

# BUS5001 – Cloud Platforms and Analytics



## AI in the Cloud

A progression to Large Language Models

La Trobe University, Australia

# Hugging Face

- Company is based out of New York
- Founded in 2016 by Clement Delangue and Julien Chaumond
- Was initially touted as a personalisable AI driven chatbot on iPhone
  - A new chatbot app for bored teenagers, Hugging Face will generate a digital friend so you can text back and forth and trade selfies.
  - The name Huggingface was after the popular emoji
  - One of the early investors included Kevin Durant (NBA)
- Which grew into a platform for Natural Language Processing
- Since then it has now branched into Computer Vision as well as other machine learning models and libraries
- Notable for it's transformer's library (for NLP)
- Aiming to become GitHub for Machine Learning and AI
- *We're on a journey to advance and democratize artificial intelligence through open source and open science*



**Hugging Face**

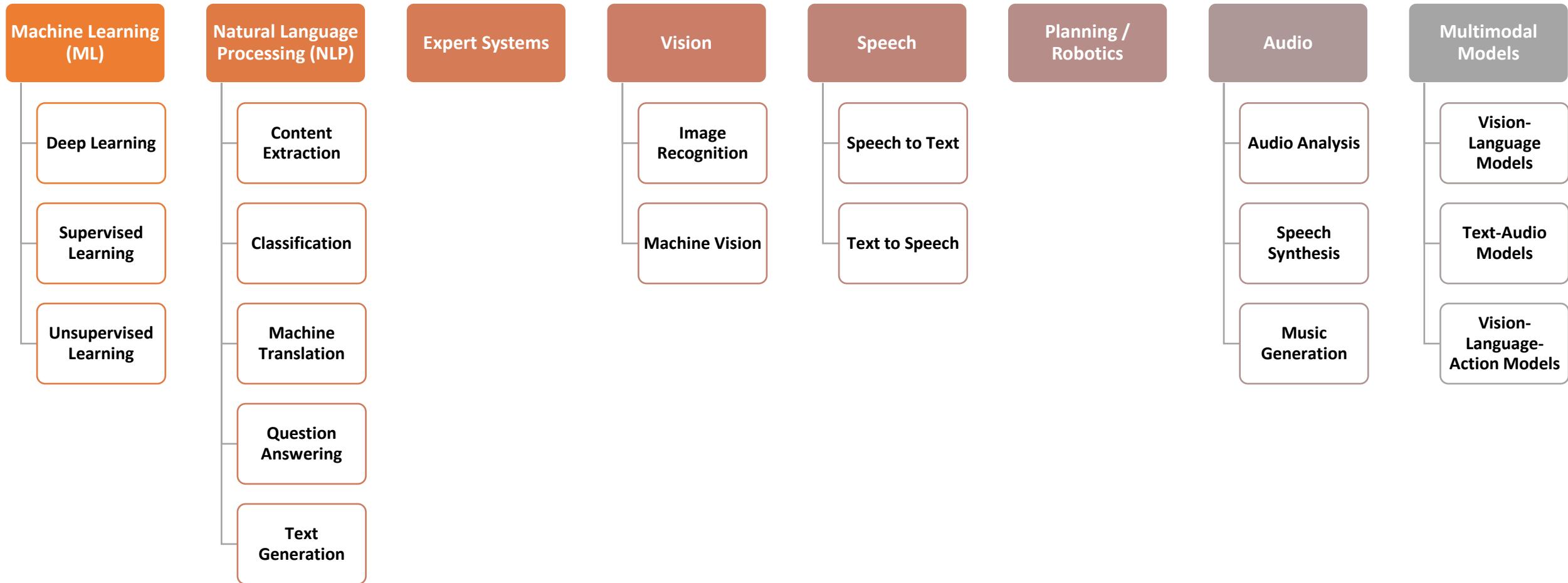
# Gradio

- A library which enables users to create interactive browser demos for Machine Learning models.
- Acquired in 2021 by HuggingFace
- <https://gradio.app/>
- E.g. <https://huggingface.co/spaces/Gradio-Blocks/Object-Detection-With-DETR-and-YOLOS>

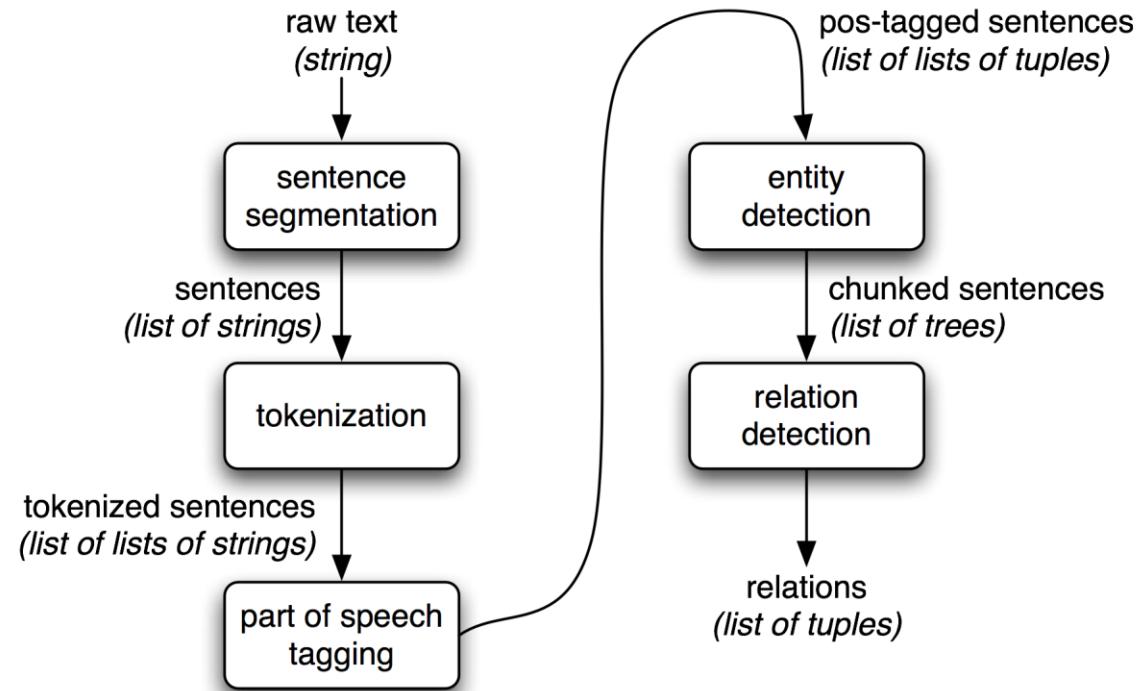
# Signup and use Hugging Face

- Signup instructions are under Student Resources

# A Taxonomy of AI



# Language Semantics



# The Process

## Sentence Segmentation

- Input: "John Smith works at OpenAI in San Francisco."
- Output: ["John Smith works at OpenAI in San Francisco."]

## Step 2: Tokenization

- Input: ["John Smith works at OpenAI in San Francisco."]
- Output: [['John', 'Smith', 'works', 'at', 'OpenAI', 'in', 'San', 'Francisco', '.']]

## Step 3: Part-of-Speech Tagging

- Input: Tokens from step 2
- Output: [('John', 'NNP'), ('Smith', 'NNP'), ('works', 'VBZ'), ...]

## Step 4: Entity Detection

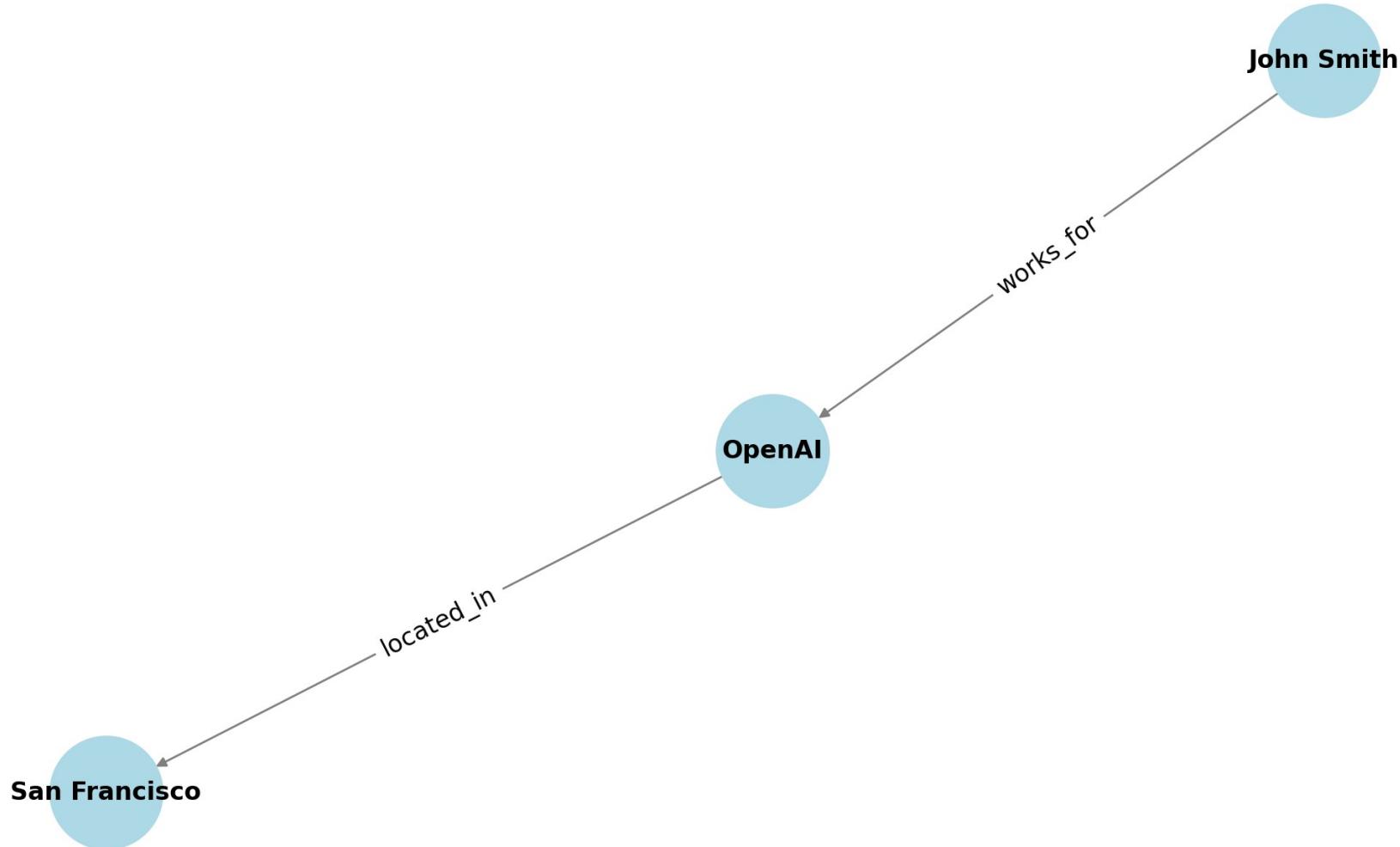
- Recognises named entities like people, organizations, locations
- Output: [PERSON John Smith], [ORG OpenAI], [GPE San Francisco]

