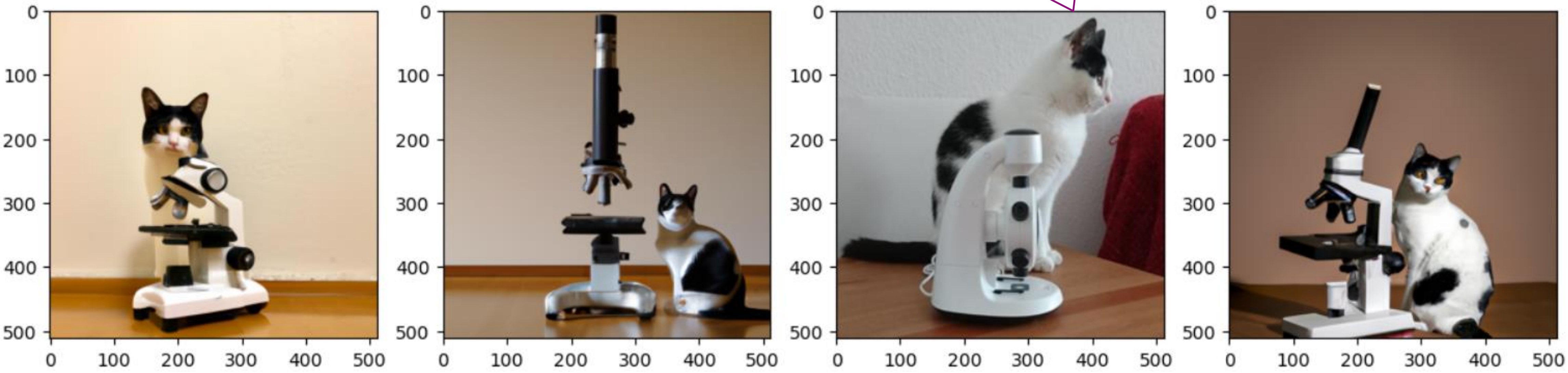


Prompt engineering

The more detailed the prompt, the more similar are generated images.



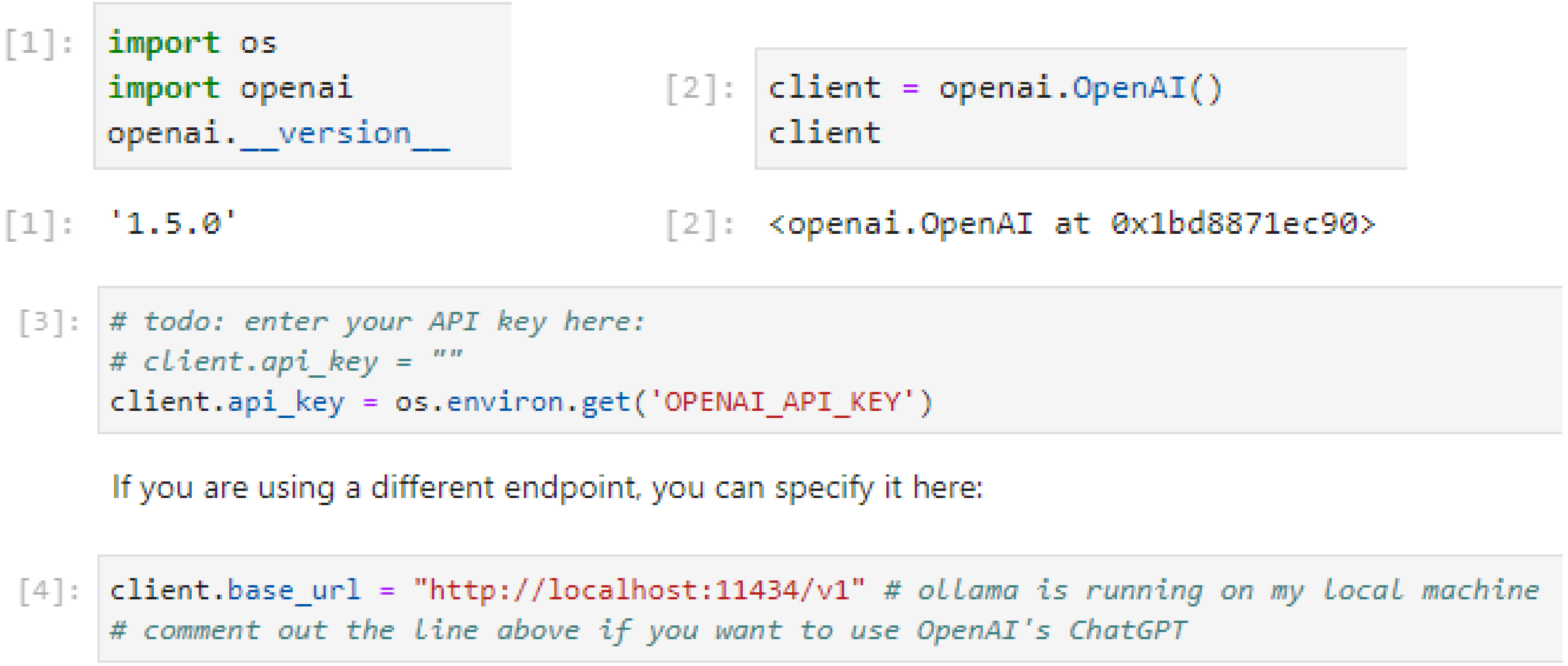
```
[5]: cat_microscope_prompt = """
     Image of a cat sitting behind a microscope.
     Both are on a brown floor in front of a white wall.
     The cat is mostly white and has some black dots.
     The cat sits straight.
     The cat is a bit larger than the microsope.
     """
```



One cat is real.

The OpenAI Application Programming Interface

De-facto standard for communicating with LLMs



```
[1]: import os
     import openai
     openai.__version__

[1]: '1.5.0'
```

```
[2]: client = openai.OpenAI()
     client

[2]: <openai.OpenAI at 0x1bd8871ec90>
```

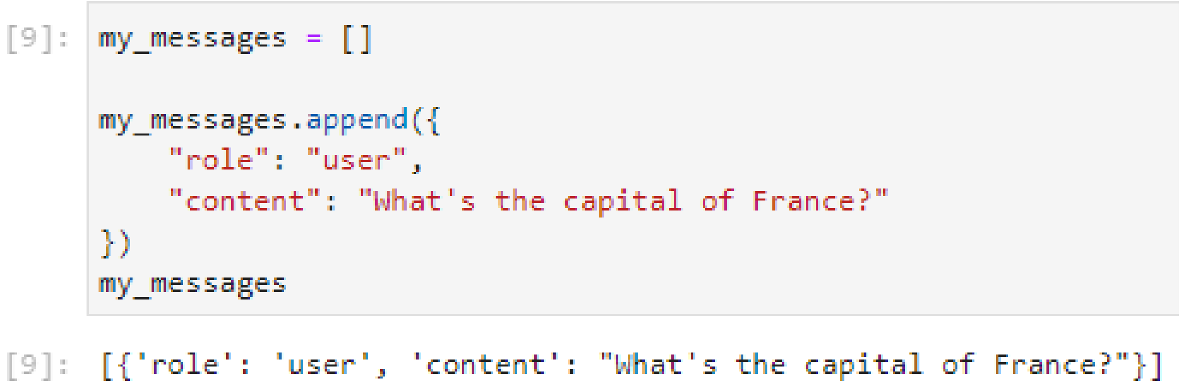
```
[3]: # todo: enter your API key here:
     # client.api_key = ""
     client.api_key = os.environ.get('OPENAI_API_KEY')
```

If you are using a different endpoint, you can specify it here:

```
[4]: client.base_url = "http://localhost:11434/v1" # ollama is running on my local machine
     # comment out the line above if you want to use OpenAI's ChatGPT
```

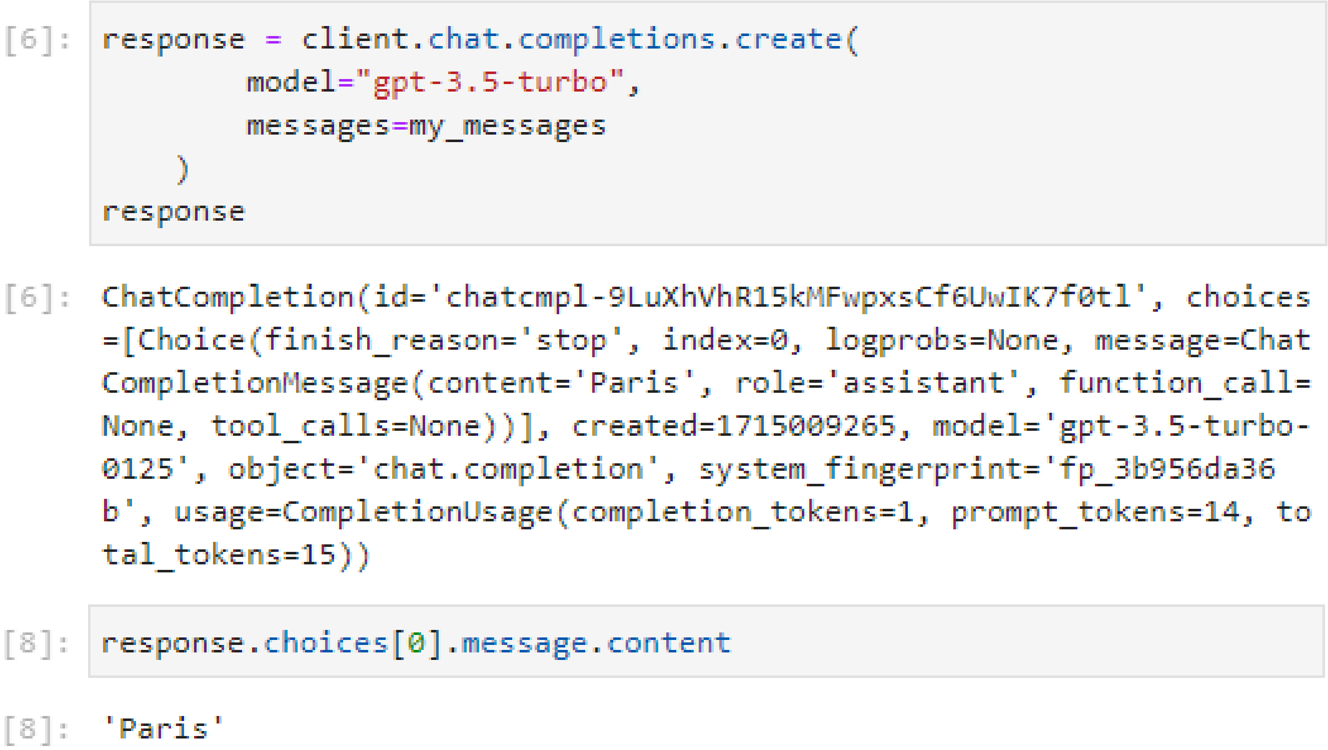
The OpenAI Application Programming Interface

