Generative AI in Organisations: Challenges and Opportunities

ODSC Europe 2023 – Heiko Hotz

Agenda

- What is Generative AI & how does it work?
- How to use Large Language Models (LLMs)?
- Demo: Chat with your document
- Bias and ethics in Generative AI

What is Generative AI?

Generative AI – I grew up with it 😉

Source: https://theconversation.com/star-treks-holodeck-from-science-fiction-to-a-new-reality-74839

Source: https://www.fanpop.com/clubs/star-trek-the-next-generation/images/9406565/title/lt-commander-data-photo

Generative AI – What is it?

AI that can produce original content close enough to human generated content for real-world tasks

How does it work (Text Generation Edition)?

Transformer Architecture

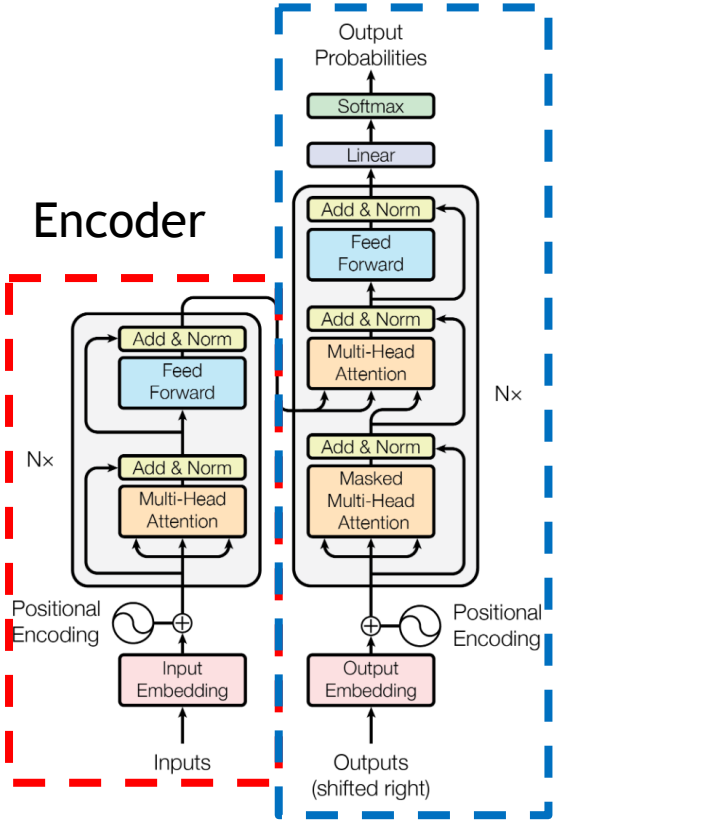


Figure 1: The Transformer - model architecture.

Source:
https://arxiv.org/pdf/1706.03762.pdf
(Attention is all you need)

Encoder-only models

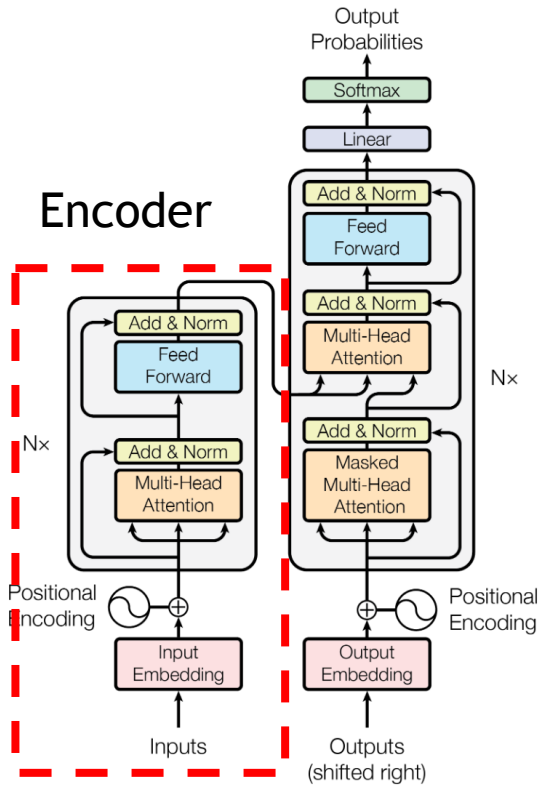


Figure 1: The Transformer - model architecture.

