swiss ai center

Workshop 1:
RAG: Unveiling the Power of Retrieval-Augmented Generation

- Célien Donzé, HEIA-FR / HES-SO
- Henrique Marques Reis, HE-ARC, HES-SO
- Jonathan Guerne, HE-ARC, HES-SO

la Mobilière

opi industries technologies

eksperiens 25 LA RENCONTRE DU PROJET

alp+ict western switzerland digital cluster

Hes·so

Schedule - Morning

8:30:00 AM	0:05	Opening remarks	Sébatien Rumley	HEIA-FR, HES-SO / Swiss Ai center
8:35:00 AM	0:30	The Alps research infrastructure at CSCS: enabling world-class ML research in Switzerland	Fawzi Mohamed	The Swiss National Supercomputing Centre (CSCS), ETH Zurich
9:05:00 AM	0:18	SCITAS: On-premise and Cloud Infrastructure driving HPC & AI Scientific Computing at EPFL	Gilles Fourestey	
9:23:00 AM	0:18	Picterra's Infrastructure: Scaling ML for Geospatial Imagery Analysis	Julien Rebetez	CTO @ Picterra
9:41:00 AM	0:19	Securing AI Infrastructure: Strategies & Common Pitfalls	Terry Vogelsang	Kudelski Security
10:00:00 AM	0:30	Is your infrastructure ready for AI workloads ?	Jean-Baptiste Thomas	Principal Field Solutions Architect – Pure Storage EMEA
10:30:00 AM	0:20	Break - Offered by the Swiss Ai Center		
10:50:00 AM	0:18	Enabling ressources optimisation thru Monitoring of Mixed GPU Setups	Martin Roch-Neirey	HEIA-FR, HES-SO
11:08:00 AM	0:18	Enabling headache-free heterogeneous GPU resource sharing for a small cluster	Abele Mălan, Romain De Laage	UNINE
11:26:00 AM	0:18	Efficient GPU Resource Sharing with Kubernetes and Coder	Dorian Gambin	HE
11:44:00 AM	0:18	Unlocking Performance: vGPU Acceleration on Cisco UCS X-Series with VMware vSphere	Jérémy Gamba	HEFR
12:02:00 PM	0:18	GPU infrastructure at UNIL, an attempt at continuous adaptation	Emmanuel Jeanvoine	UNIL - Scientific Computing and Research Support unit
12:20:00 PM	0:55	Lunch - Offered by PureStorage and Exoscale		

Warm-up

Use-cases

PURESTORAGE®

EXOSCALE

Schedule - Afternoon

12:20:00 PM	0:55	Lunch - Offered by PureStorage and Exoscale		
1:15:00 PM	0:30	GPU hyperspecialisation	Antoine Coetsier	Exoscale
1:45:00 PM	0:18	Building a SLURM Cluster with Existing Heterogeneous Hardware	Marc Stadelman	Centre for Artificial Intelligence, ZHAW School of Er
2:03:00 PM	0:19	Slurm & heterogenous users: avoiding main pitfalls	Ljiljana Dolamic	ar Campus
2:22:00 PM	0:19	OpenOnDemand	Adrien Albert, Yann Sagon	UNIGE
2:41:00 PM	0:19	Where to ask for help when building or operating a GPU cluster?	Marco Merkel	HPC-DoItNow
3:00:00 PM	0:30	Break - Offered by E4		
3:30:00 PM	0:20	OAR: a Versatile Resource and Job Management System to Tame Complexity	Olivier Richard	Pc GA
3:50:00 PM	0:30	Private LLM for industrial users	Daniele Cremonini	E4
4:20:00 PM	0:05	Mini-break		
4:25:00 PM	0:50	Panel/group discussion		
5:15:00 PM		End		

Scaling

Streching

Merci à  EXOSCALE

Who are we ?