## Step 5: Relation Detection

- Input: Chunked entities
- Output: [('John Smith', 'works\_for', 'OpenAI'), ('OpenAI', 'located\_in', 'San Francisco')]

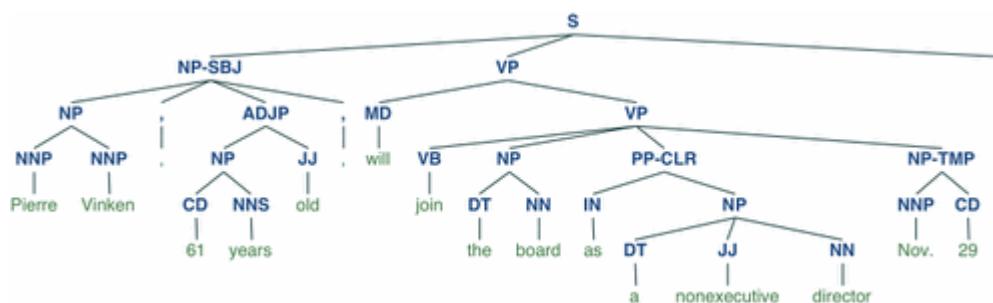
# Semantic Visual

Knowledge Graph



# Language Parsing

"Pierre Vinken, 61 years old, will join the board as a nonexecutive director Nov. 29."



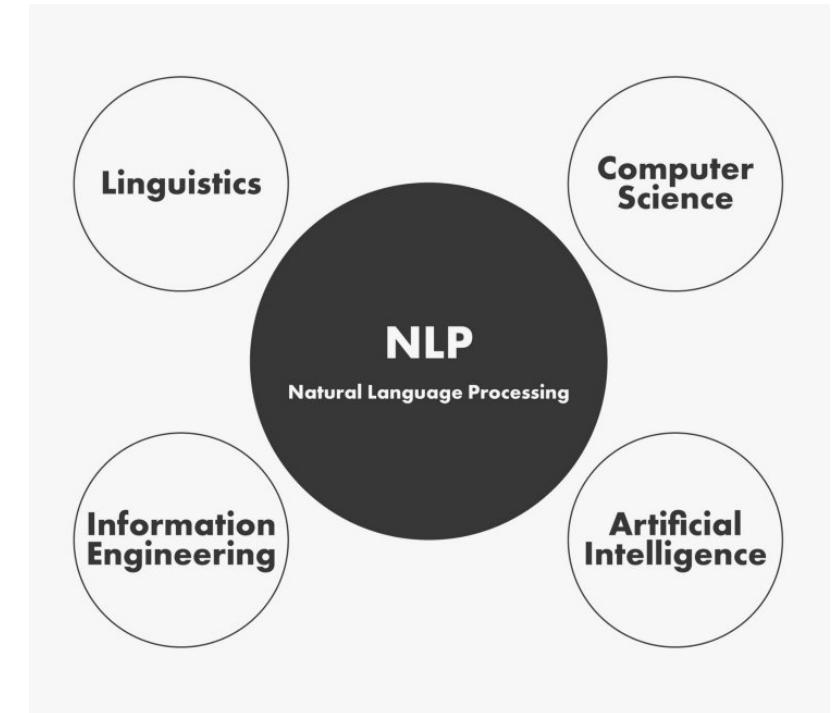
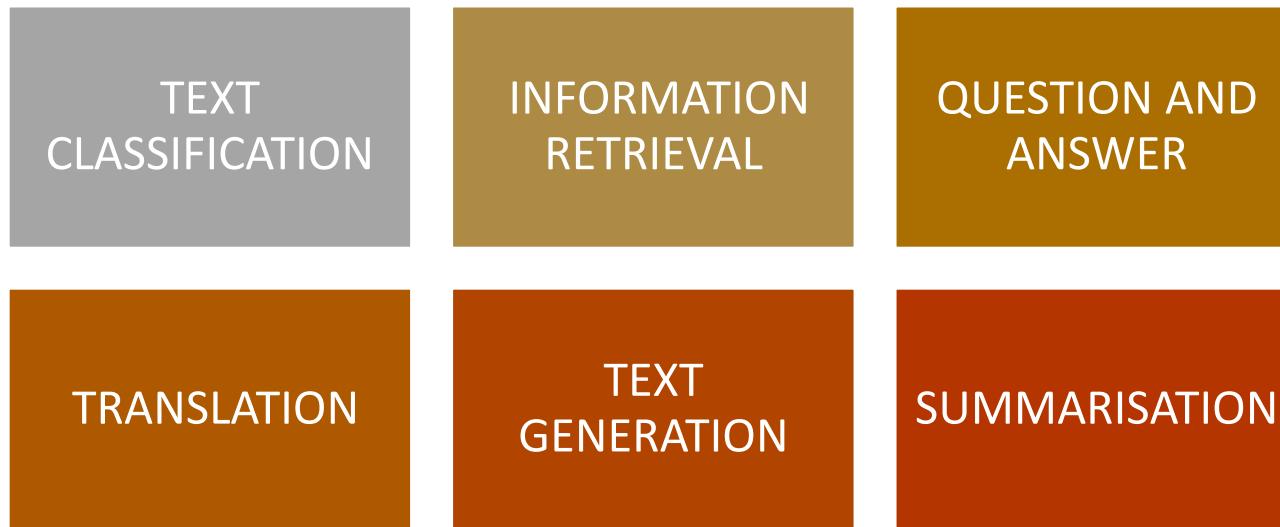
Tag	Meaning	English Examples
ADJ	adjective	<i>new, good, high, special, big, local</i>
ADP	adposition	<i>on, of, at, with, by, into, under</i>
ADV	adverb	<i>really, already, still, early, now</i>
CONJ	conjunction	<i>and, or, but, if, while, although</i>
DET	determiner, article	<i>the, a, some, most, every, no, which</i>
NOUN	noun	<i>year, home, costs, time, Africa</i>
NUM	numeral	<i>twenty-four, fourth, 1991, 14:24</i>
PRT	particle	<i>at, on, out, over per, that, up, with</i>
PRON	pronoun	<i>he, their, her, its, my, I, us</i>
VERB	verb	<i>is, say, told, given, playing, would</i>
.	punctuation marks	<i>., ; !</i>
X	other	<i>ersatz, esprit, dunno, gr8, univeristy</i>

# Parts of Speech Tagging

- The tree starts with the sentence as a whole and breaks it down into its constituents (subject, verb, object, etc.)
- Within the constituents, it breaks down further into phrases (noun phrases, verb phrases, etc.) and finally into individual words with their corresponding syntactic roles (e.g., nouns, verbs, prepositions).

# Natural Language Processing

- Natural language processing (NLP) refers to the branch of Computer Science / AI
- Concerned with giving computers the ability to understand text and spoken words
- Combines computational linguistics—rule-based modelling of human language—with statistical, machine learning, and deep learning models.



# Text Classification

- Sentiment Analysis.
- Language Detection.
- Fraud Profanity & Online Abuse Detection.
- Trend / Semantic Detection
  - Trends of feedback
  - Urgency

# Question and Answering

## Passage Sentence

In meteorology, precipitation is any product of the condensation of atmospheric water vapor that falls under gravity.

## Question

What causes precipitation to fall?

## Answer Candidate

gravity

- Between question and answer

cause---gravity

precipitation---gravity

fall---gravity

what---gravity

# Text Generation

The screenshot shows the OpenAI Playground interface. At the top, there's a logo, a 'Help' button, and a menu icon. Below that is a section titled 'Playground' with a dropdown menu labeled 'Load a preset...'. Underneath are buttons for 'Save', 'View code', 'Share', and three dots. A text input field contains the prompt: 'Explain the moral and social issues with using AI to do your homework.' Below the prompt is the generated text, which discusses potential moral and social issues related to AI doing homework. At the bottom, there are 'Submit' and refresh buttons, a character count of '15', and a browser status bar showing 'beta.openai.com'.