Encoder:

- Reads the entire input sequence & encodes the information
- Bidirectional: It has access to all the words in the input sequence
- Useful for tasks where the entire context needs to be taken into account
- Example: Text classification with BERT (**B**idirectional **E**ncoder **R**epresentation from **T**ransformers)

Encoder-decoder models

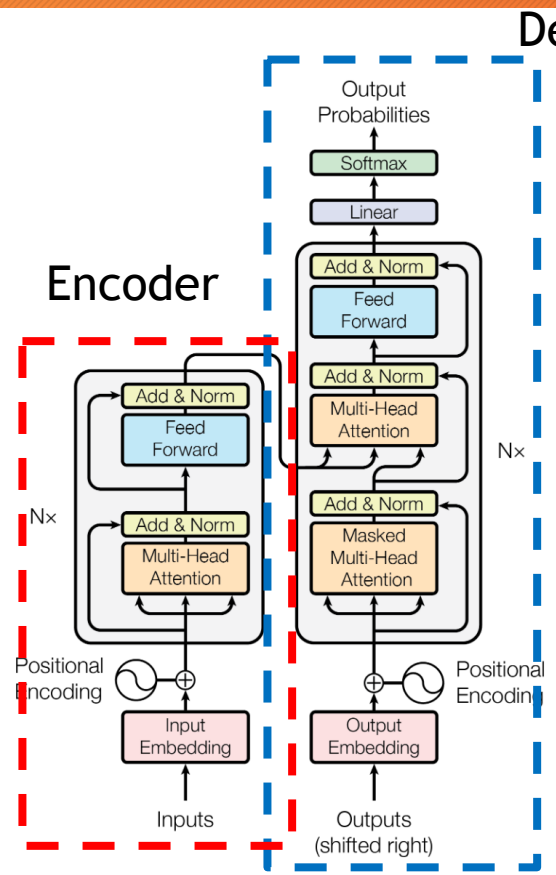


Figure 1: The Transformer - model architecture.

Encoder-Decoder:

- Combines both abilities: Reading and understanding an input sequence and generating an output sequence
- Sequence-to-sequence models (T5, BART)
- Example: Translation

Decoder-only models

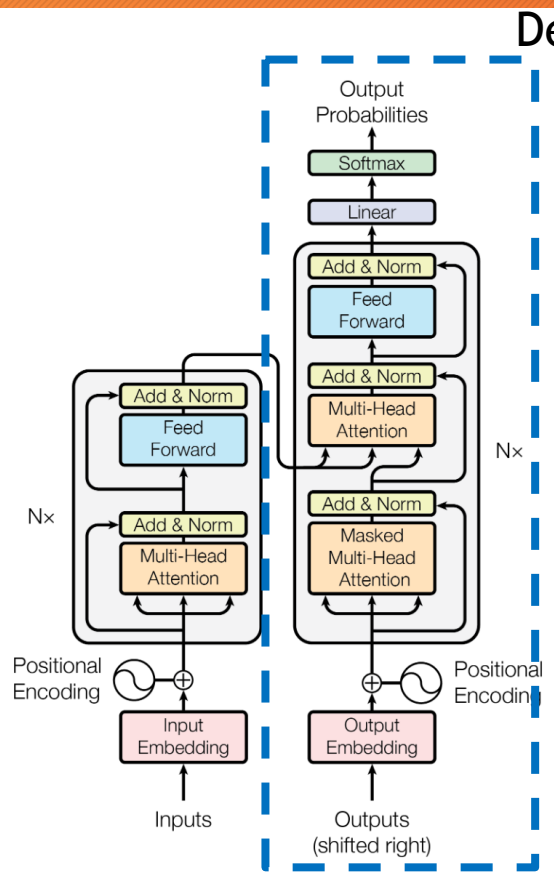


Figure 1: The Transformer - model architecture.