- Célien Donzé

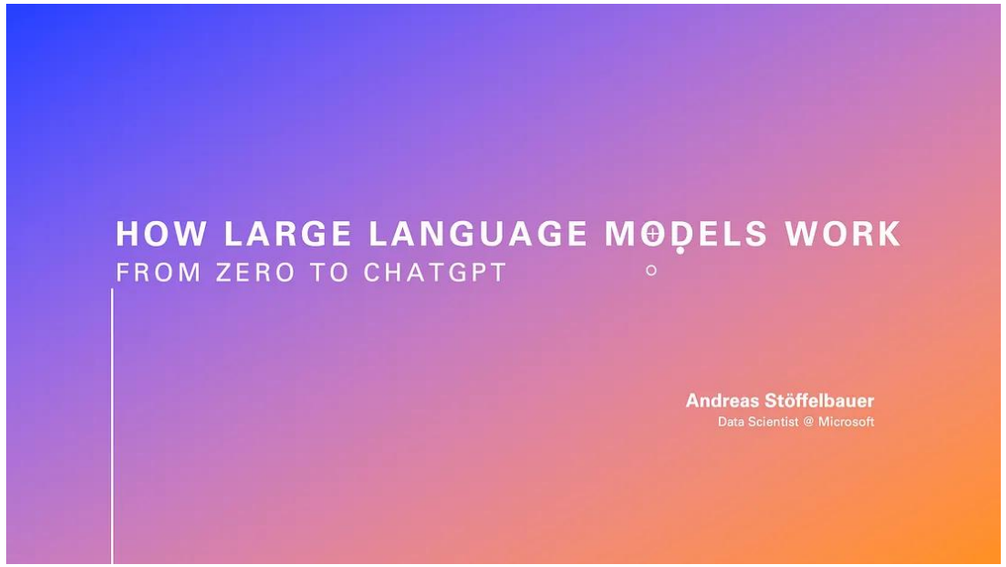
- Henrique Marques Reis
- Jonathan Guerne

Outline

- Technical background
- *break*
- Hands on
- *break*
- Final discussion
- Total duration: 2h30

A bit of background

About LLM: how do they work



Excellent resource from Andreas Stöffelbauer on Medium

- Large pretrained models for word prediction
- Fine-tuned for better alignment
- Improved via reinforcement learning from human feedback (RLHF)