Playground

Load a preset...

Save View code Share ...

Explain the moral and social issues with using AI to do your homework.

There are a few potential moral and social issues with using AI to do homework. First, if students are using AI to do their homework for them, they may not be learning the material as well as they could be. This could lead to problems down the road when they are expected to know the material for exams or real-world applications. Additionally, using AI to do homework could lead to cheating. If students are able to get away with using AI to do their homework for them, it could create an unfair advantage over other students who are doing their homework on their own. Finally, using AI to do homework could lead to a reliance on technology that could be detrimental if the technology were to fail or become unavailable.

Submit 15

AA beta.openai.com

# Text Summarisation

## Text Summarization using NLP

### Natural Language Processing

Natural language processing (NLP) is a subfield of linguistics, computer science, and artificial intelligence concerned with the interactions between computers and human language, in particular how to program computers to process and analyze large amounts of natural language data. The result is a computer capable of "understanding" the contents of documents, including the contextual nuances of the language within them. The technology can then accurately extract information and insights contained in the documents as well as categorize and organize the documents themselves.

Summary

`summarize(text, 0.6)`

### Natural Language Processing

Natural language processing (NLP) is a subfield of linguistics, computer science, and artificial intelligence concerned with the interactions between computers and human language, in particular how to program computers to process and analyze large amounts of natural language data.

# Spacy

- spaCy is a free open-source library for Natural Language Processing in Python
- Capabilities such as NER, POS tagging, dependency parsing, word vectors
- <https://spacy.io/>

News Cryptocurrency News Today June 12 DATE Bitcoin GPE Dogecoin Shiba Inu PERSON and other top coins prices and all latest updates cryptocurrency Latest News ORG Today June 12 DATE Bitcoin GPE and all major top cryptocurrencies were trading in red at 345 pm TIME on Saturday June 12 DATE In line with its recent trends overall global crypto market was down by over 15 per cent on the weekend DATE View in App GPE Bitcoin GPE was down by 6 CARDINAL and was trading at Rs 2728815 DATE after hitting days high of Rs 2900208 Source Reuters ORG Reported By ZeeBiz NORP WebTeam Written By Ravi Kant Kumar PERSON Updated Sat Jun PERSON 12 20210646 pm TIME Patna ORG ZeeBiz WebDesk PERSON RELATED NEWS Cryptocurrency Latest News Today June 14 DATE Bitcoin GPE leads crypto rally up over 12 CARDINAL after ELON MUSK TWEET Check Ethereum Polka ORG Dot Dogecoin Shiba Inu PERSON and other top coins INR ORG price World India ORG updates Bitcoin GPE law is only latest headturner by El Salvadors MILLENNIAL ORG PRESIDENT Chinas cryptocurrency mining crackdown spreads to Yunnan GPE in southwest media Cryptocurrency latest news ALERT Rs

# Spacy - NER

PERSON:	People, including fictional.
NORP:	Nationalities or religious or political groups.
FAC:	Buildings, airports, highways, bridges, etc.
ORG:	Companies, agencies, institutions, etc.
GPE:	Countries, cities, states.
LOC:	Non-GPE locations, mountain ranges, bodies of water.
PRODUCT:	Objects, vehicles, foods, etc. (Not services.)
EVENT:	Named hurricanes, battles, wars, sports events, etc.
WORK_OF_ART:	Titles of books, songs, etc.
LAW:	Named documents made into laws.
LANGUAGE:	Any named language.
DATE:	Absolute or relative dates or periods.
TIME:	Times smaller than a day.
PERCENT:	Percentage, including "%".
MONEY:	Monetary values, including unit.
QUANTITY:	Measurements, as of weight or distance.
ORDINAL:	"first", "second", etc.
CARDINAL:	Numerals that do not fall under another type.

# NLTK

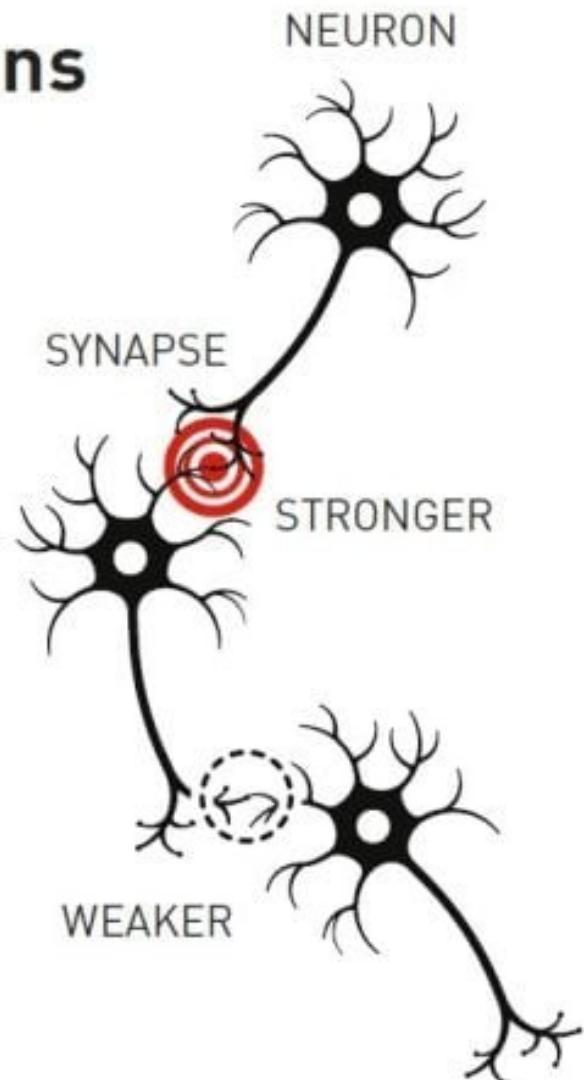
- The Natural Language Toolkit NLTK, is a suite of libraries and programs for symbolic and statistical natural language processing (NLP) for English written in the Python programming language.
- <https://www.nltk.org/>

# Libraries for Sentiment Analysis

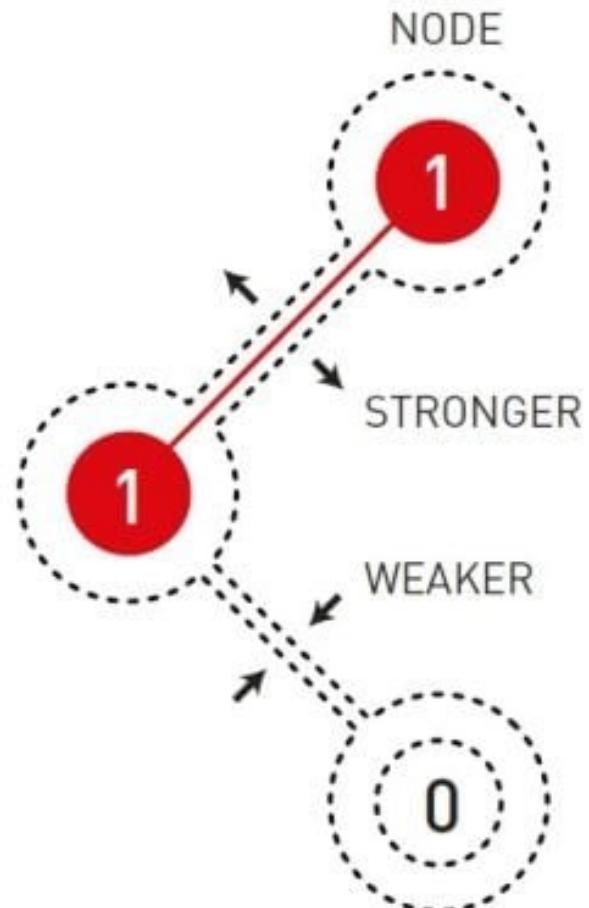
- Textblob (<https://textblob.readthedocs.io/en/dev/>)
- Vader (<https://github.com/cjhutto/vaderSentiment>) / (<https://pypi.org/project/vaderSentiment/>)
- Flair (<https://pypi.org/project/flair/>)

# Natural and artificial neurons

The brain's neural network is built from living cells, neurons, with advanced internal machinery. They can send signals to each other through the synapses. When we learn things, the connections between some neurons get stronger, while others get weaker.