Decoder:

- Generates output sequence one token at a time
- Unidirectional: It has access only to the words to the left
- Autoregressive: Each next token is predicted based on the tokens that came before
- Example: Text generation (All GPT models are decoder-only)

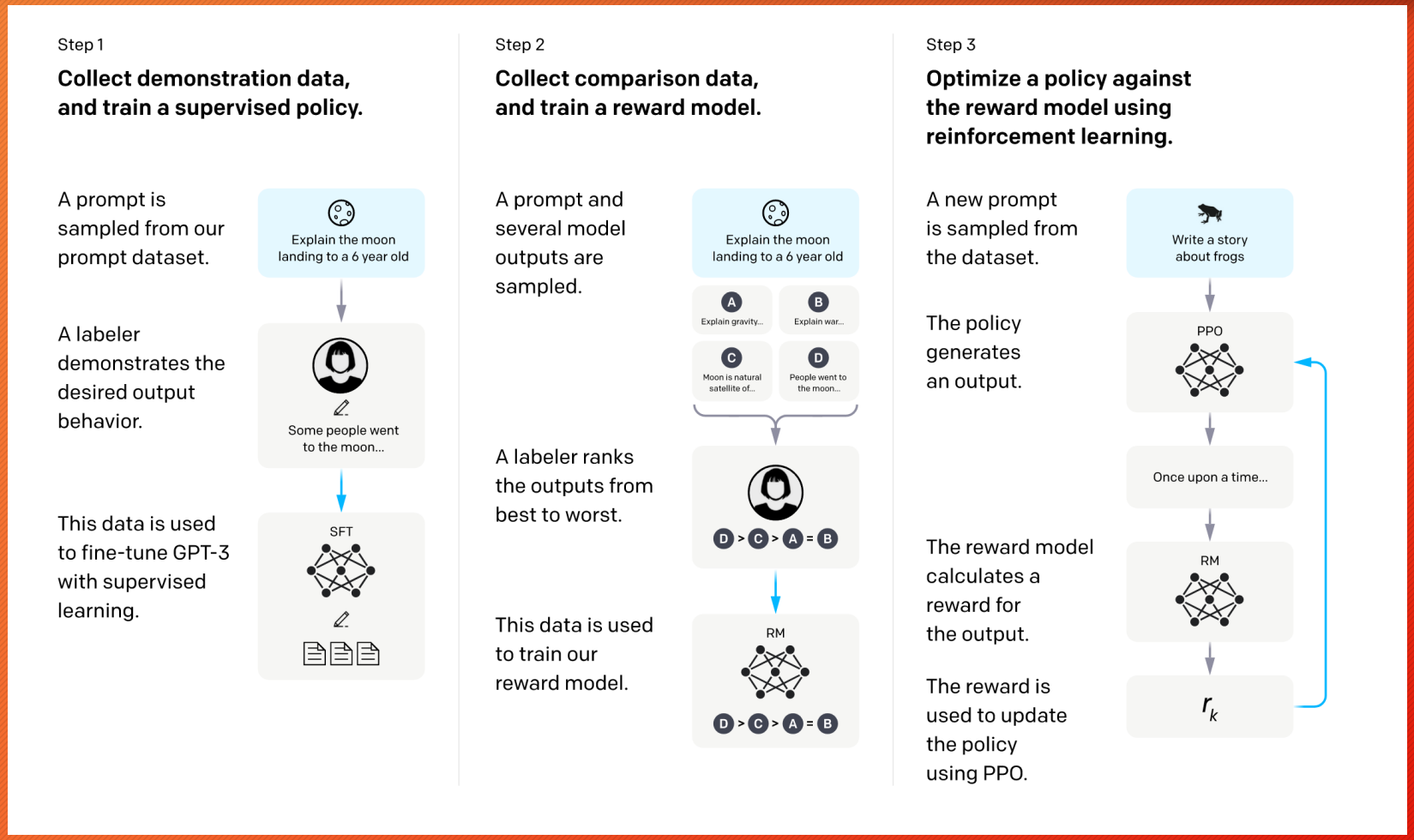
How to train decoder-only models

Step1: Self-supervised *pretraining*

- Feed the model with text from left to right and it learns to predict the next …
- Self-supervised because it uses unlabelled data and creates the label on its own (by masking the next word)