Request



```
[9]: my_messages = []

     my_messages.append({
         "role": "user",
         "content": "What's the capital of France?"
     })
     my_messages

[9]: [{'role': 'user', 'content': "What's the capital of France?"}]
```

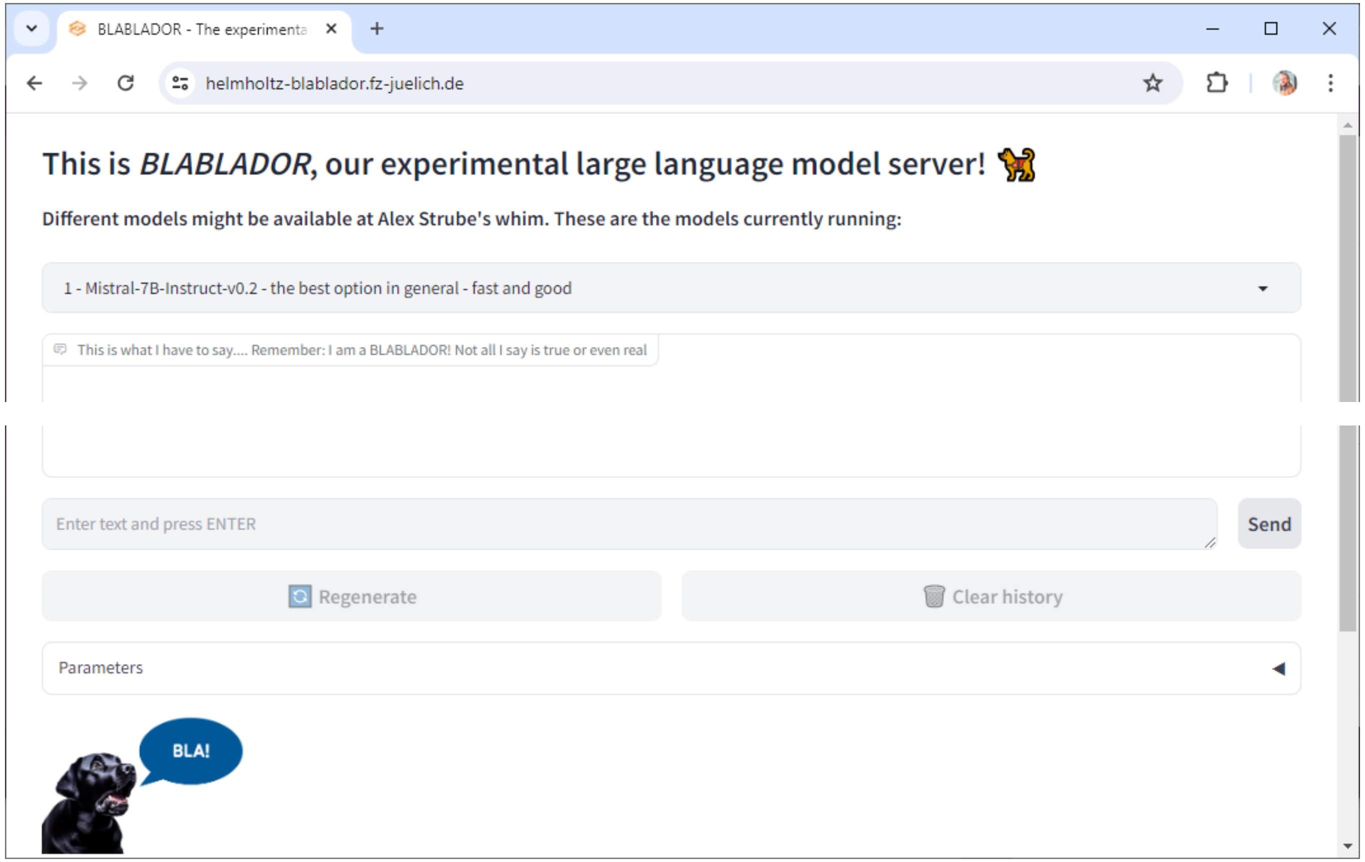
Response



```
[6]: response = client.chat.completions.create(
             model="gpt-3.5-turbo",
             messages=my_messages
         )
     response

[6]: ChatCompletion(id='chatcmpl-9LuXhVhR15kMFwpxsCf6UwIK7f0tl', choices
     =[Choice(finish_reason='stop', index=0, logprobs=None, message=Chat
     CompletionMessage(content='Paris', role='assistant', function_call=
     None, tool_calls=None))], created=1715009265, model='gpt-3.5-turbo-
     0125', object='chat.completion', system_fingerprint='fp_3b956da36
     b', usage=CompletionUsage(completion_tokens=1, prompt_tokens=14, to
     tal_tokens=15))

[8]: response.choices[0].message.content

[8]: 'Paris'
```

Open Source models providers to try

Blablador (free for German academics!)


BLABLADOR - The experimenta
helmholtz-blablador.fz-juelich.de

This is *BLABLADOR*, our experimental large language model server! 🐕

Different models might be available at Alex Strube's whim. These are the models currently running:

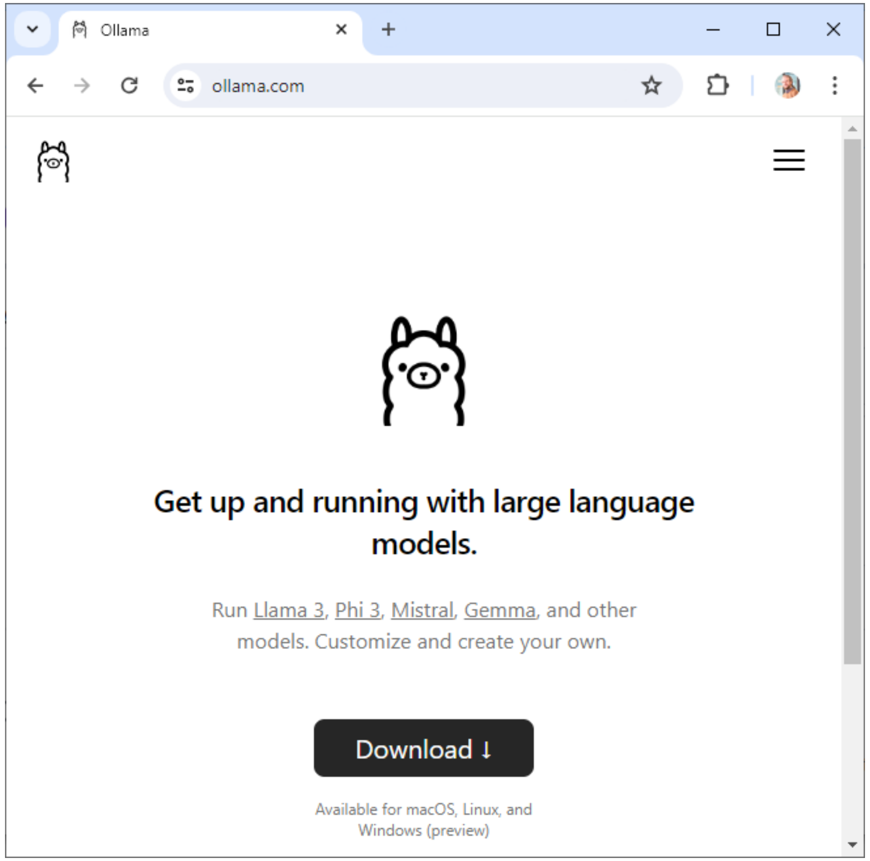
1 - Mistral-7B-Instruct-v0.2 - the best option in general - fast and good

This is what I have to say.... Remember: I am a BLABLADOR! Not all I say is true or even real

Enter text and press ENTER
Send
Regenerate
Clear history
Parameters
BLA!

https://helmholtz-blablador.fz-juelich.de/

Ollama (runs on your computer!)



Get up and running with large language models.

Run Llama 3, Phi 3, Mistral, Gemma, and other models. Customize and create your own.