Natural language generation

After training: We can generate text by predicting one word at a time

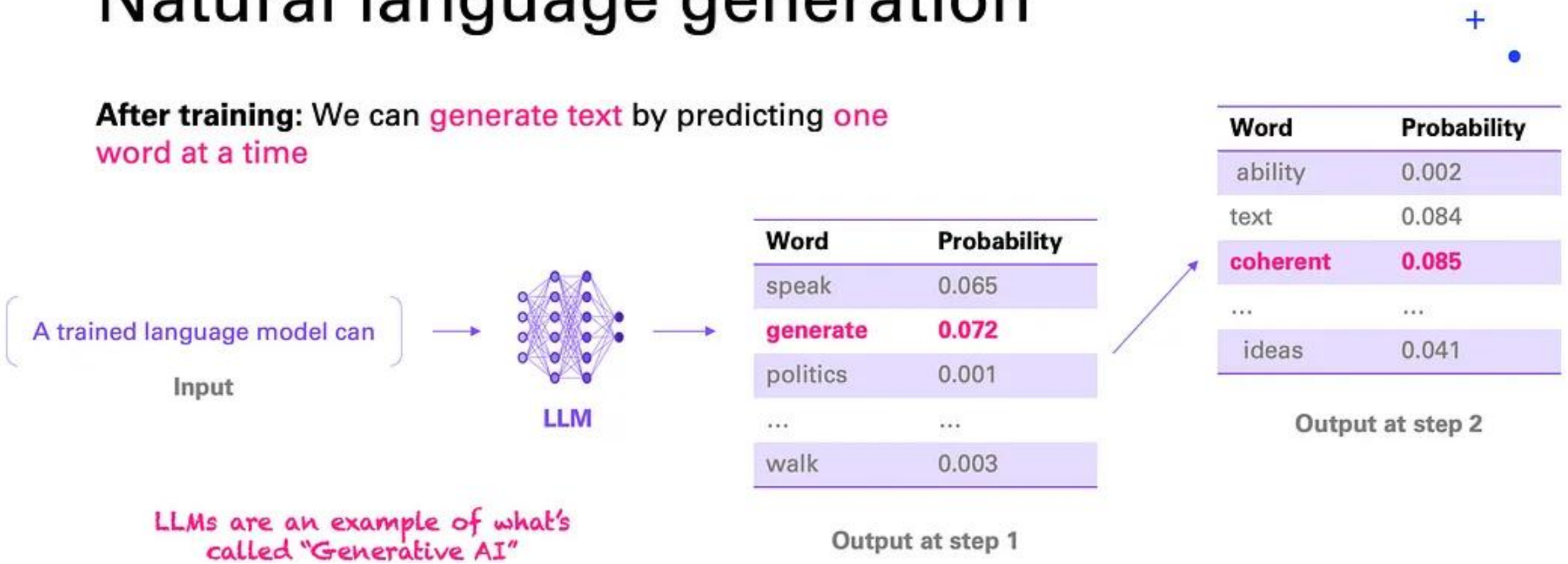