Step 2: Train (finetune) the model on human feedback

Training using human feedback



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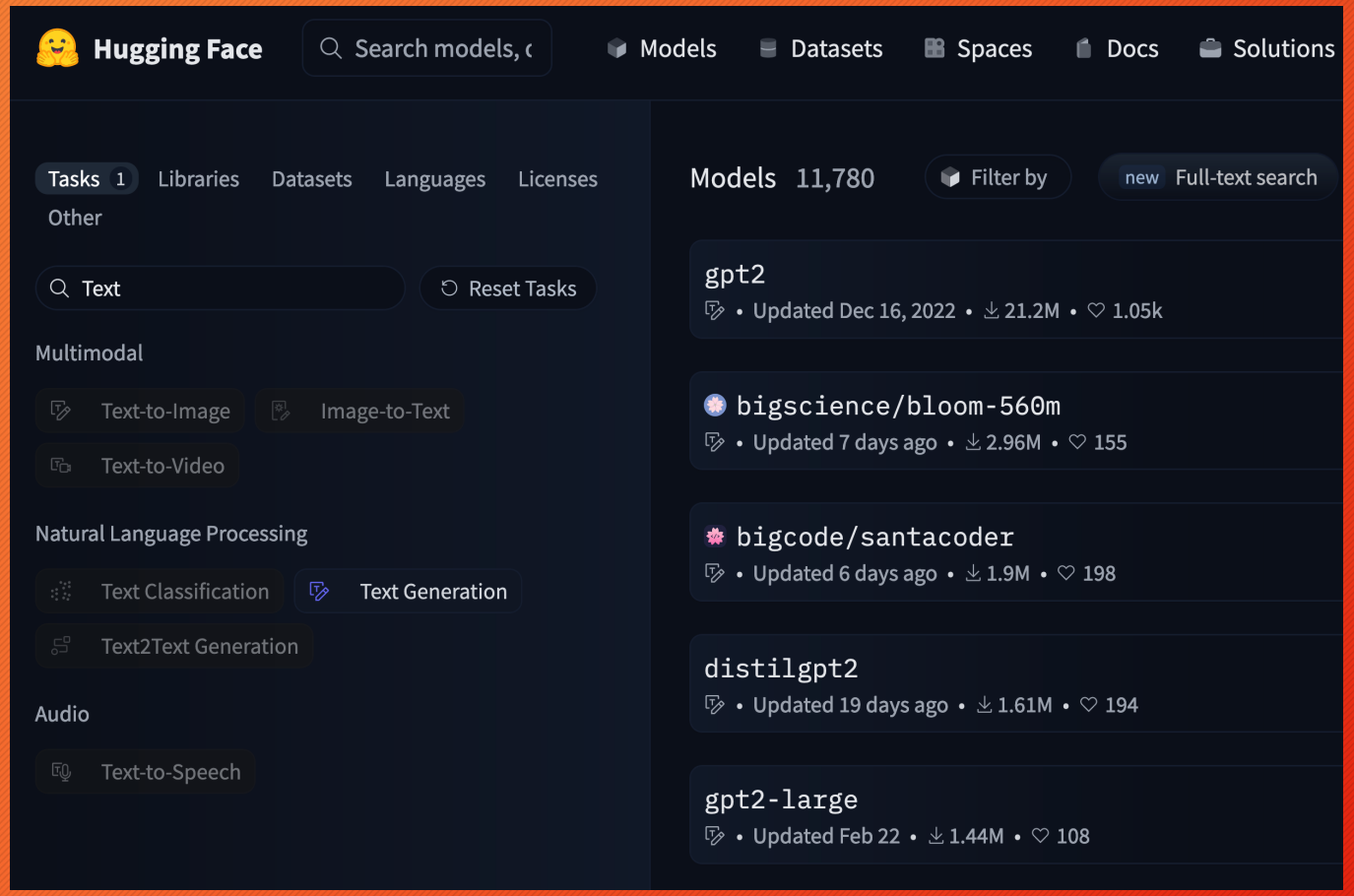
How to deploy Large Language Models?

There are different ways to use LLMs

- API-based (OpenAI)
- Self-hosted on local machine
- Hosted in Cloud

Self-hosting



Challenge with self-hosting

- GPU Memory!