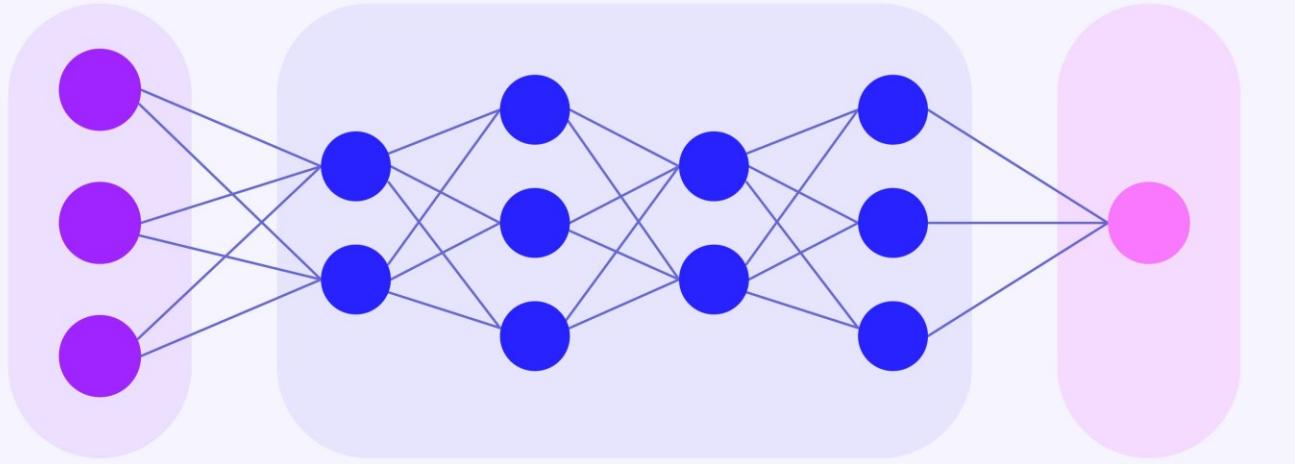


Artificial neural networks are built from nodes that are coded with a value. The nodes are connected to each other and, when the network is trained, the connections between nodes that are active at the same time get stronger, otherwise they get weaker.