Illustration from Andreas Stöffelbauer

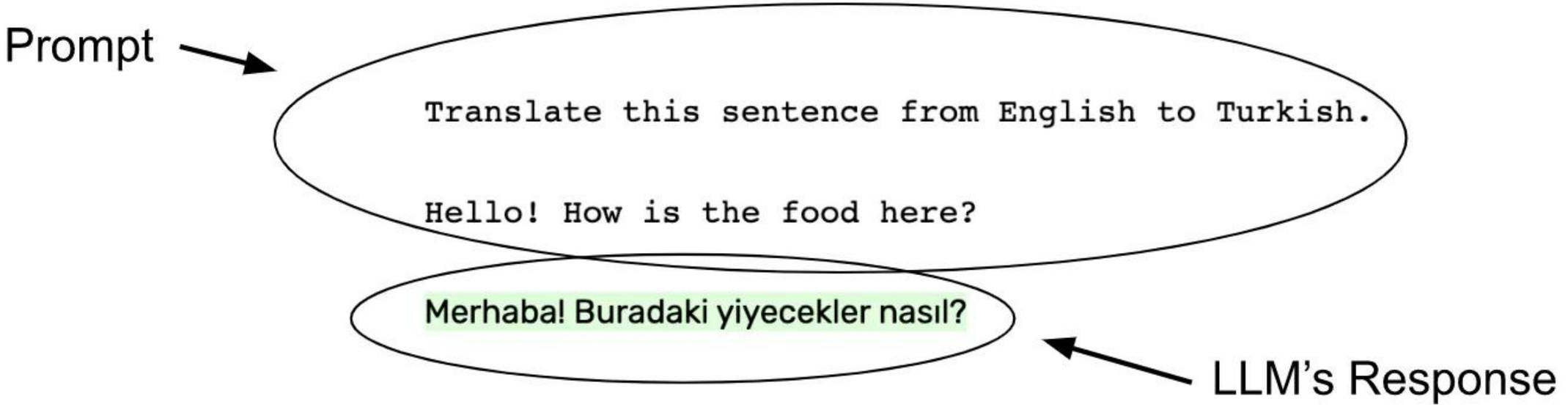
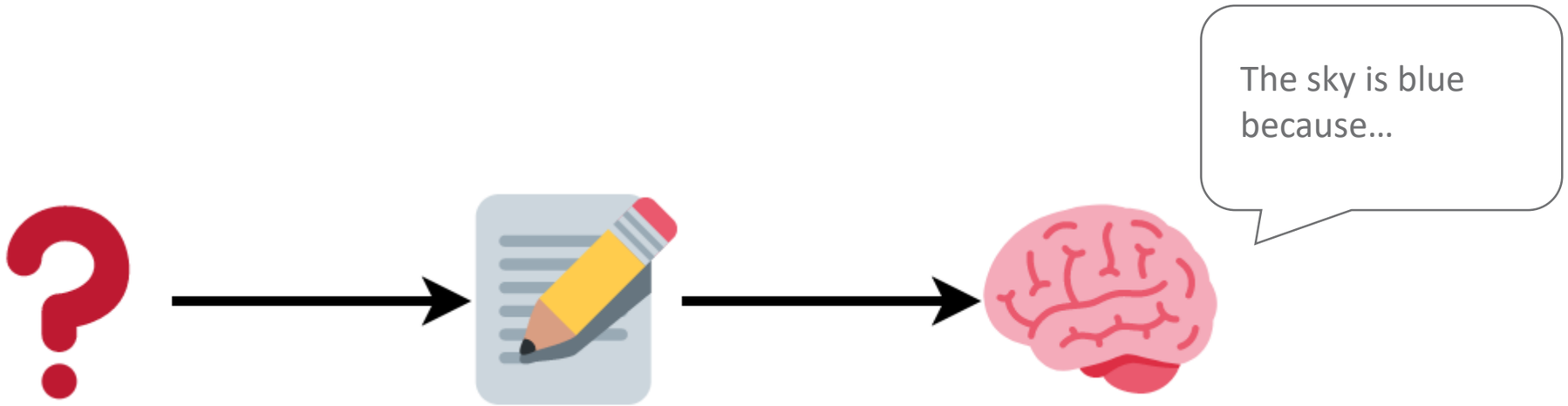