Cloud providers can help

	Instance Size	GPU	GPU Memory (GiB)	vCPUs	Memory (GiB)	Storage (GB)	Network Bandwidth (Gbps)	EBS Bandwidth (Gbps)	On Demand Price/hr*
Single GPU VMs	g5.xlarge	1	24	4	16	1x250	Up to 10	Up to 3.5	$1.006
	g5.2xlarge	1	24	8	32	1x450	Up to 10	Up to 3.5	$1.212
	g5.4xlarge	1	24	16	64	1x600	Up to 25	8	$1.624
	g5.8xlarge	1	24	32	128	1x900	25	16	$2.448
	g5.16xlarge	1	24	64	256	1x1900	25	16	$4.096
Multi GPU VMs	g5.12xlarge	4	96	48	192	1x3800	40	16	$5.672
	g5.24xlarge	4	96	96	384	1x3800	50	19	$8.144
	g5.48xlarge	8	192	192	768	2x3800	100	19	$16.288

Source: https://aws.amazon.com/ec2/instance-types/g5/

How to use Large Language Models?

API use

<SCREENSHOT>

Better: playground

Create Your Own Large Language Model Playground in SageMaker Studio

Now you can deploy LLMs and experiment with them all in one place

Heiko Hotz
Published in Towards Data Science · 4 min read · Mar 20

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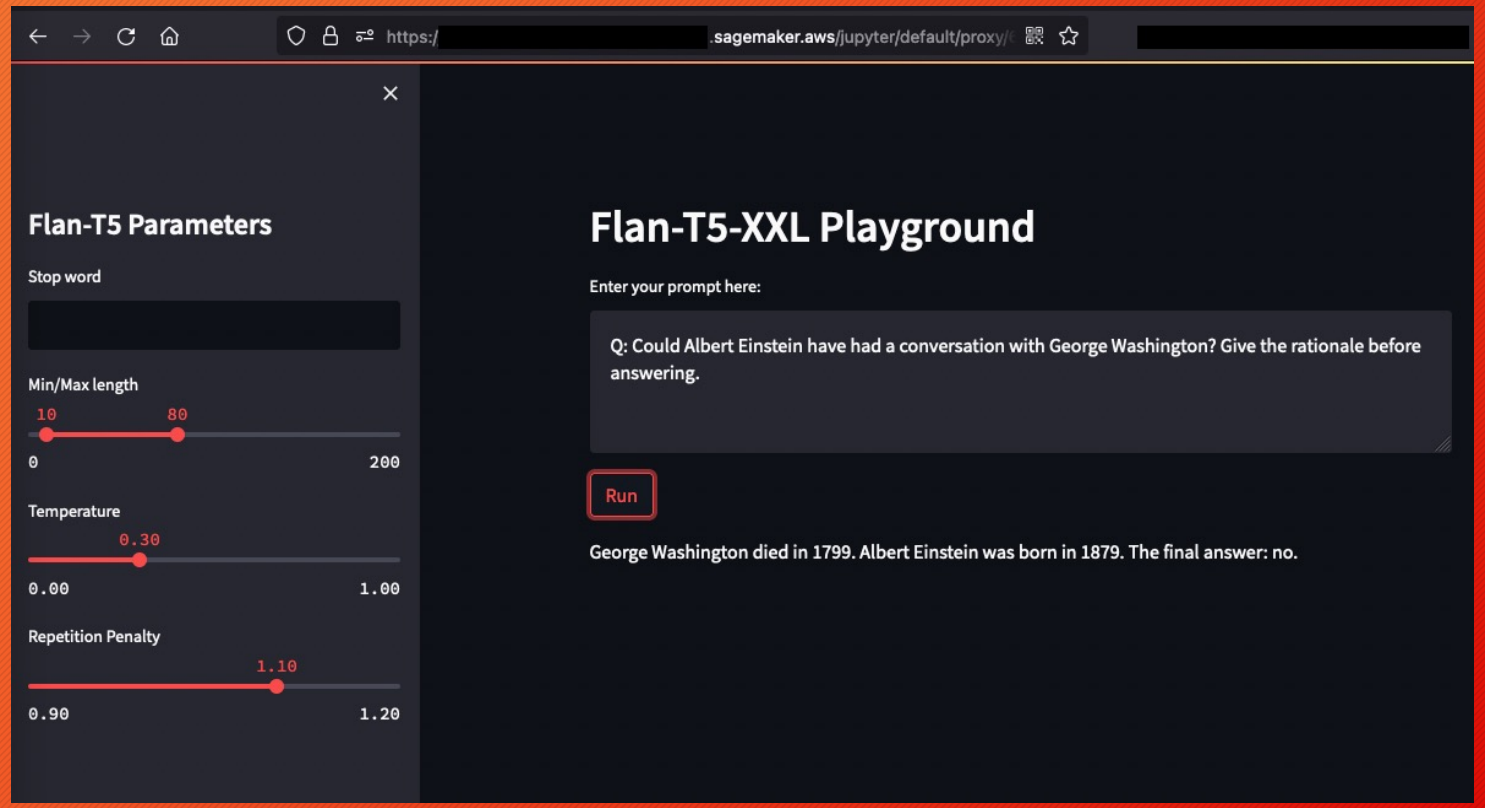
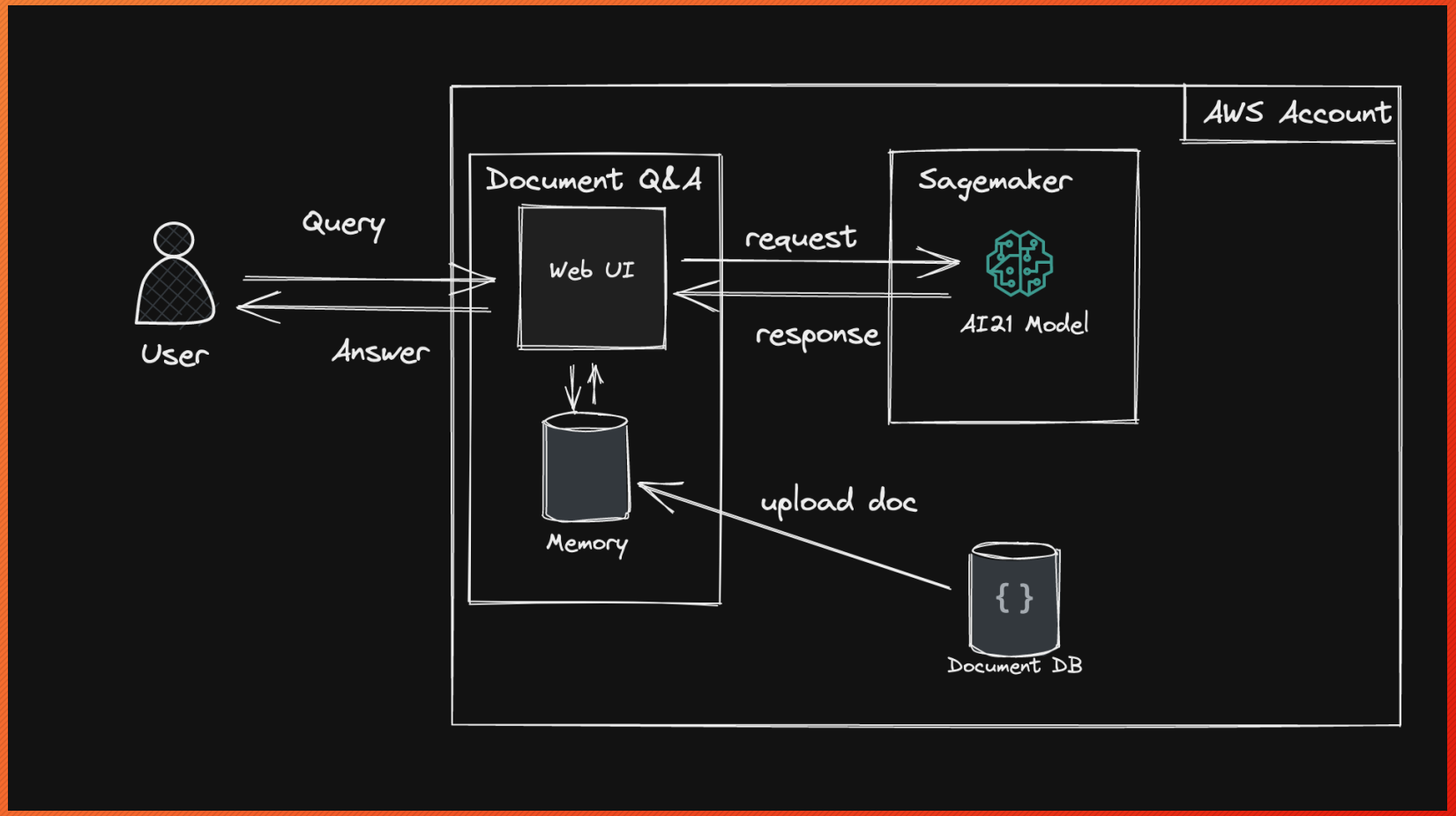
Image by author — created with Midjourney



How to build applications with LLMs?