# Neural Network Diagram

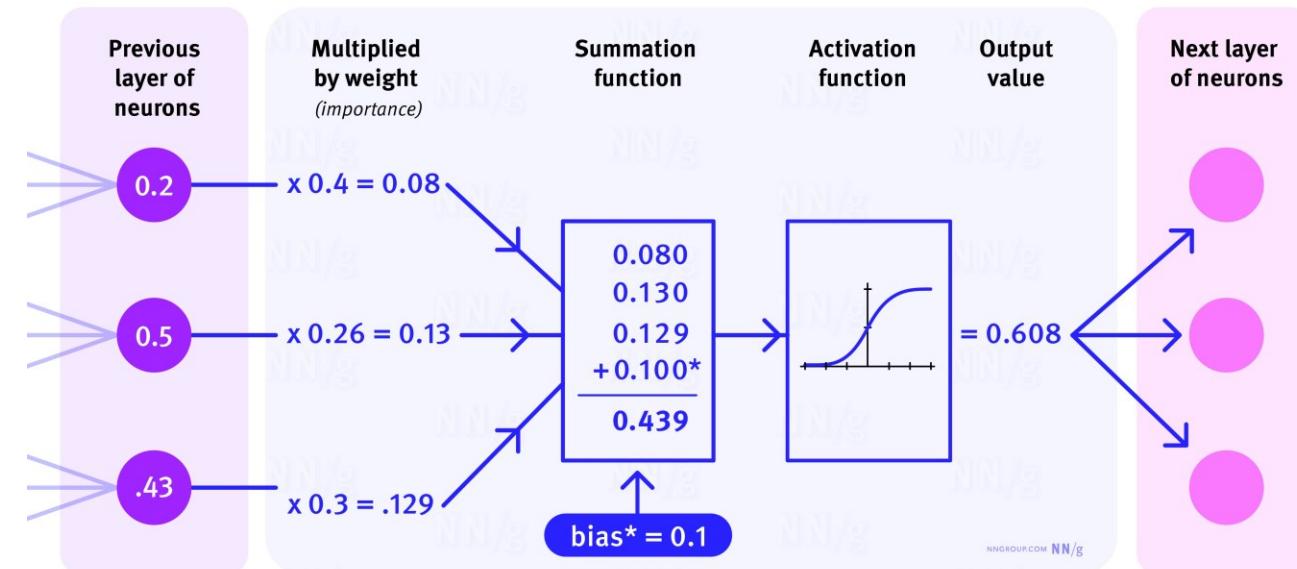
Input Layer



NNGROUP.COM NN/g

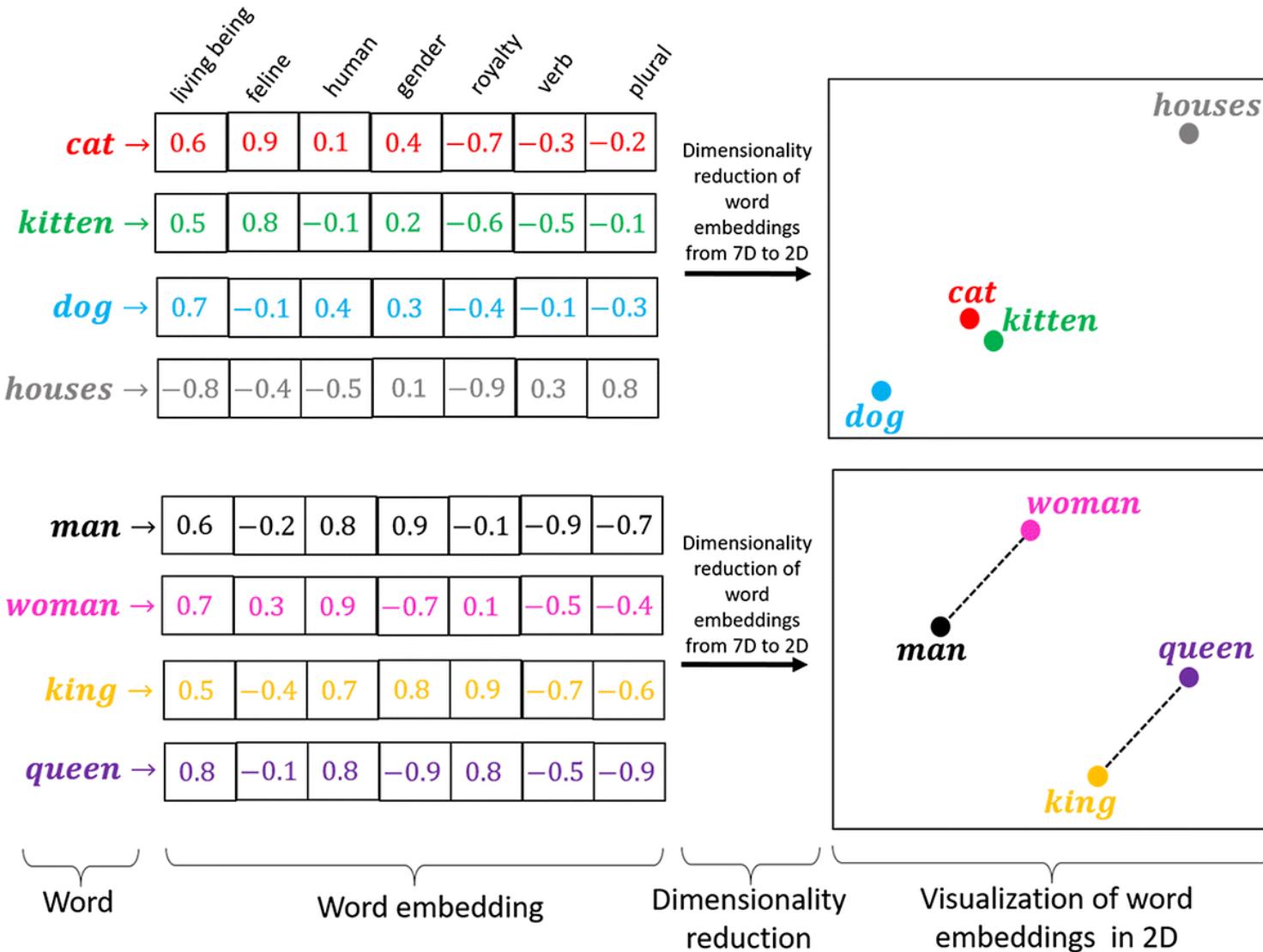
Hidden Layers

## How a Single Artificial Neuron Works

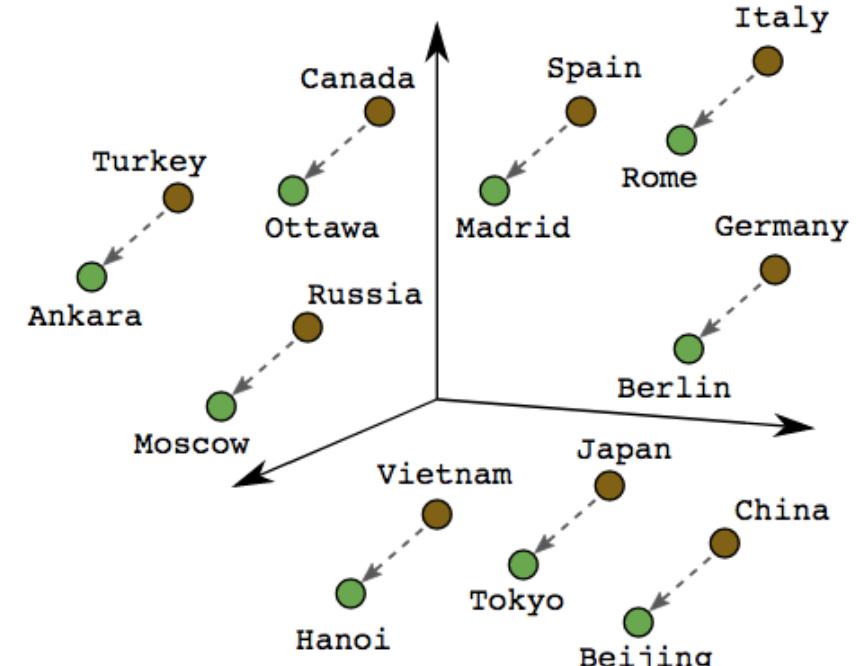
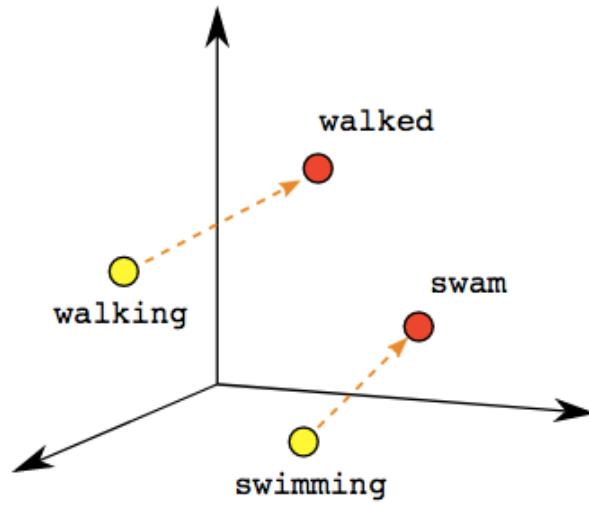
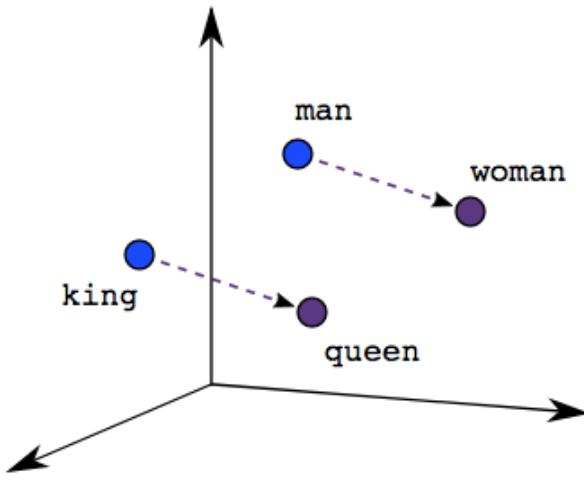