Illustration from Raza Habib and Sinan Ozdemir on [humanloop]

Interaction with LLMs : a first simplification

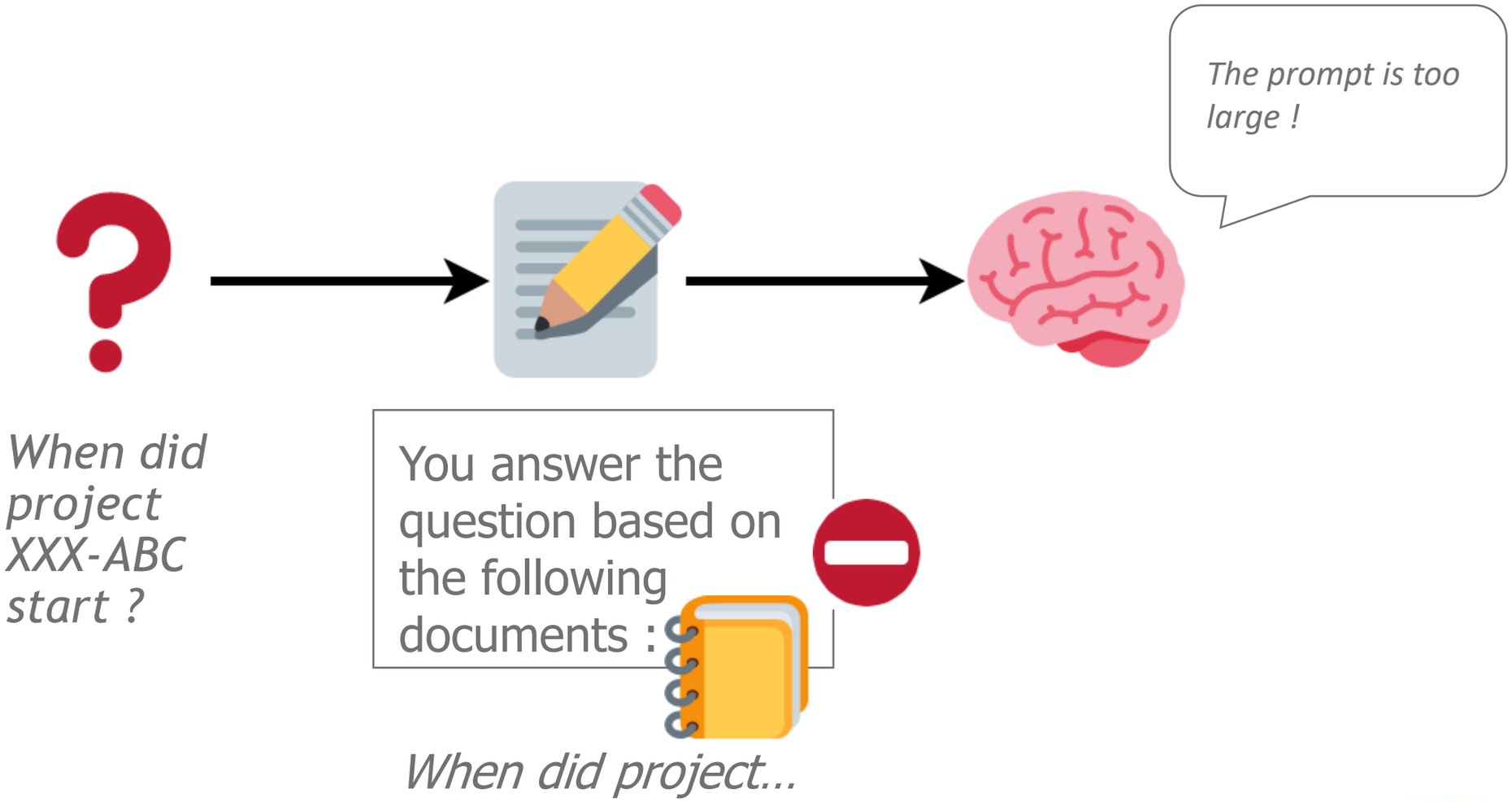


Why is the sky blue ?

You are a helpful chatbot that answer the question: *Why is the sky blue ?*

How can I ask questions about my own documents ?

Document query: a first intuition

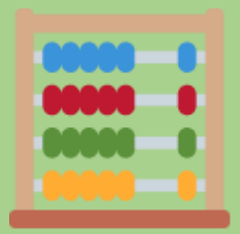


The prompt is too large !

- There are too many documents submitted in the prompt
- Are they all relevant to answer the question ? Probably not…
- How can we find the most relevant documents / sections of document to submit ?
- With the help of **Similarity Search**

Similarity Search: how does it work ?

- Measure the similarity between two texts, i.e. find a distance between texts
- It’s easier to compute distances on numbers than words
- How can we turn words into numbers ? With **Embeddings**

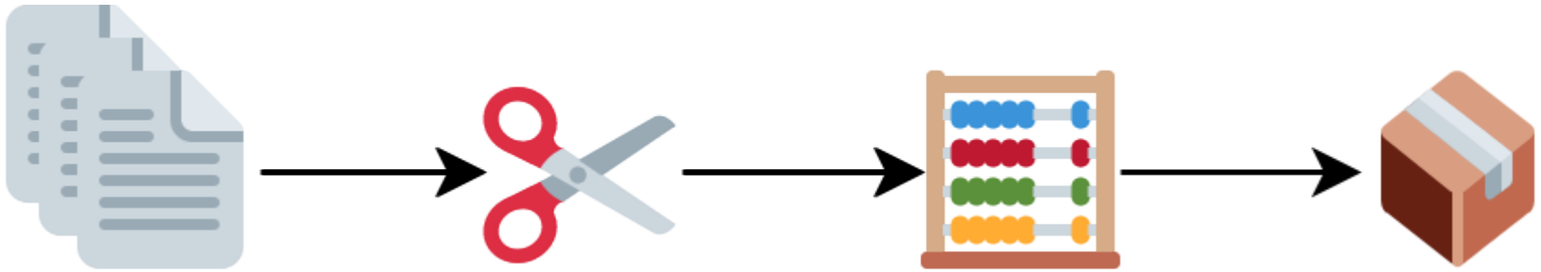


Embedding can be seen as a collection of numbers; the simplest form of embedding would be to count the presence of each word in a sentence. E.g. “Hello world, hello Switzerland” →