Architecture



Demo

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Bias in LLMs

SCREENSHOT

Ethics with (Generative) AI

TV and film writers are fighting to save their jobs from AI. They won't be the last

By Samantha Murphy Kelly, CNN Business

Updated 5:28 PM EDT, Thu May 4, 2023

Source: https://edition.cnn.com/2023/05/04/tech/writers-strike-ai/index.html

Appendix

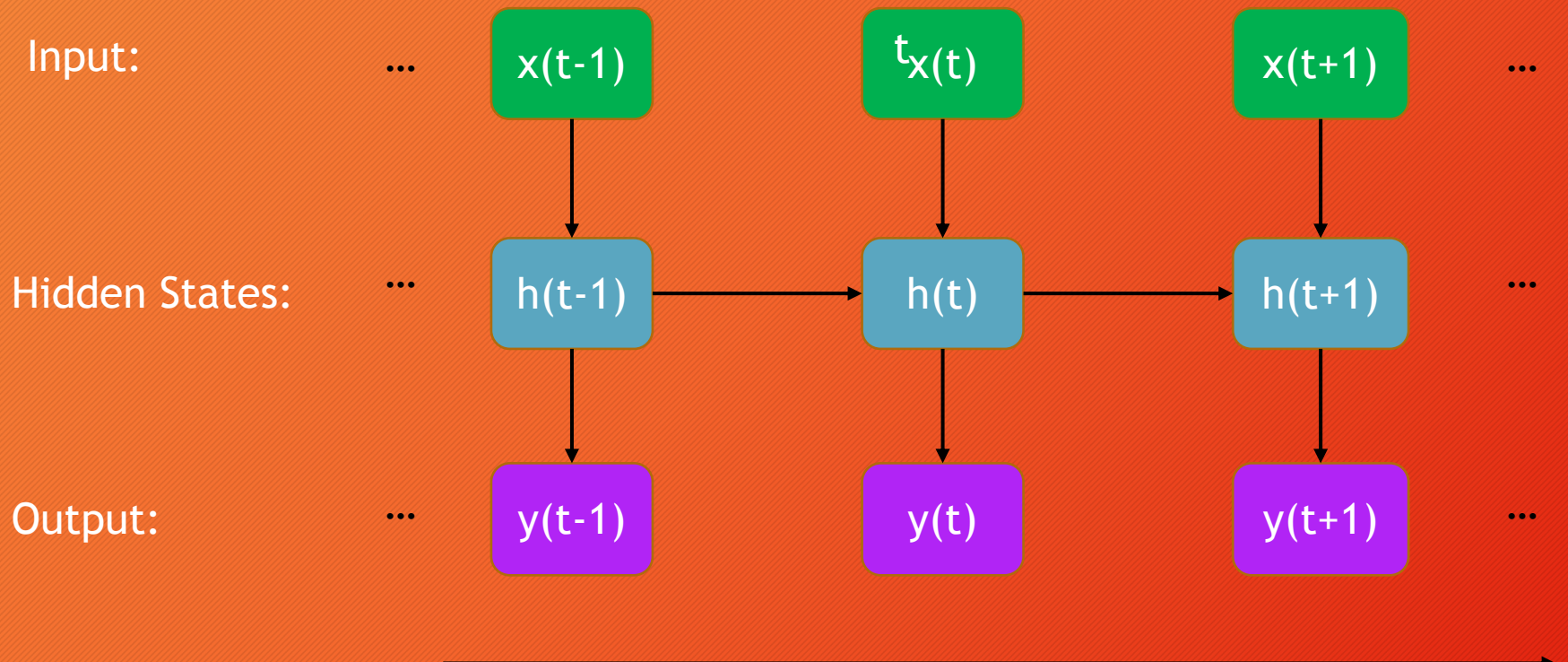
Neural Networks Recap

Input:

Hidden States:

Output:

Recurrent Neural Networks Recap



RNNs are useful for text generation