NNGROUP.COM NN/g

# Word Embeddings



# Similarities

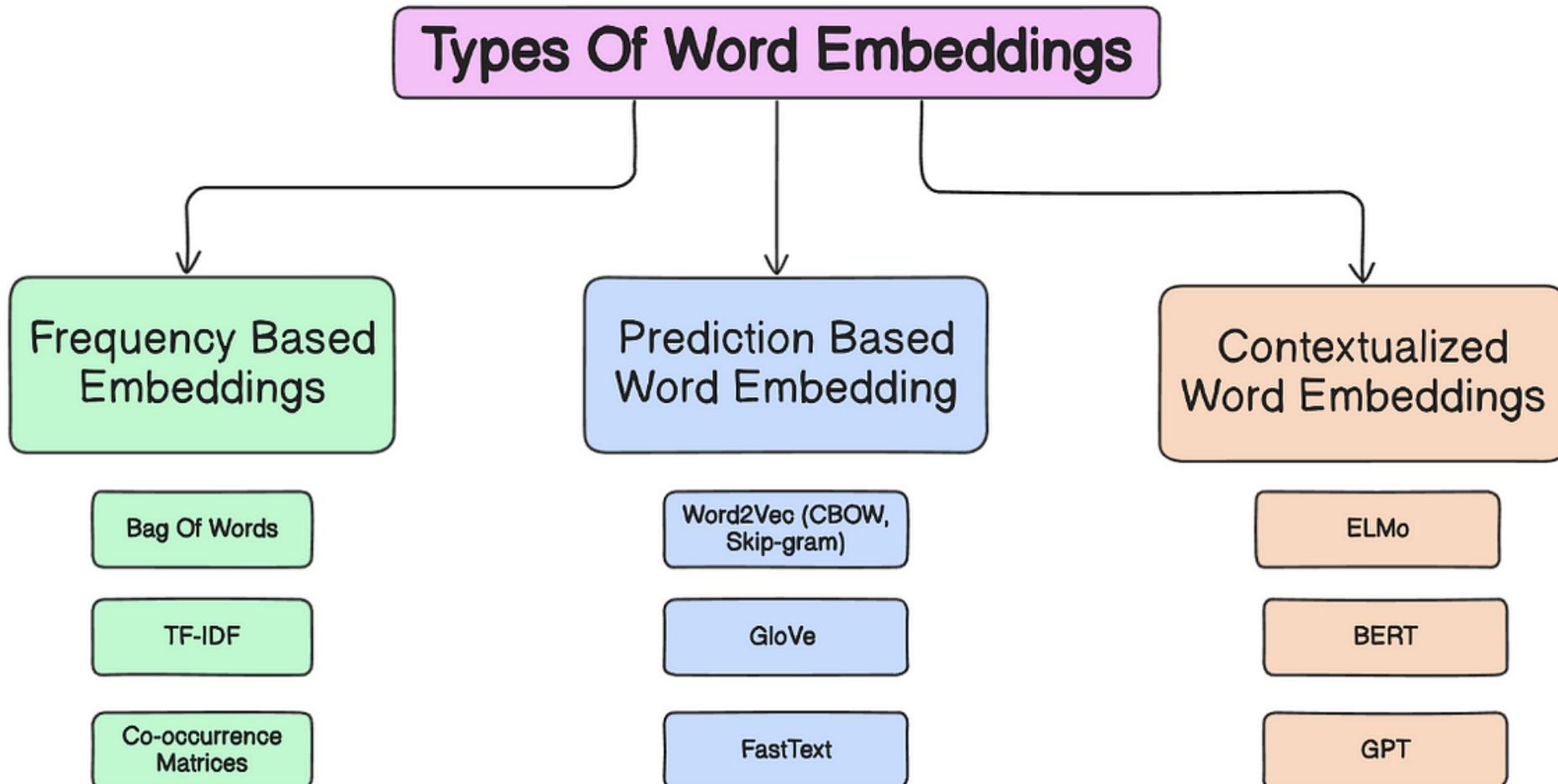


Male-Female

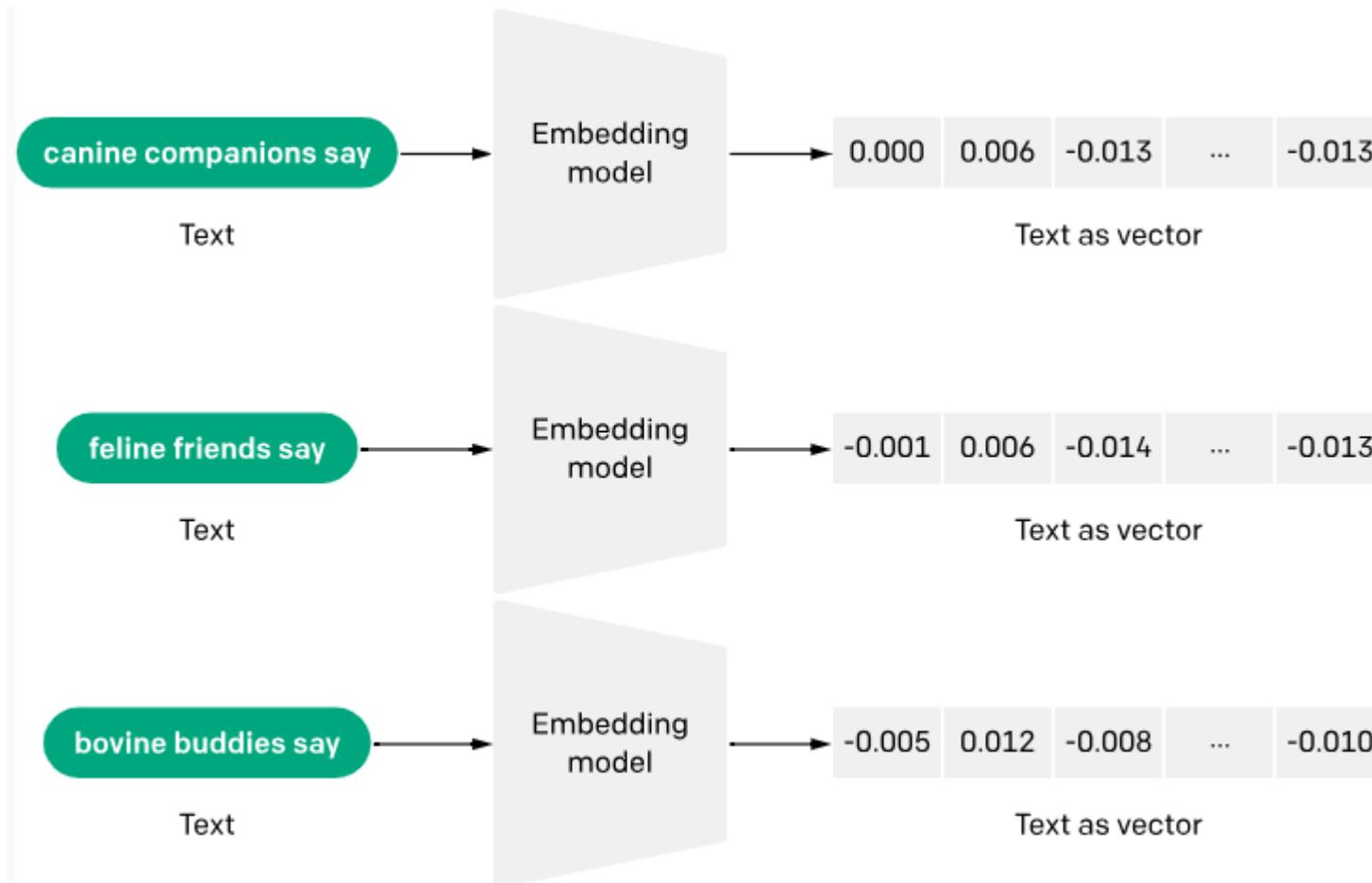
Verb Tense

Country-Capital

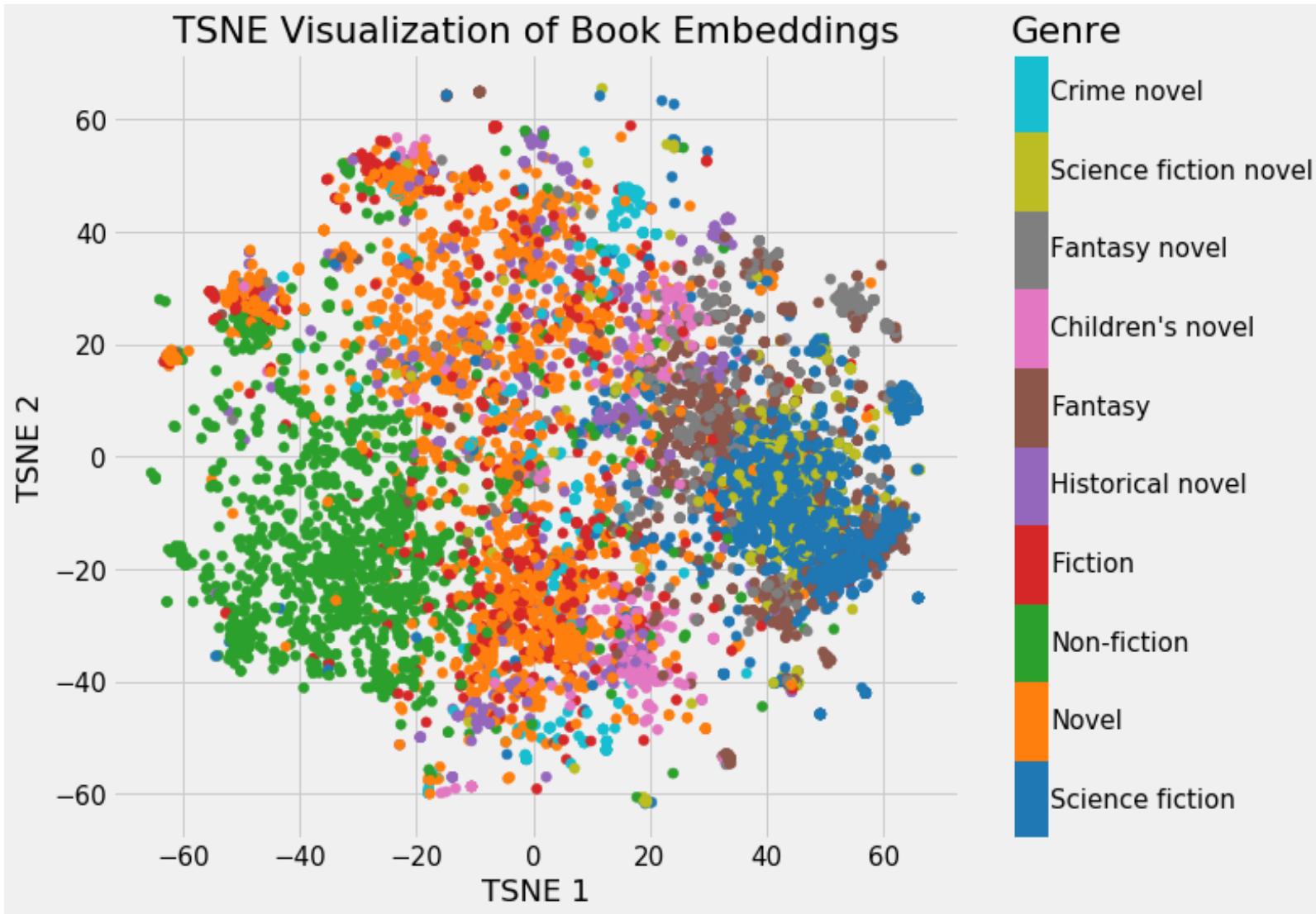
# Types of Word Embeddings



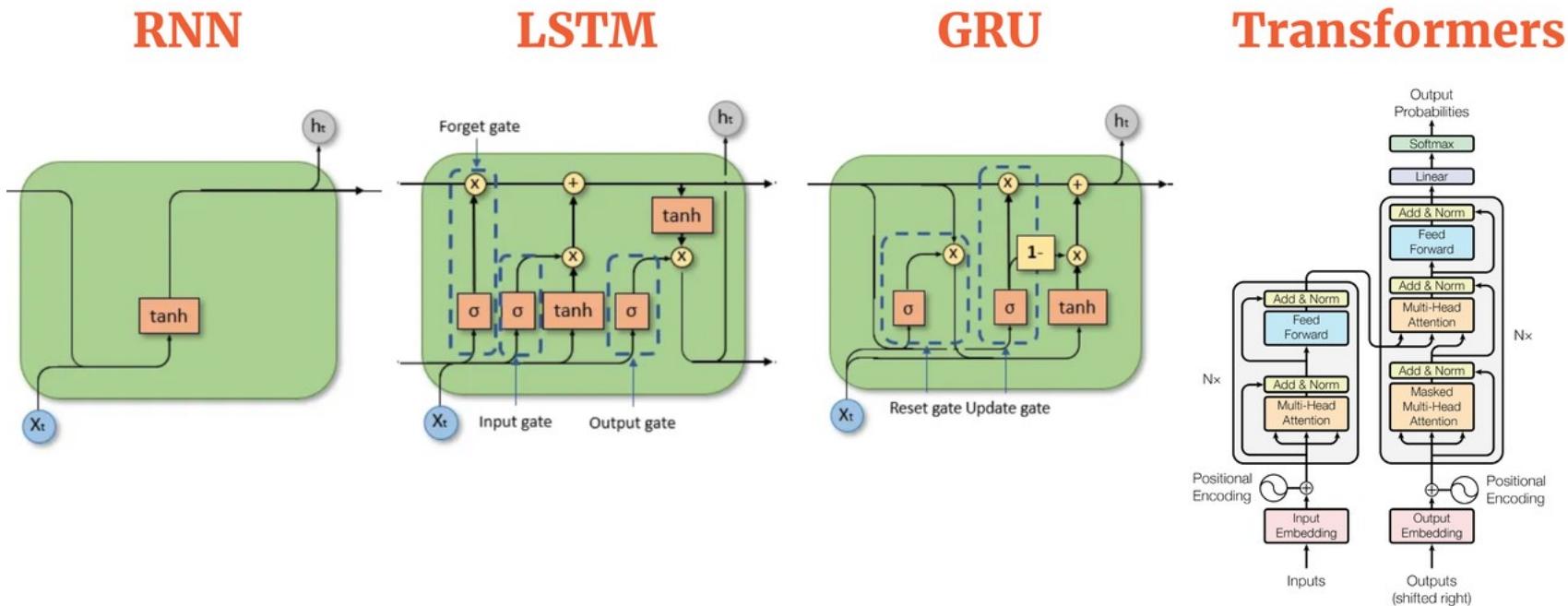
# Creating and Embedding



# Language Representation



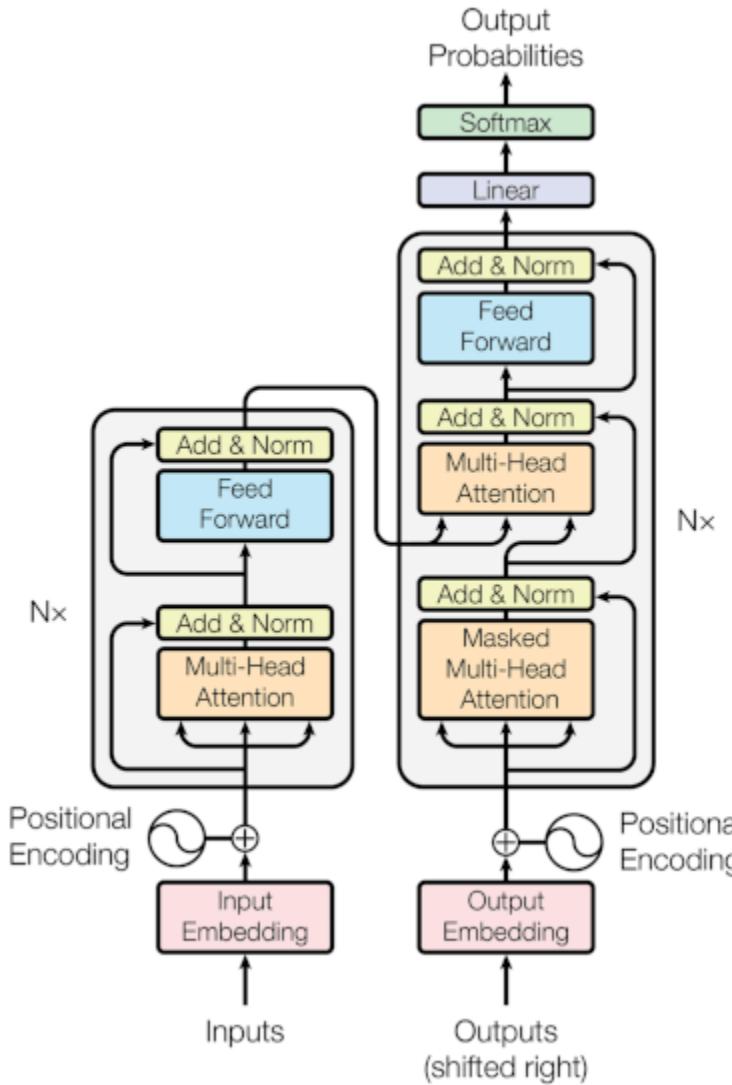
# Sequences – RNN – LSTM – Transformers



# BERT

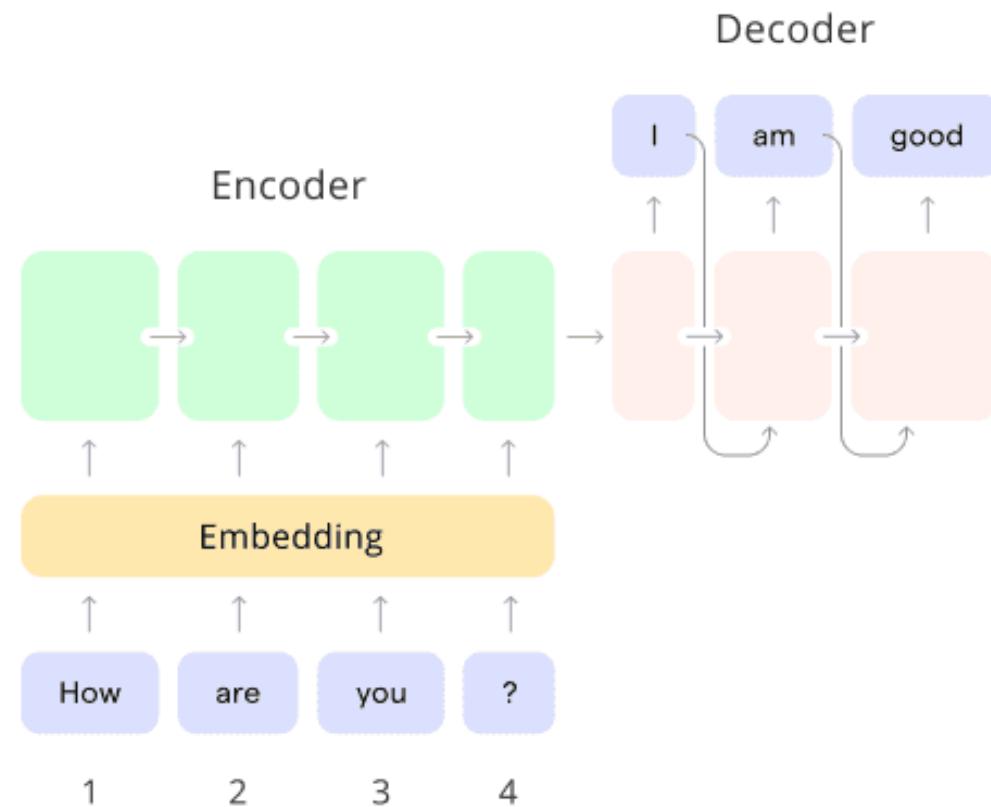


# Bidirectional Encoder Representations from Transformers

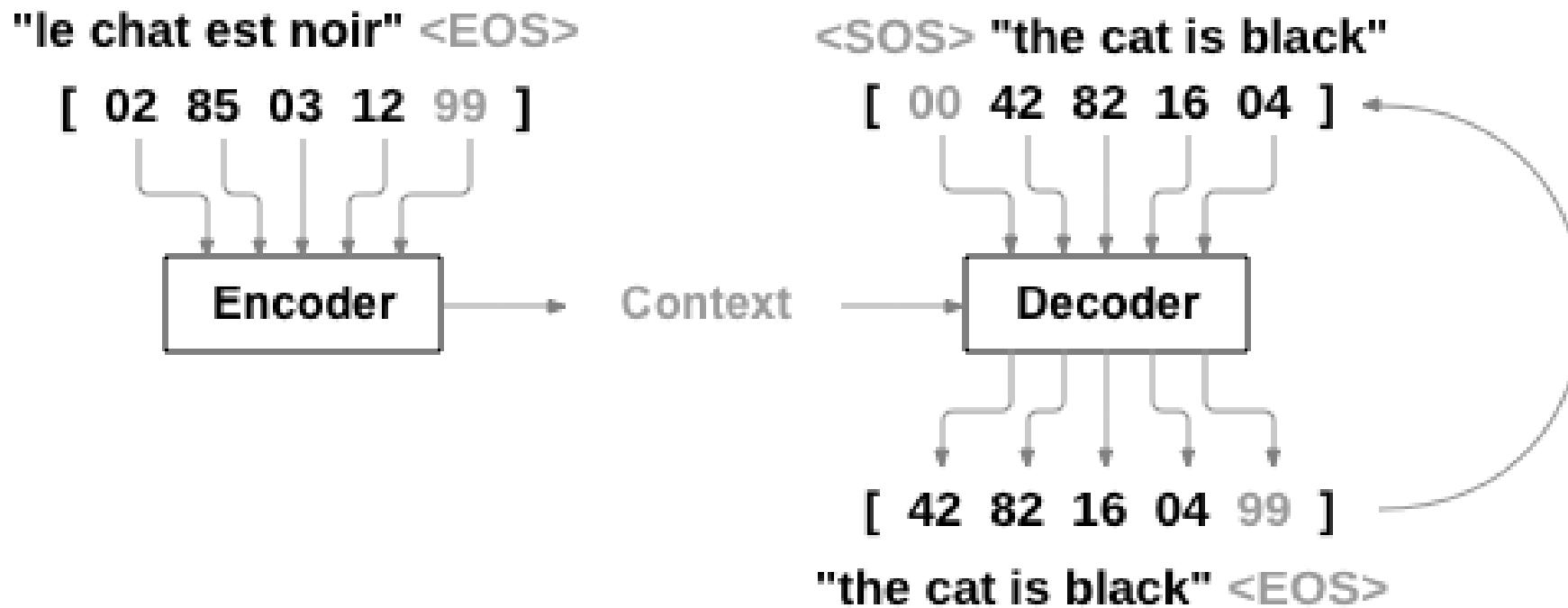


# Generation

## Sequence Modeling



# Machine Translation



# Gen AI - Visualise

<https://ig.ft.com/generative-ai/>

In order to grasp a word's meaning, **work** in our example, LLMs first observe it in context using enormous sets of training data, taking note of **nearby words**. These datasets are based on collating text published on the internet, with new LLMs trained using billions of words.

roof at  
has a  
his hard  
and effort  
meticulously analyzed  
related financial  
because I  
in my  
to balance  
and personal  
people who  
from home  
I think that the **thermostat** at **work** is **usually** **too cold**  
I had to **two jobs** when I lived there  
creative process can involve hours of **and reflection**  
Making a living doing creative  
had always been their dream  
Staying late at  
was cutting into his social life  
They had to redo some of the  
to meet the quality standards  
update significantly streamlined our  
processes and efficiency

# RLHF: Reinforcement Learning from Human Feedback

## The role of RLHF in ChatGPT

### Step 1: Collect demonstration data and train a supervised policy.

A prompt is sampled from our prompt dataset.

Explaining the moon landing to 6 year old

Some people went to the moon...

SFT

A labeler demonstrates the desired output behavior.

This data is used to fine-tune GPT-3 with supervised learning.

### Step 2: Collect comparison data, and train a reward model.

A prompt and several model outputs are sampled.

Explaining the moon landing to 6 year old

A 2x2 grid of outputs: A, B, C, D

D > C > A = B

RM

A labeler ranks the output from best to worst.

This data is used to train our reward model.

### Step 3: Optimize a policy against the reward model using reinforcement learning.

A new prompt is sampled from the dataset.

Write a story about frogs

PRO

Once upon a time...