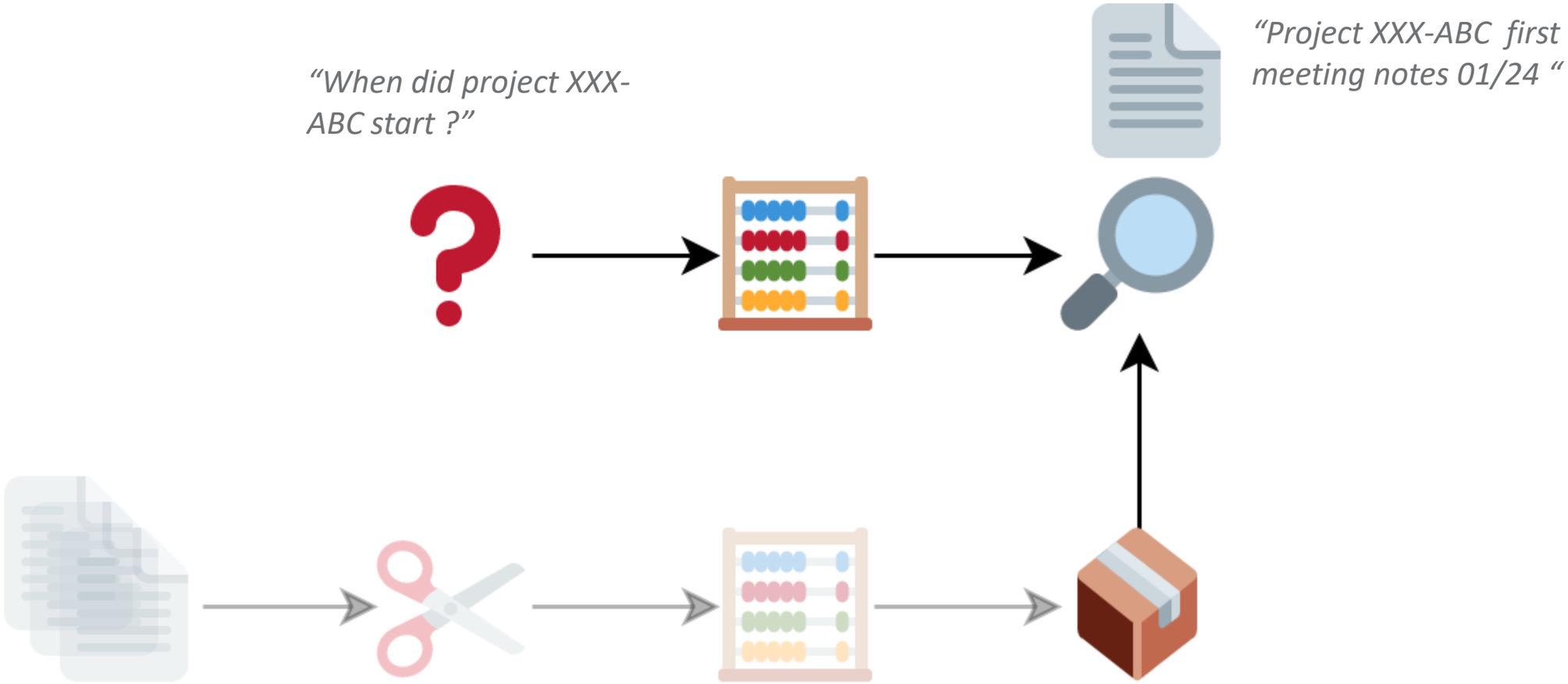
…	*cat*	*dog*	*Hello*	*switzerland*	*world*
	0	0	2	1	1