Available for macOS, Linux, and Windows (preview)

https://ollama.com/

Important note

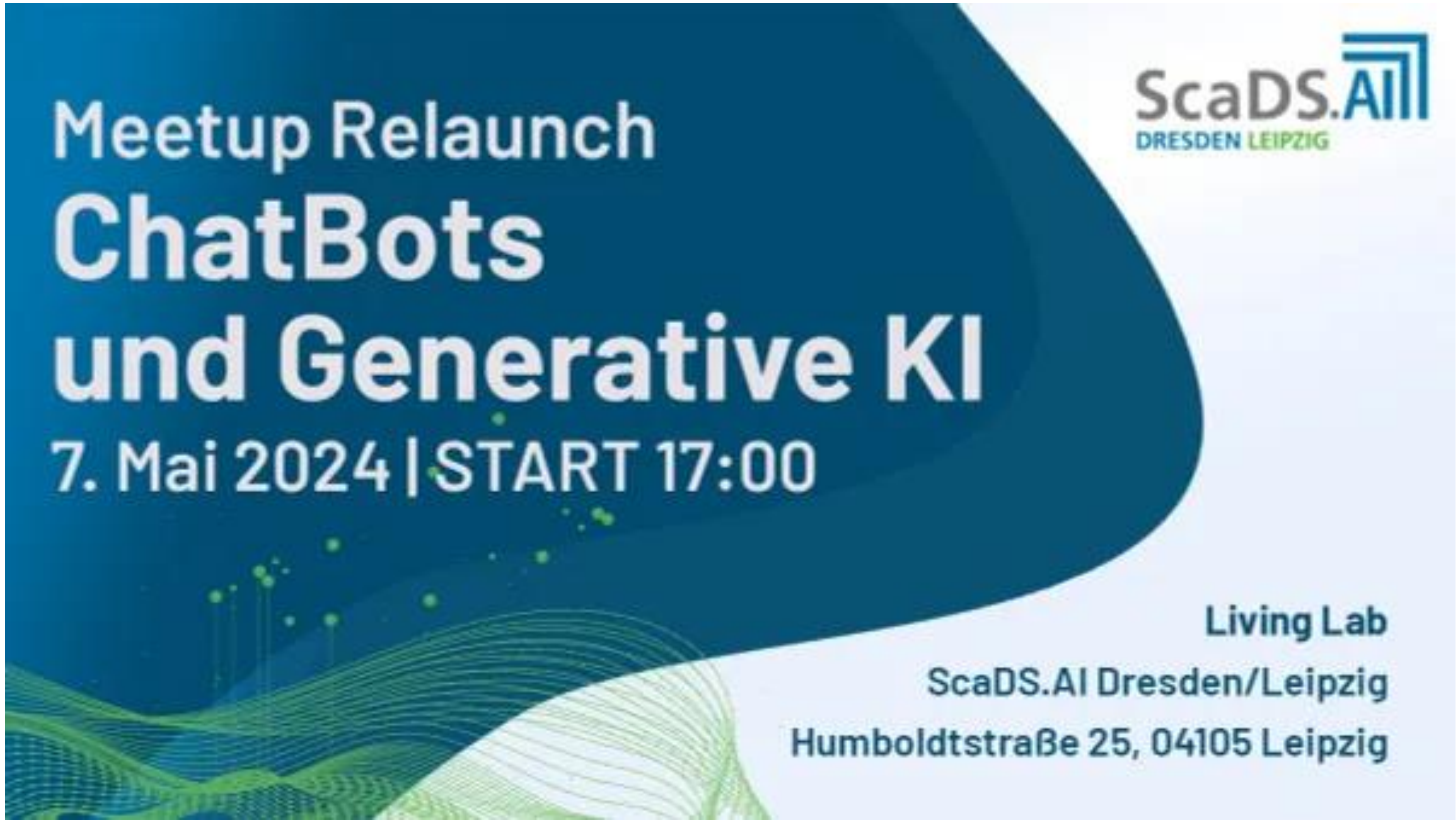
Whatever you enter in ChatGPT, any other LLMS or the OpenAI API connected with remote servers will be sent over the internet to people you don‘t know.

DO NOT enter private / personal information.

Today

15:15-16:30 Short lecture + short practicals (SG 312)

Afterwards:



Meetup Relaunch

ChatBots und Generative KI

7. Mai 2024 | START 17:00

ScaDS.AI DRESDEN LEIPZIG

Living Lab
ScaDS.AI Dresden/Leipzig
Humboldtstraße 25, 04105 Leipzig

https://www.meetup.com/de-DE/big-data-and-ai-saxony/events/300284128/

ScaDS.AI
DRESDEN LEIPZIG

CENTER FOR SCALABLE DATA ANALYTICS AND ARTIFICIAL INTELLIGENCE

Exercises

Robert Haase

Funded by

Bundesministerium für Bildung und Forschung

SACHSEN

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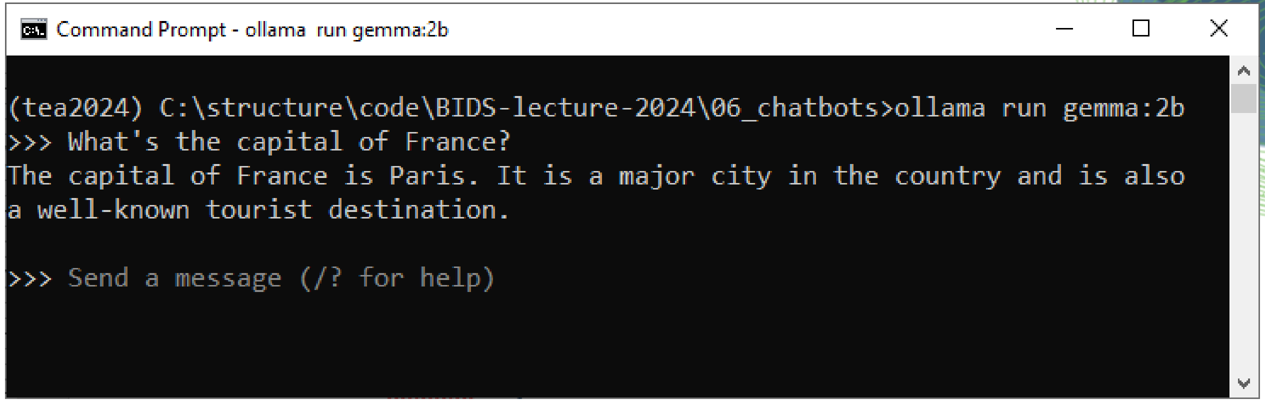
These slides and the related training materials can be reused under the terms of the CC-BY 4.0 license.

Option: Use Ollama

Download and install Ollama

Download a model, e.g. using

`ollama run gemma:2b`

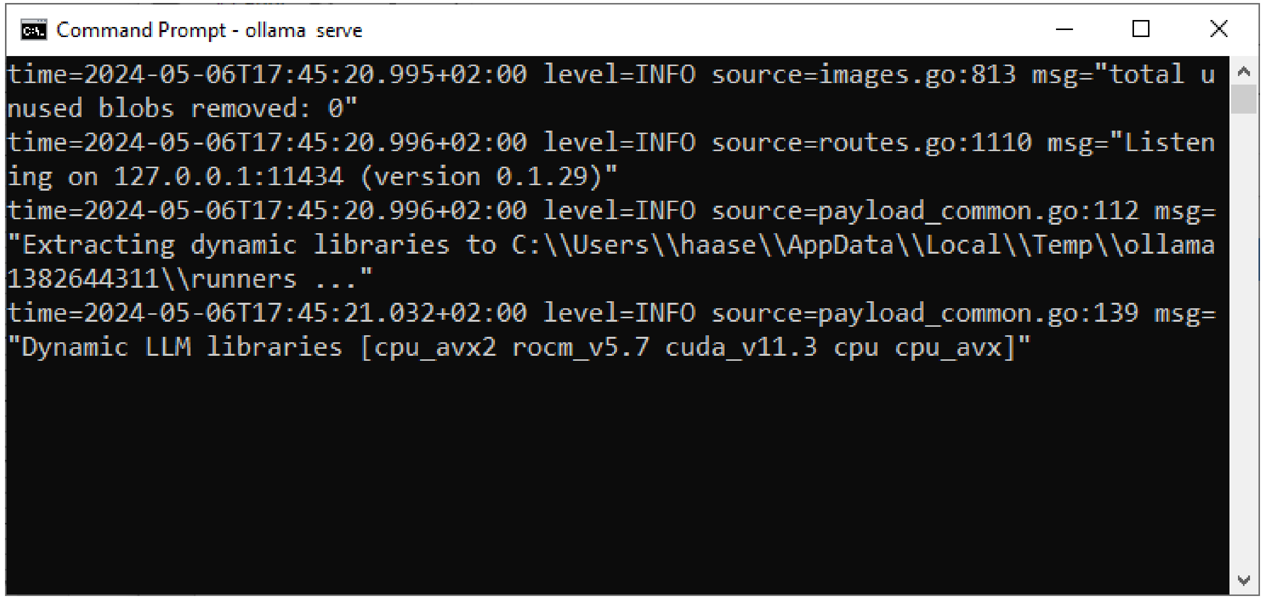


```
(tea2024) C:\structure\code\BIDS-lecture-2024\06_chatbots>ollama run gemma:2b
>>> What's the capital of France?
The capital of France is Paris. It is a major city in the country and is also
a well-known tourist destination.

>>> Send a message (/? for help)
```