Turning documents into embeddings

- Synthetising a whole document into a single embedding is too broad
- Each document must first be sliced into **chunks** of text
- Those chunks can then be converted to embeddings
- Those embeddings can then be stored in dedicated database called **vectorstore**



Exploring the vectorstore

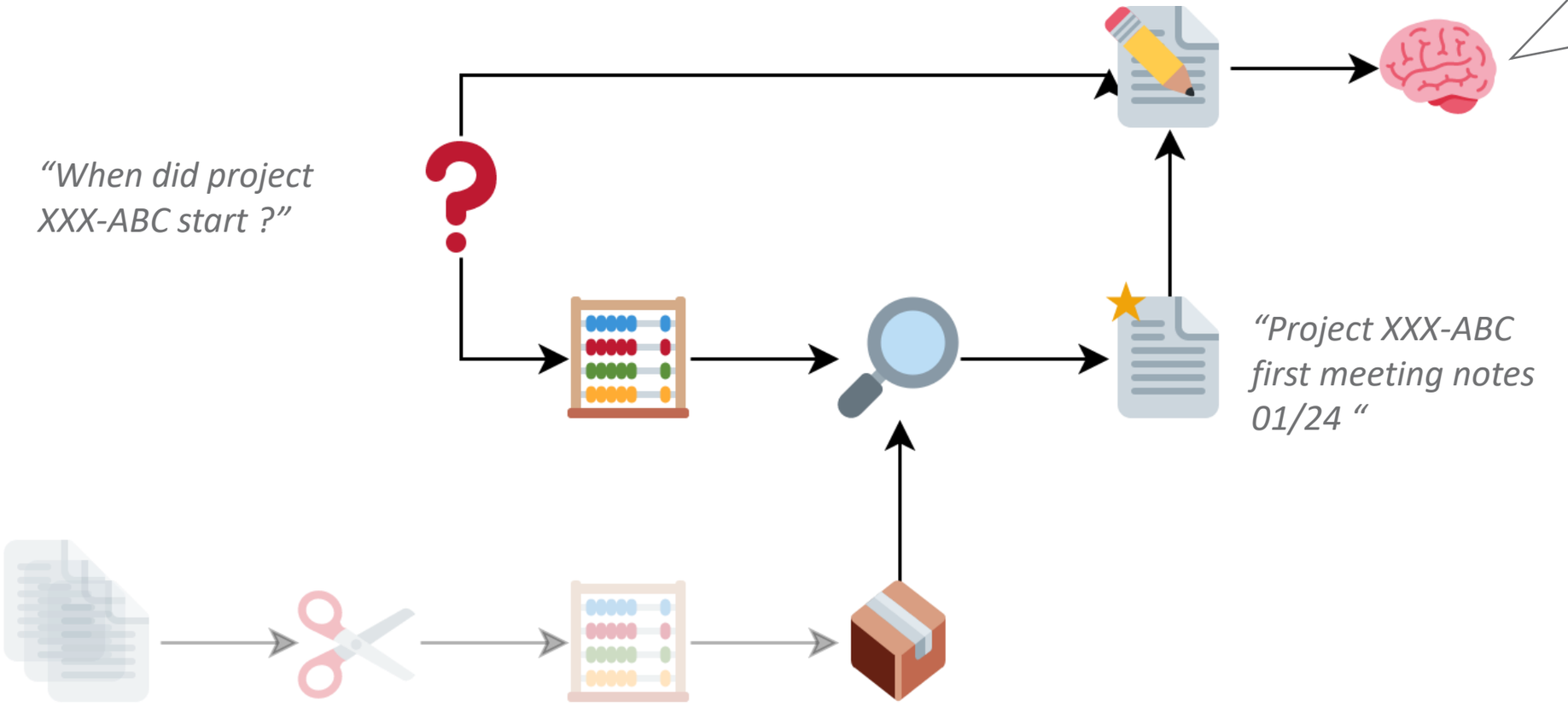


Putting it all together

You answer the question “*when did project XXX-ABC start”* based on “*Project XXX-ABC first meeting notes 01/24 “*