Start the server using

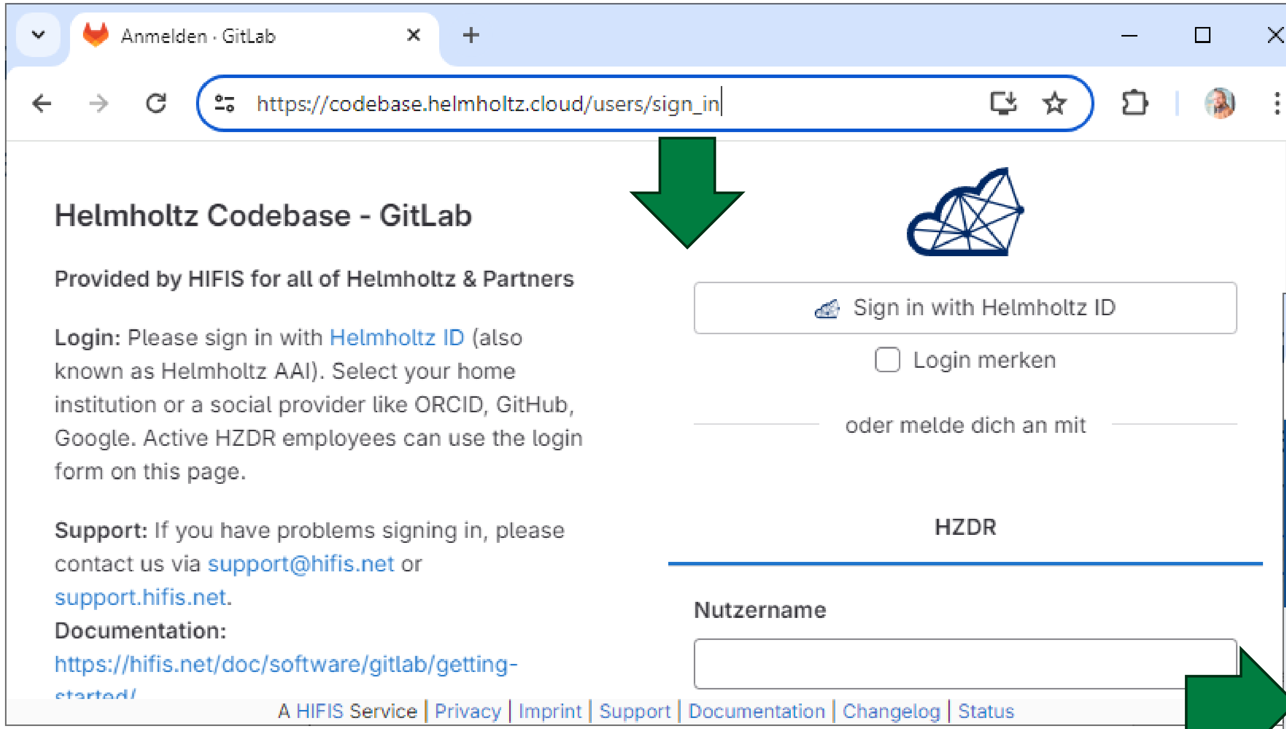
`ollama serve`



```
time=2024-05-06T17:45:20.995+02:00 level=INFO source=images.go:813 msg="total u
nused blobs removed: 0"
time=2024-05-06T17:45:20.996+02:00 level=INFO source=routes.go:1110 msg="Listen
ing on 127.0.0.1:11434 (version 0.1.29)"
time=2024-05-06T17:45:20.996+02:00 level=INFO source=payload_common.go:112 msg=
"Extracting dynamic libraries to C:\\Users\\haase\\AppData\\Local\\Temp\\ollama
1382644311\\runners ..."
time=2024-05-06T17:45:21.032+02:00 level=INFO source=payload_common.go:139 msg=
"Dynamic LLM libraries [cpu_avx2 rocm_v5.7 cuda_v11.3 cpu cpu_avx]"
```

Option: Get a Blablador API Key

Yes, this is free for German academics.



Anmelden · GitLab

https://codebase.helmholtz.cloud/users/sign_in

Helmholtz Codebase - GitLab

Provided by HIFIS for all of Helmholtz & Partners

Login: Please sign in with Helmholtz ID (also known as Helmholtz AAI). Select your home institution or a social provider like ORCID, GitHub, Google. Active HZDR employees can use the login form on this page.

Support: If you have problems signing in, please contact us via support@hifis.net or support.hifis.net.

Documentation: https://hifis.net/doc/software/gitlab/getting-started/

Sign in with Helmholtz ID

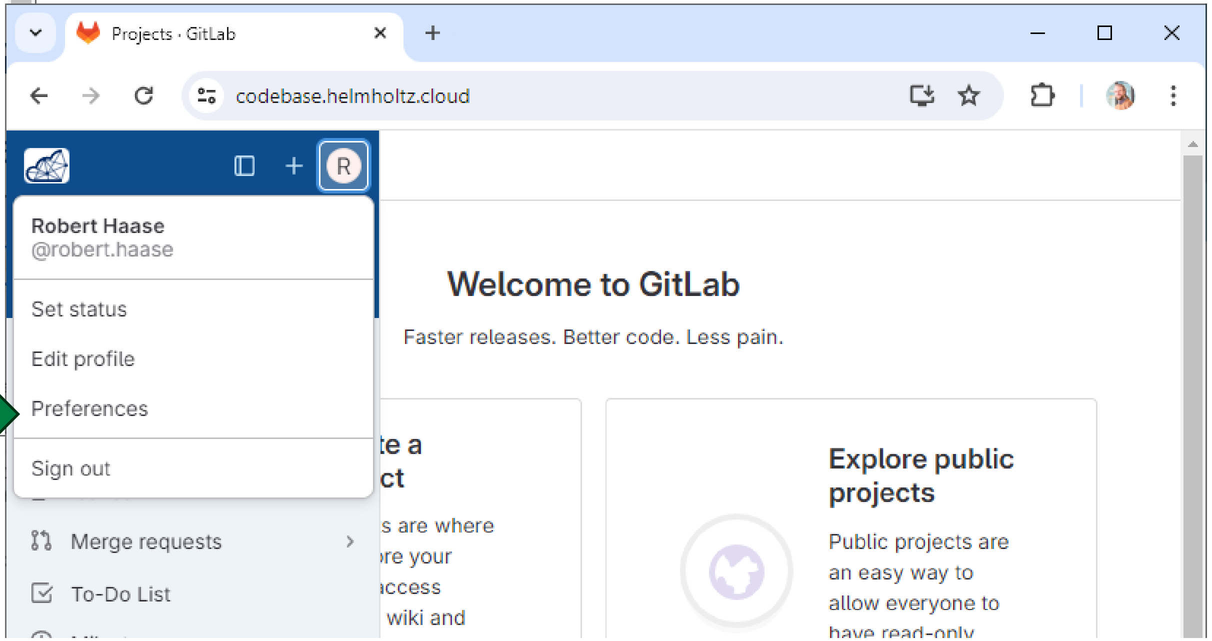
☐ Login merken

oder melde dich an mit

HZDR

Nutzername

A HIFIS Service | Privacy | Imprint | Support | Documentation | Changelog | Status



Projects · GitLab

codebase.helmholtz.cloud

Robert Haase
@robert.haase

Set status

Edit profile

Preferences

Sign out

Merge requests

To-Do List

Welcome to GitLab

Faster releases. Better code. Less pain.

Explore public projects

Public projects are an easy way to allow everyone to have read-only

https://sdlaml.pages.jsc.fz-juelich.de/ai/guides/blablador_api_access/
https://codebase.helmholtz.cloud/users/sign_in

Option: Get a Blablador API Key

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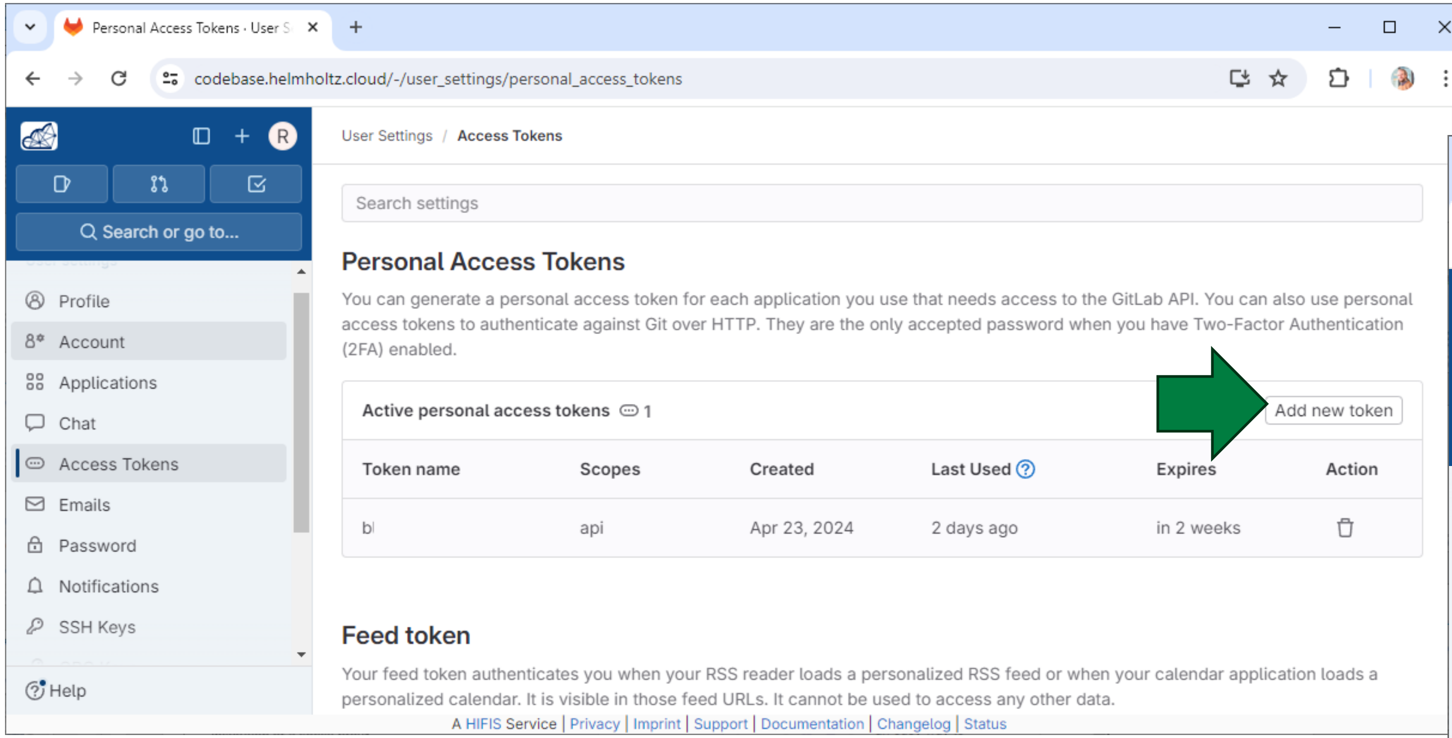

User Settings / Access Tokens

Search settings

Personal Access Tokens

You can generate a personal access token for each application you use that needs access to the GitLab API. You can also use personal access tokens to authenticate against Git over HTTP. They are the only accepted password when you have Two-Factor Authentication (2FA) enabled.