The project started on 01/24

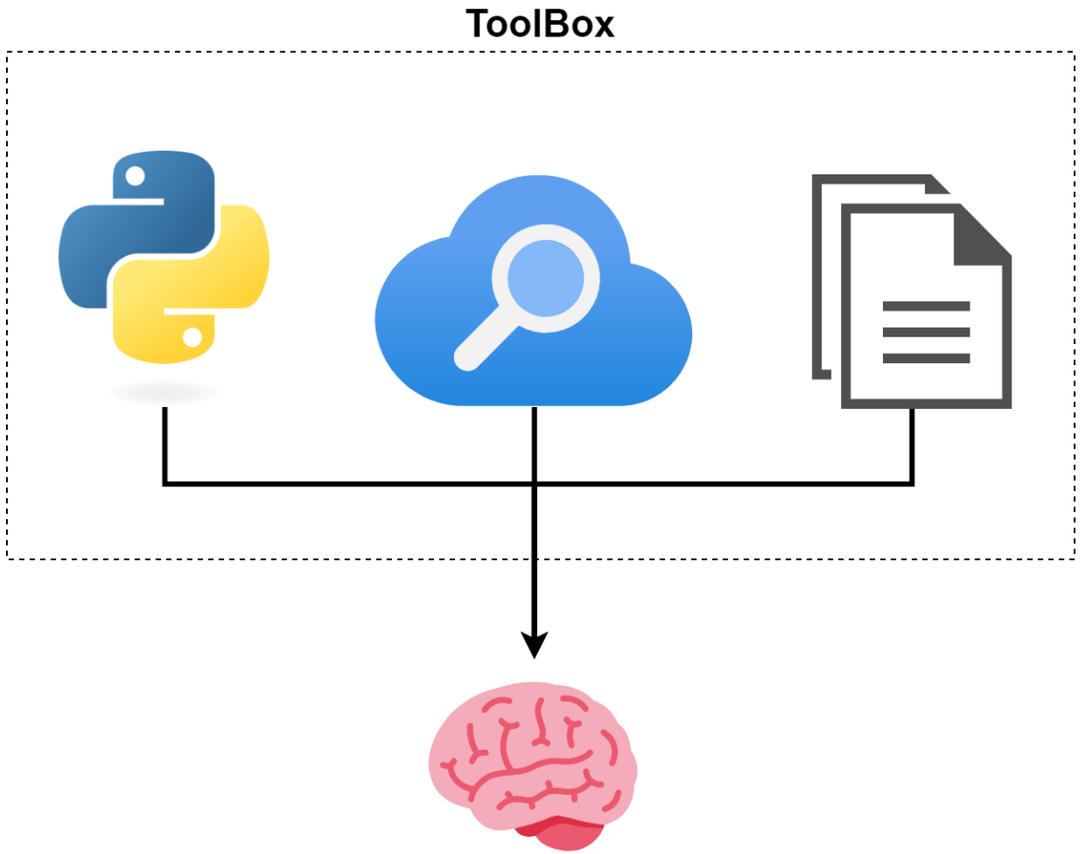
“When did project XXX-ABC start ?”



“Project XXX-ABC first meeting notes 01/24 “

Tool Calling

- Vector store retriever can be seen as a **function** with **input parameter** and **outputs** => a ***Tool***
- Code execution, web search, … are all example of tools that an LLM can use as well
- An LLM could *decide* which tool to use and when



Questions ?

… now we are ready to code

https://github.com/swiss-ai-center/workshop-rag

Ressources

- https://medium.com/data-science-at-microsoft/how-large-language-models-work-91c362f5b78f
- https://humanloop.com/blog/prompt-engineering-101