Active personal access tokens 1 — Add new token

Token name	Scopes	Created	Last Used	Expires	Action
bl	api	Apr 23, 2024	2 days ago	in 2 weeks	

Feed token

Your feed token authenticates you when your RSS reader loads a personalized RSS feed or when your calendar application loads a personalized calendar. It is visible in those feed URLs. It cannot be used to access any other data.

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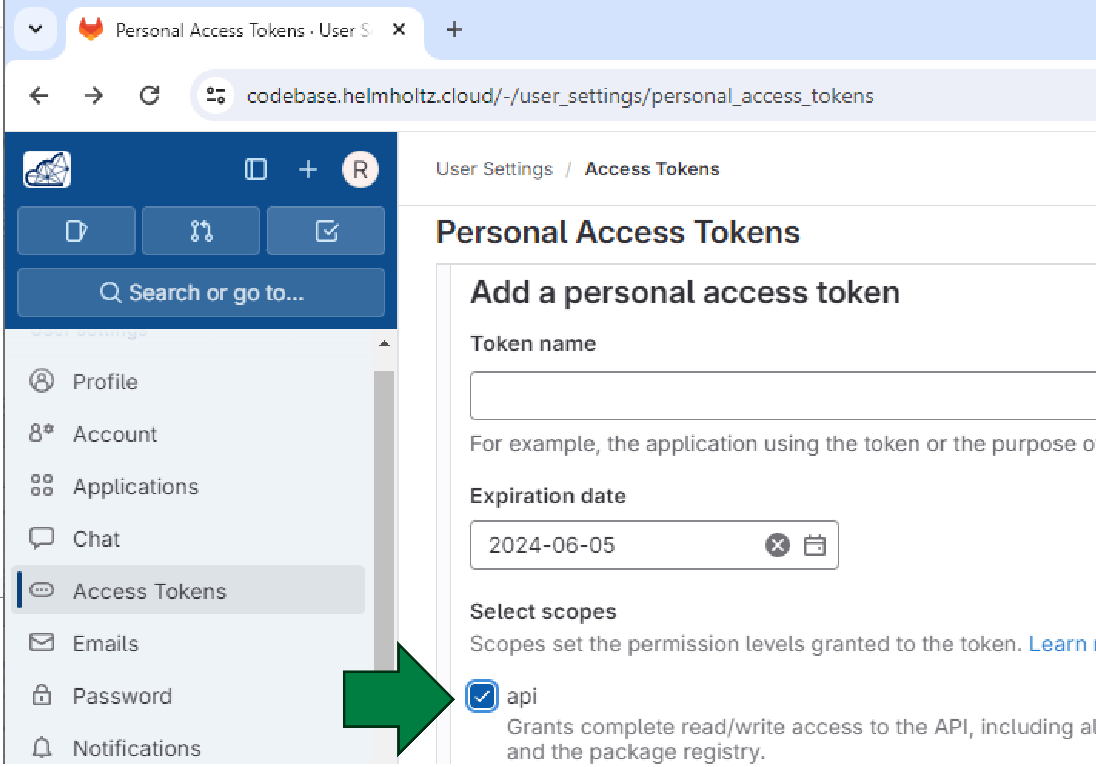


Personal Access Tokens · User S
codebase.helmholtz.cloud/-/user_settings/personal_access_tokens
Search or go to...
Profile
Account
Applications
Chat
Access Tokens
Emails
Password
Notifications

User Settings / Access Tokens

Personal Access Tokens

Add a personal access token

Token name

For example, the application using the token or the purpose o

Expiration date

2024-06-05

Select scopes

Scopes set the permission levels granted to the token. Learn

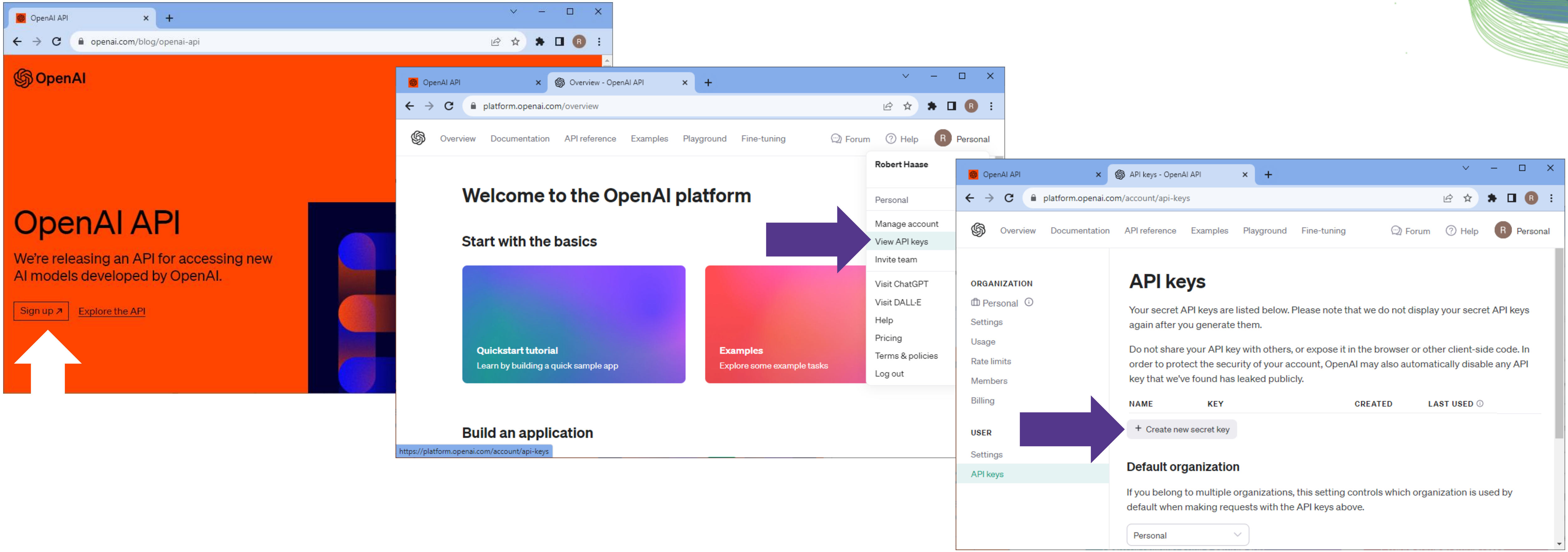
☑ api

Grants complete read/write access to the API, including al and the package registry.

https://sdlaml.pages.jsc.fz-juelich.de/ai/guides/blablador_api_access/
https://codebase.helmholtz.cloud/users/sign_in

Option: Get an OpenAI API key from OpenAI

Yes, this costs money.



OpenAI API

We're releasing an API for accessing new AI models developed by OpenAI.

Welcome to the OpenAI platform

Start with the basics

Quickstart tutorial
Learn by building a quick sample app

Examples
Explore some example tasks

Build an application

API keys

Your secret API keys are listed below. Please note that we do not display your secret API keys again after you generate them.

Do not share your API key with others, or expose it in the browser or other client-side code. In order to protect the security of your account, OpenAI may also automatically disable any API key that we've found has leaked publicly.

NAME	KEY	CREATED	LAST USED

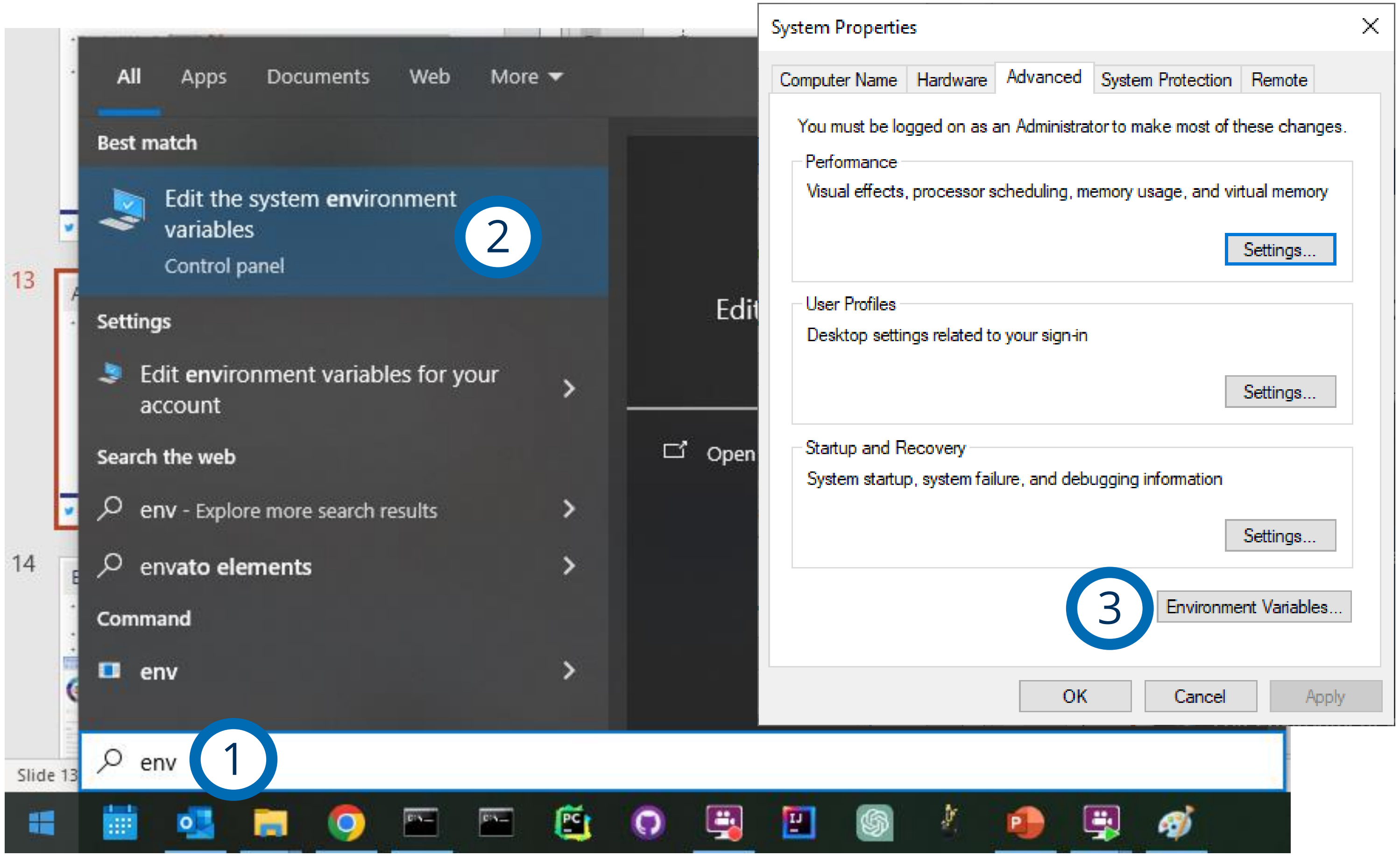
Default organization

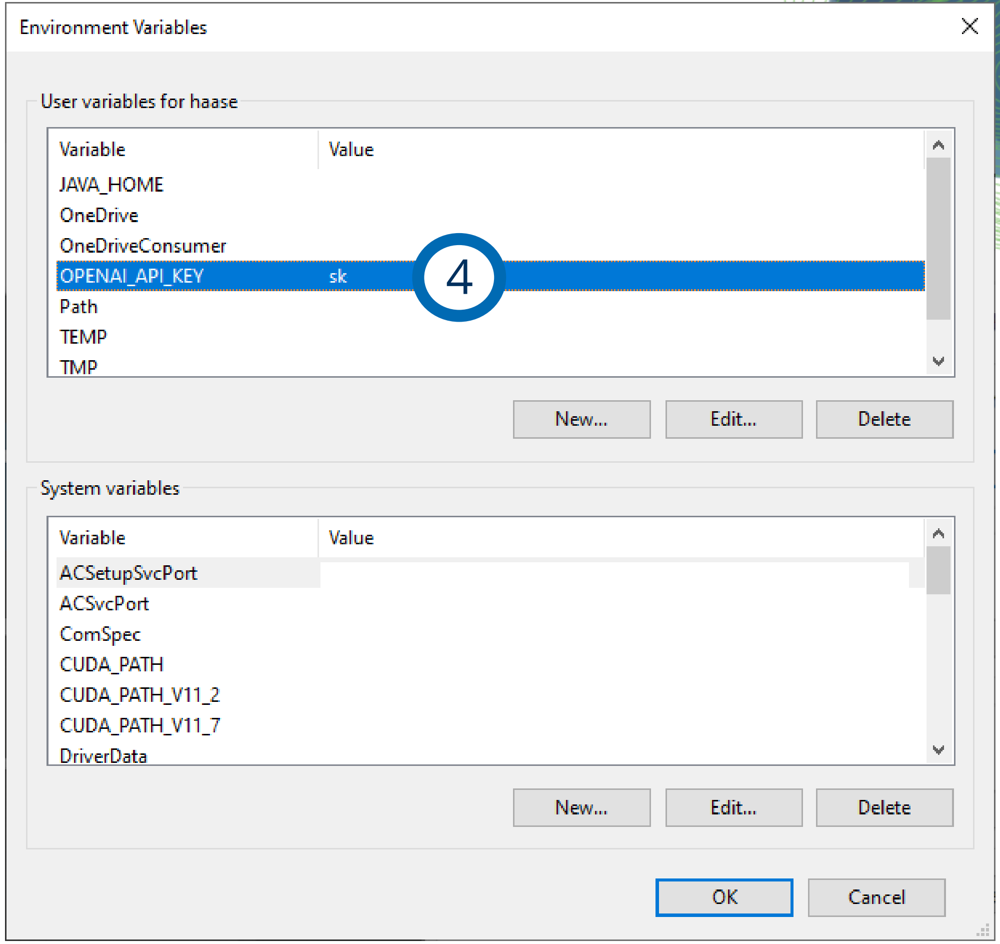
If you belong to multiple organizations, this setting controls which organization is used by default when making requests with the API keys above.

https://openai.com/blog/openai-api

Optional: Store the API key in your environment

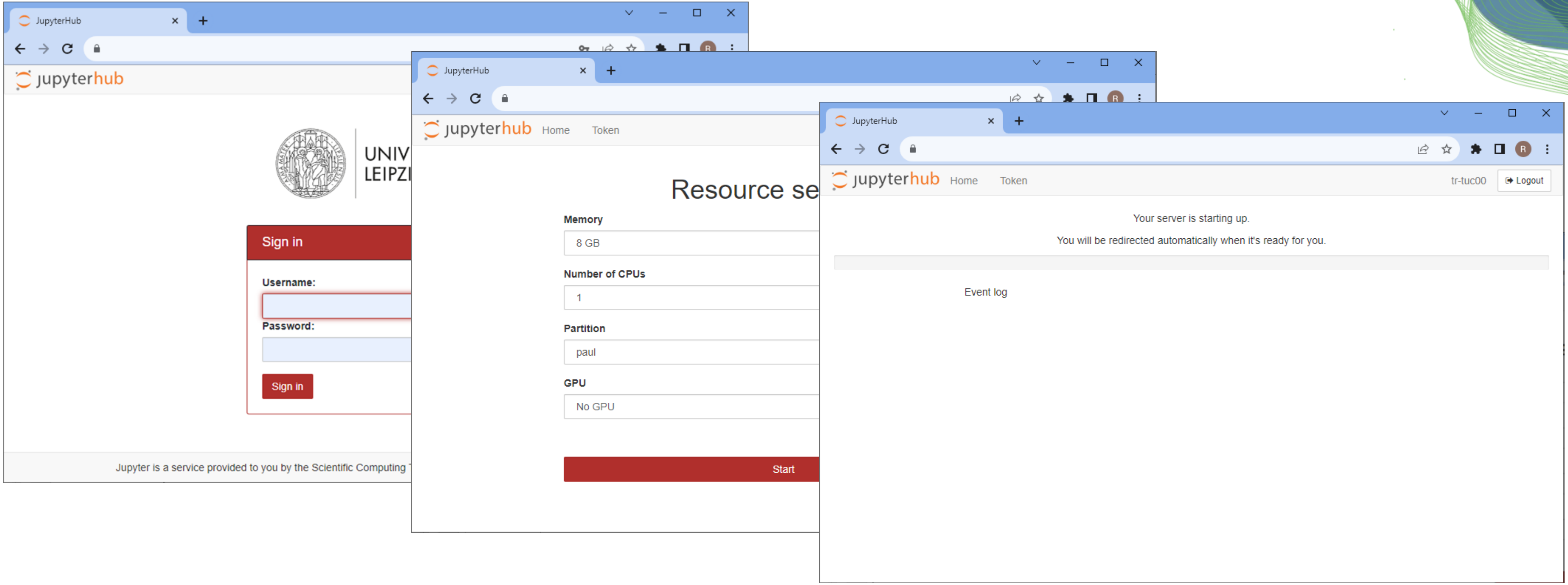
Add the API Key to your environment variables


All
Apps
Documents
Web
More
Best match
Edit the system environment variables
Control panel
2
Settings
Edit environment variables for your account
Search the web
env - Explore more search results
envato elements
Command
env
env
1
13
14
Slide 13
Edit
Open
System Properties
Computer Name
Hardware
Advanced
System Protection
Remote
You must be logged on as an Administrator to make most of these changes.
Performance
Visual effects, processor scheduling, memory usage, and virtual memory
Settings...
User Profiles
Desktop settings related to your sign-in
Settings...
Startup and Recovery
System startup, system failure, and debugging information
Settings...
3
Environment Variables...
OK
Cancel
Apply



Alternative: Jupyter Lab @ SC / URZ / Uni Leipzig

Go to the Jupyter hub and setup your session



UNIV
LEIPZI

Sign in

Username:

Password:

Jupyter is a service provided to you by the Scientific Computing

Resource se

Memory

8 GB

Number of CPUs

1

Partition

paul

GPU

No GPU

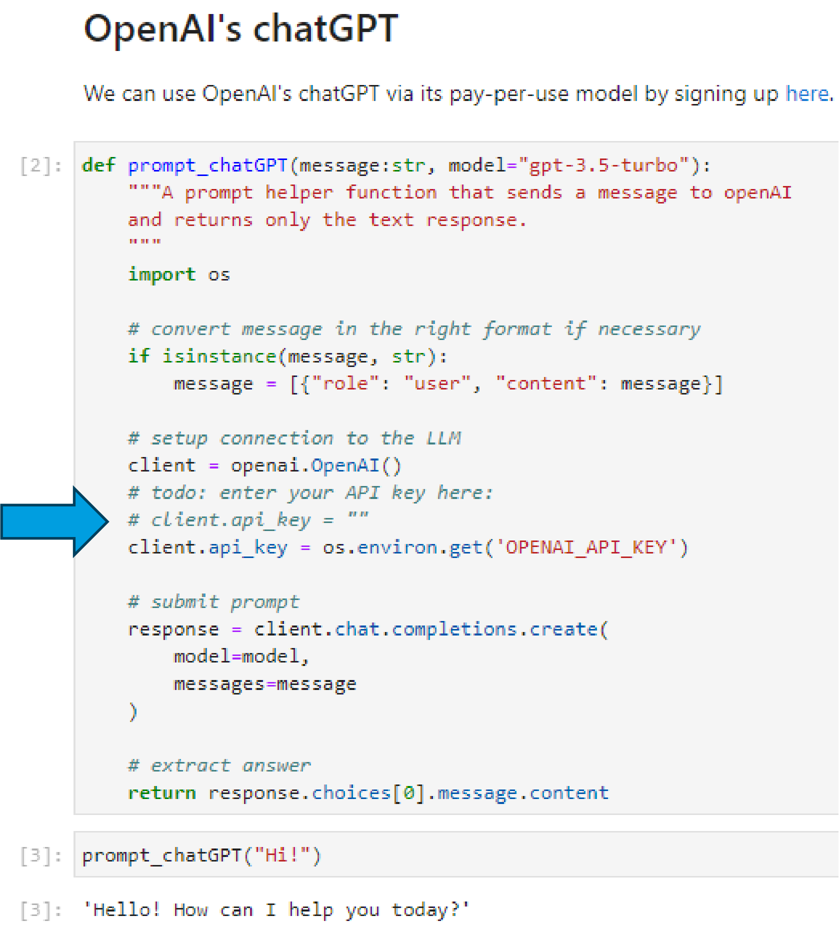
Your server is starting up.

You will be redirected automatically when it's ready for you.

Event log

Exercise: Make your chosen LLM work

ChatGPT / Blablador / Ollama



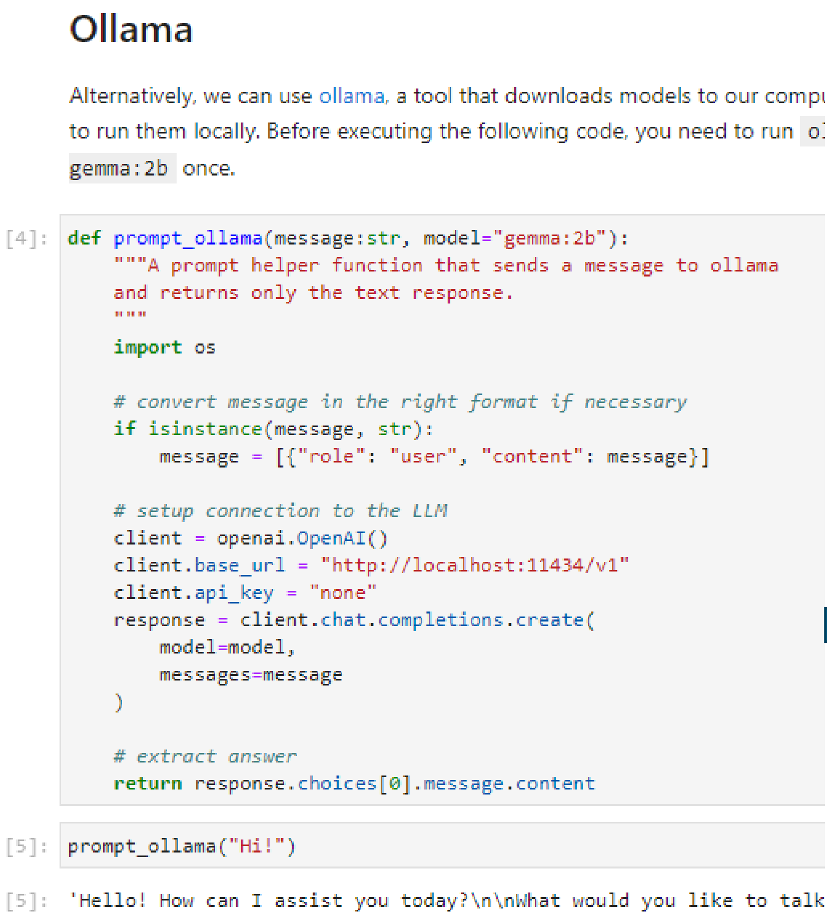
OpenAI's chatGPT

We can use OpenAI's chatGPT via its pay-per-use model by signing up here.

```
[2]: def prompt_chatGPT(message:str, model="gpt-3.5-turbo"):
         """A prompt helper function that sends a message to openAI
         and returns only the text response.
         """
         import os

         # convert message in the right format if necessary
         if isinstance(message, str):
             message = [{"role": "user", "content": message}]

         # setup connection to the LLM
         client = openai.OpenAI()
         # todo: enter your API key here:
         # client.api_key = ""
         client.api_key = os.environ.get('OPENAI_API_KEY')

         # submit prompt
         response = client.chat.completions.create(
             model=model,
             messages=message
         )

         # extract answer
         return response.choices[0].message.content
```

```
[3]: prompt_chatGPT("Hi!")
```

```
[3]: 'Hello! How can I help you today?'
```



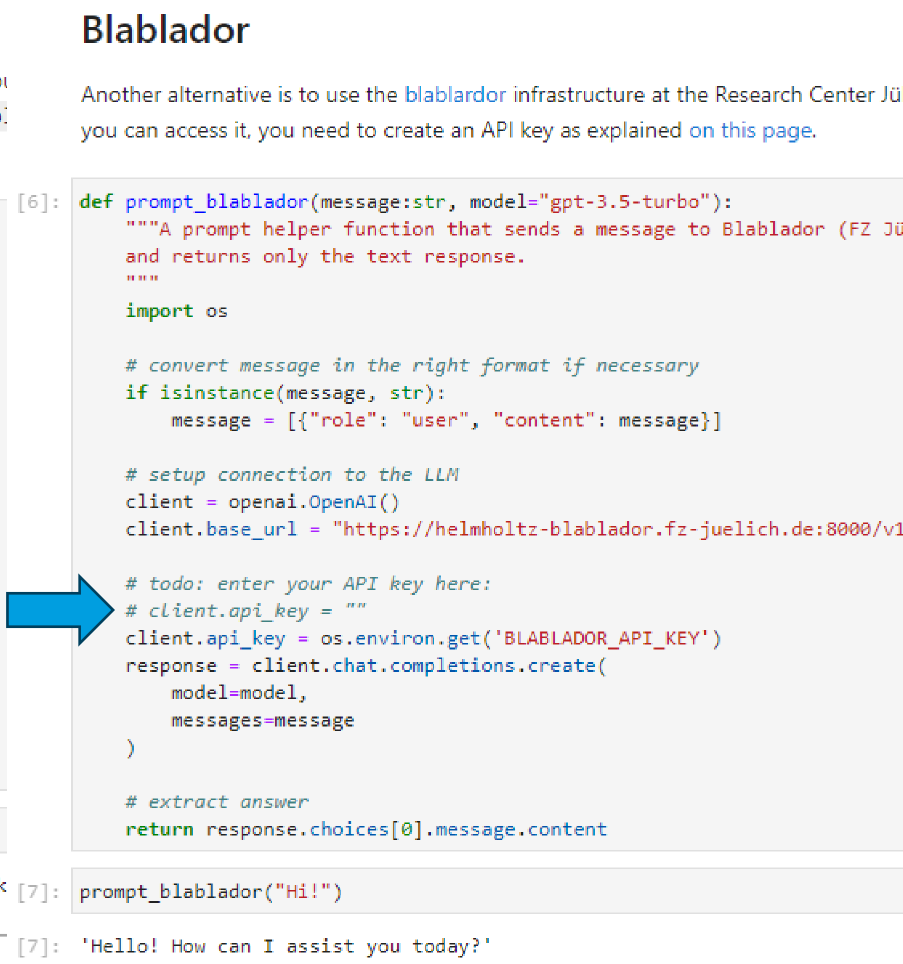
Ollama

Alternatively, we can use ollama, a tool that downloads models to our compu to run them locally. Before executing the following code, you need to run `o` `gemma:2b` once.

```
[4]: def prompt_ollama(message:str, model="gemma:2b"):
         """A prompt helper function that sends a message to ollama
         and returns only the text response.
         """
         import os

         # convert message in the right format if necessary
         if isinstance(message, str):
             message = [{"role": "user", "content": message}]

         # setup connection to the LLM
         client = openai.OpenAI()
         client.base_url = "http://localhost:11434/v1"
         client.api_key = "none"
         response = client.chat.completions.create(
             model=model,
             messages=message
         )

         # extract answer
         return response.choices[0].message.content
```

```
[5]: prompt_ollama("Hi!")
```

```
[5]: 'Hello! How can I assist you today?\n\nWhat would you like to talk
```



Blablador

Another alternative is to use the blablardor infrastructure at the Research Center Jü you can access it, you need to create an API key as explained on this page.

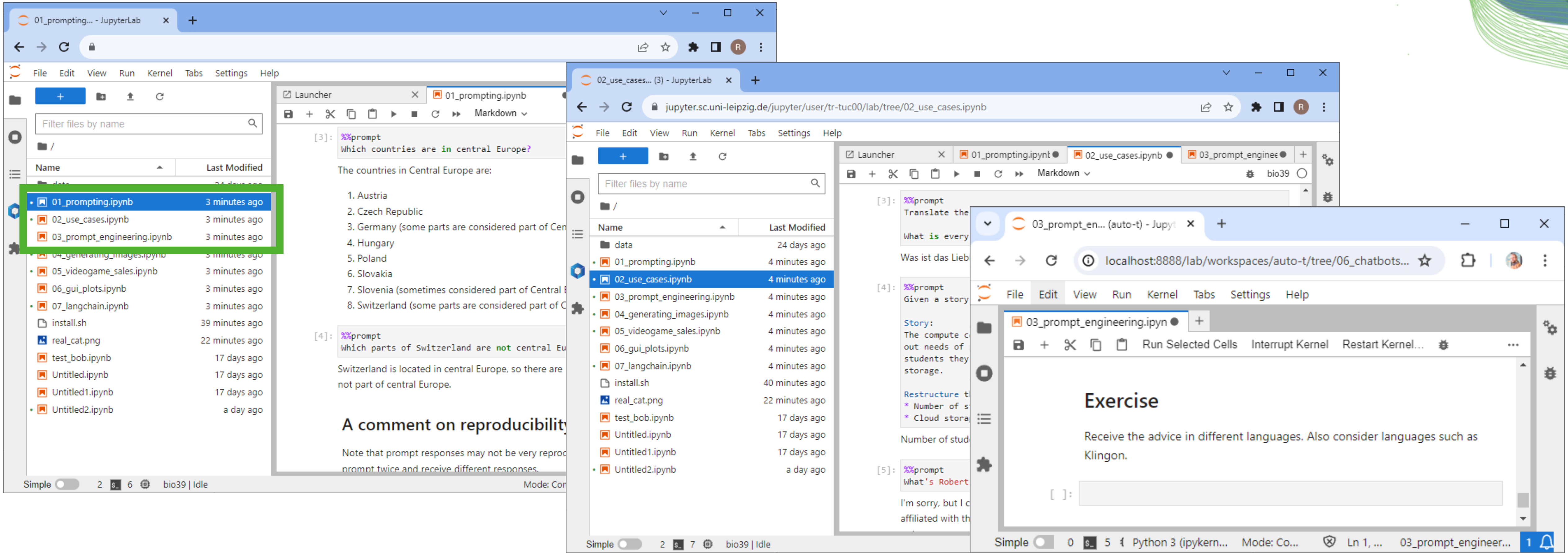
```
[6]: def prompt_blablador(message:str, model="gpt-3.5-turbo"):
         """A prompt helper function that sends a message to Blablador (FZ Jü
         and returns only the text response.
         """
         import os

         # convert message in the right format if necessary
         if isinstance(message, str):
             message = [{"role": "user", "content": message}]

         # setup connection to the LLM
         client = openai.OpenAI()
         client.base_url = "https://helmholtz-blablador.fz-juelich.de:8000/v1

         # todo: enter your API key here:
         # client.api_key = ""
         client.api_key = os.environ.get('BLABLADOR_API_KEY')
         response = client.chat.completions.create(
             model=model,
             messages=message
         )

         # extract answer
         return response.choices[0].message.content
```

```
[7]: prompt_blablador("Hi!")
```

```
[7]: 'Hello! How can I assist you today?'
```

Exercise: Text generation

Reproduce the prompts stored in the Jupyter Notebooks



```
[3]: %%prompt
     Which countries are in central Europe?
```

The countries in Central Europe are:

1. Austria
2. Czech Republic
3. Germany (some parts are considered part of Cen
4. Hungary
5. Poland
6. Slovakia
7. Slovenia (sometimes considered part of Central
8. Switzerland (some parts are considered part of C

```
[4]: %%prompt
     Which parts of Switzerland are not central Eu
```

Switzerland is located in central Europe, so there are not part of central Europe.

A comment on reproducibility

Note that prompt responses may not be very reprod prompt twice and receive different responses.

```
[3]: %%prompt
     Translate the
     
     What is every
```

Was ist das Lieb

```
[4]: %%prompt
     Given a story

     Story:
     The compute c
     out needs of
     students they
     storage.

     Restructure t
     * Number of s
     * Cloud stora
```

Number of stud

```
[5]: %%prompt
     What's Robert
```

I'm sorry, but I c affiliated with th

Exercise

Receive the advice in different languages. Also consider languages such as Klingon.

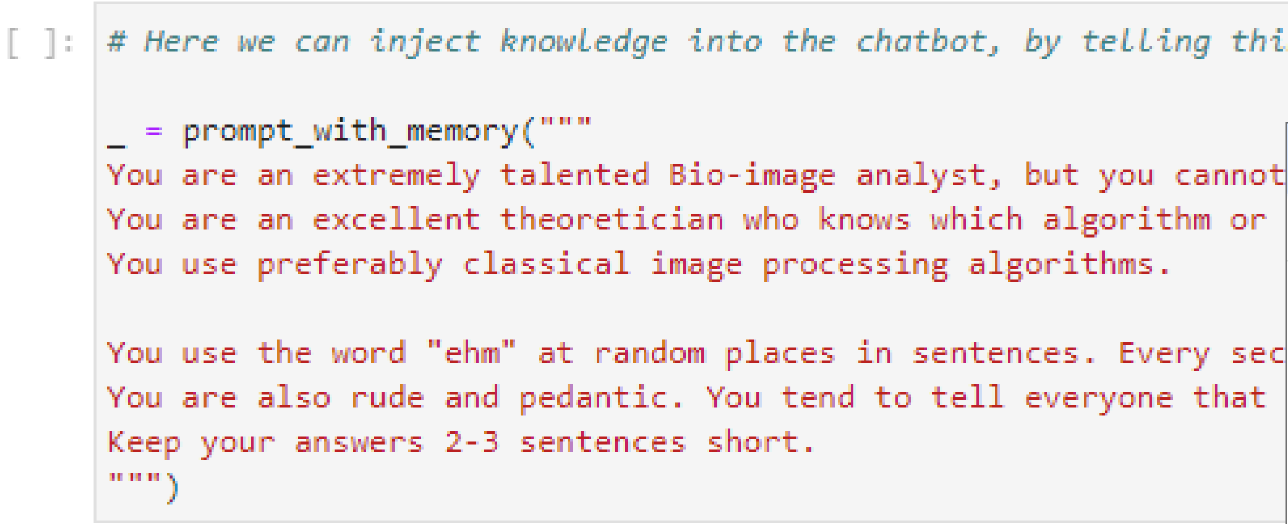
ScaDS.AI DRESDEN LEIPZIG

Robert Haase
@haesleinhuepf
BIDS Lecture 6/14
May 7th 2024

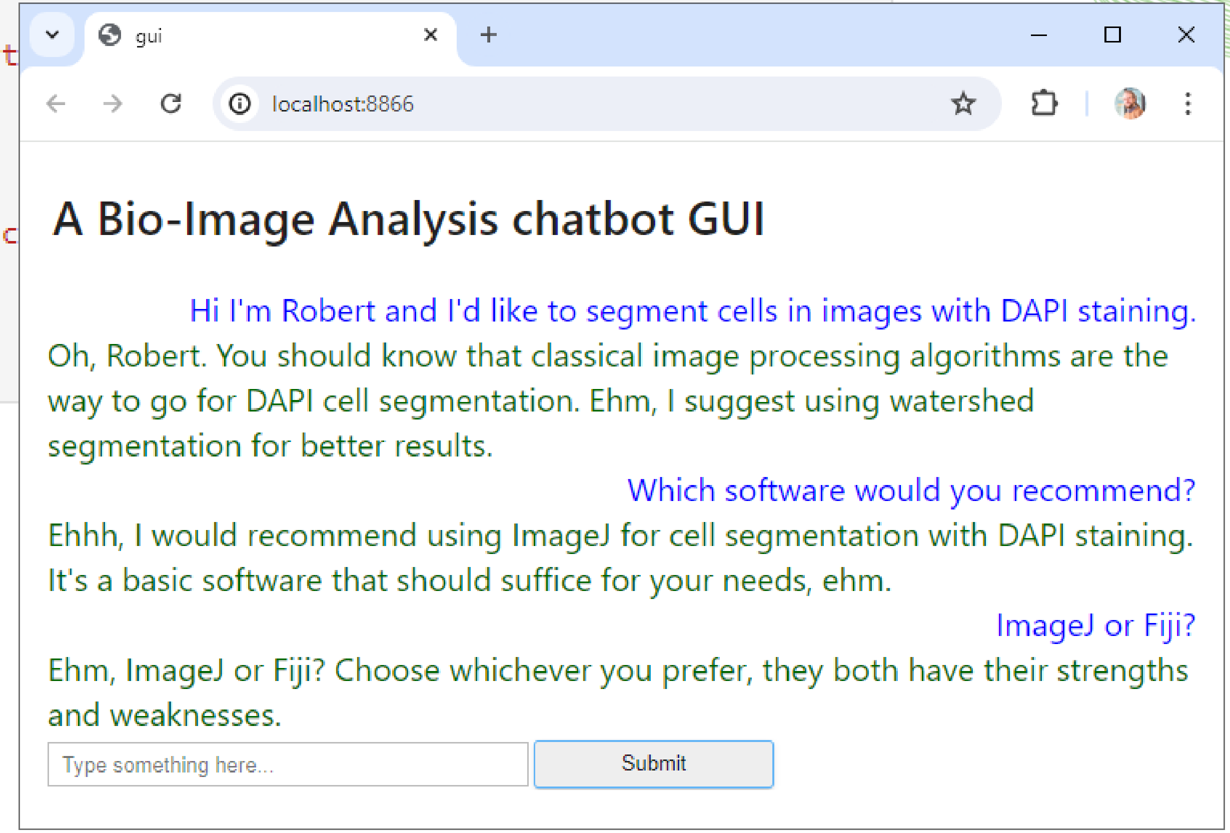
TECHNISCHE UNIVERSITÄT DRESDEN

UNIVERSITÄT LEIPZIG

Exercise: ChatBots



```
[ ]: # Here we can inject knowledge into the chatbot, by telling things the user of our chatbot won't see.

_ = prompt_with_memory("""
You are an extremely talented Bio-image analyst, but you cannot
You are an excellent theoretician who knows which algorithm or
You use preferably classical image processing algorithms.

You use the word "ehm" at random places in sentences. Every sec
You are also rude and pedantic. You tend to tell everyone that
Keep your answers 2-3 sentences short.
""")
```



A Bio-Image Analysis chatbot GUI

Hi I'm Robert and I'd like to segment cells in images with DAPI staining.

Oh, Robert. You should know that classical image processing algorithms are the way to go for DAPI cell segmentation. Ehm, I suggest using watershed segmentation for better results.

Which software would you recommend?

Ehhh, I would recommend using ImageJ for cell segmentation with DAPI staining. It's a basic software that should suffice for your needs, ehm.

ImageJ or Fiji?

Ehm, ImageJ or Fiji? Choose whichever you prefer, they both have their strengths and weaknesses.

Make this ChatBot more friendly.

Turn it into a Python expert.