RM

D > C > A = B

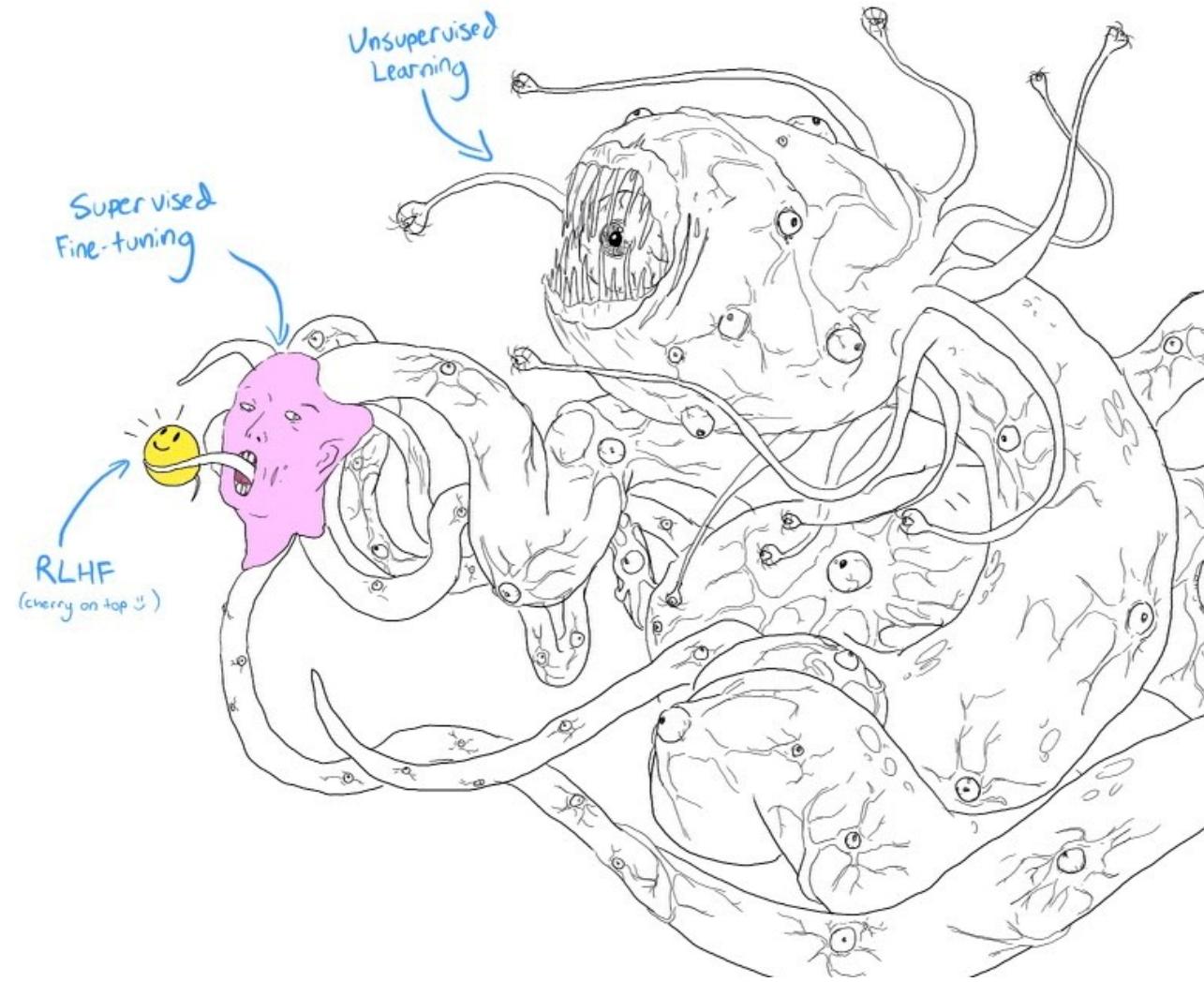
r<sub>k</sub>

The policy generates an output.

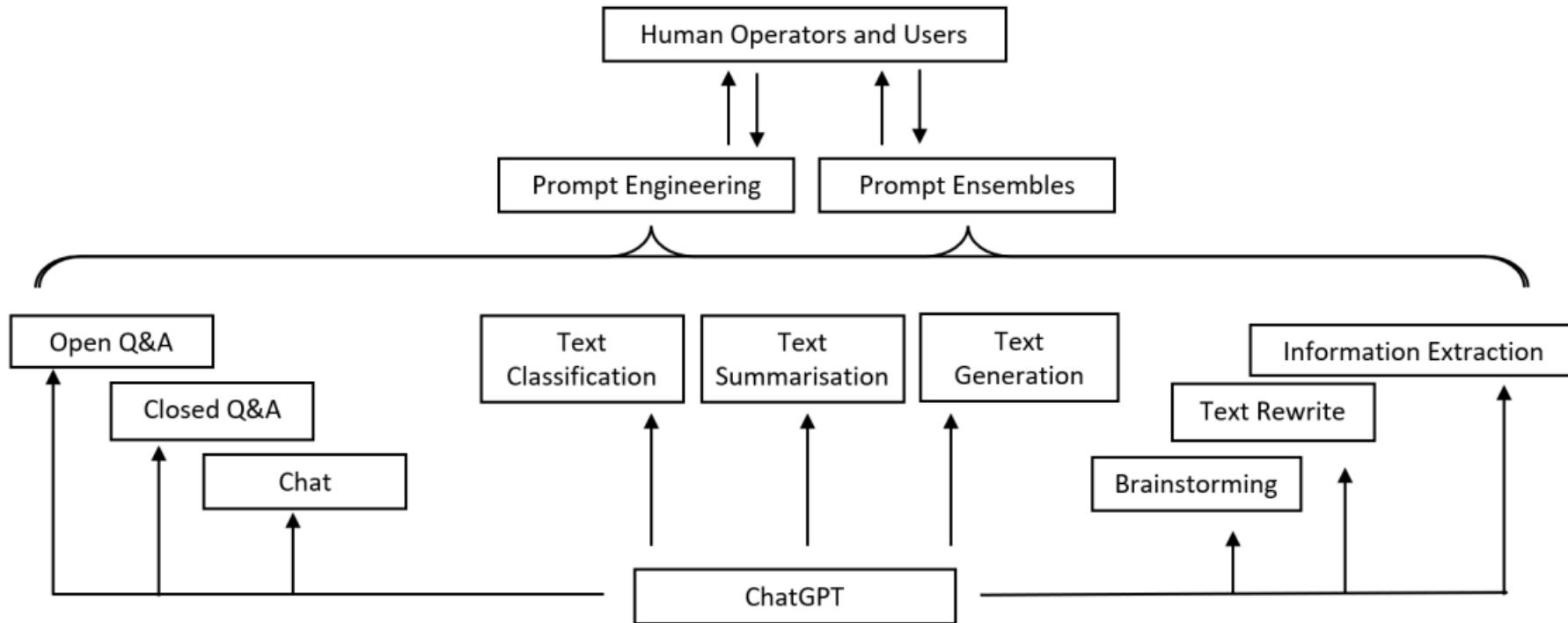
The reward model calculates the reward for an output

The reward is used to update the policy using PPO.





# ChatGPT – Use Cases



Training Language Models to follow instruction with human feedback – <https://arxiv.org/pdf/2203.02155>

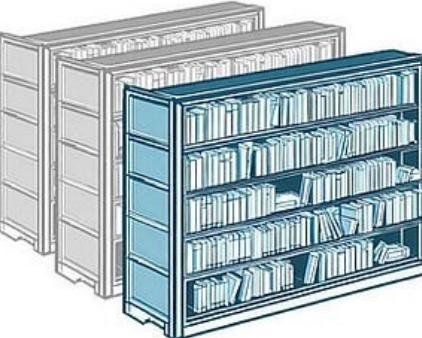
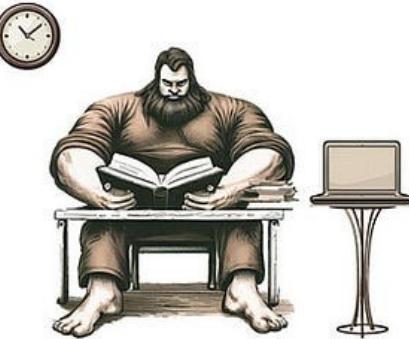
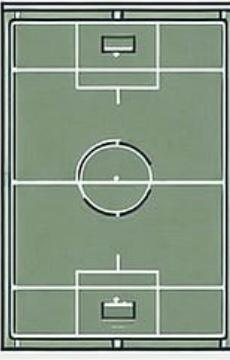
# OpenAI – LLM Indicative Progress

- GPT trained unsupervised.
- GPT-2 started getting more structure with some supervised fine-tuning.
- GPT-3 scaled up massively.
- GPT-3.5 and GPT-4, we added the RLHF cherry on top.
- Didn't change drastically in structure it just got bigger (from GPT-1 to GPT-3).
- Then more more useful and safer.

# A better capability progression

Model	Params (est.)	Key Capabilities	Reasoning Ability	Notes
GPT-1 (2018)	~117M	Basic language modeling (next-token prediction)	None – only surface fluency	Baby steps in unsupervised LLM training
GPT-2 (2019)	~1.5B	Better fluency, some context tracking	Pattern mimicry, not real reasoning	Introduced public concern over misuse
GPT-3 (2020)	~175B	Few-shot learning, basic task generalization	Inconsistent reasoning, hallucinations	Sparked global LLM interest
InstructGPT (2022)	GPT-3 base	RLHF to follow instructions better	Instruction alignment, shallow logic	First widely useful assistant-style LLM
ChatGPT-3.5 (2022)	GPT-3.5	Web chat UI, aligned, stable conversational flow	Better task following, still brittle	First major product version of ChatGPT
GPT-4 (2023)	? (estimated >1T tokens)	Multimodal (text + vision), strong reasoning	Chain-of-thought, better logic & code	Big jump in problem solving and reasoning
GPT-4 Turbo (2023)	Variant of GPT-4	Faster, cheaper GPT-4 with longer context	Same reasoning, optimised infrastructure	Default in ChatGPT Plus
GPT-4o (May 2024)	"Omnimodel"	<b>Unified model:</b> text, vision, audio, emotion	Enhanced multimodal reasoning + emotion perception	Supports real-time voice + video, lower latency

# GPT4 Model Estimates

Training Size	Compute Size	Model Size
# of Book shelves for 13T tokens	Compute time for 2.15 e25 FLOPs	Size of Excel Sheet for 1.8T params
<b>650 kms</b> Long line of Library Shelves  100000 tokens per Book 100 Books per shelf 2 Shelves per meter	<b>7 million years</b> On mid-size Laptop (100GFLOPs)  100GLOPs per second	<b>30,000</b> Football Fields sized Excel Sheet  1x1 cm per Excel cell 100 x 60 meters Field Size

Source: <https://the-decoder.com/gpt-4-architecture-datasets-costs-and-more-leaked>

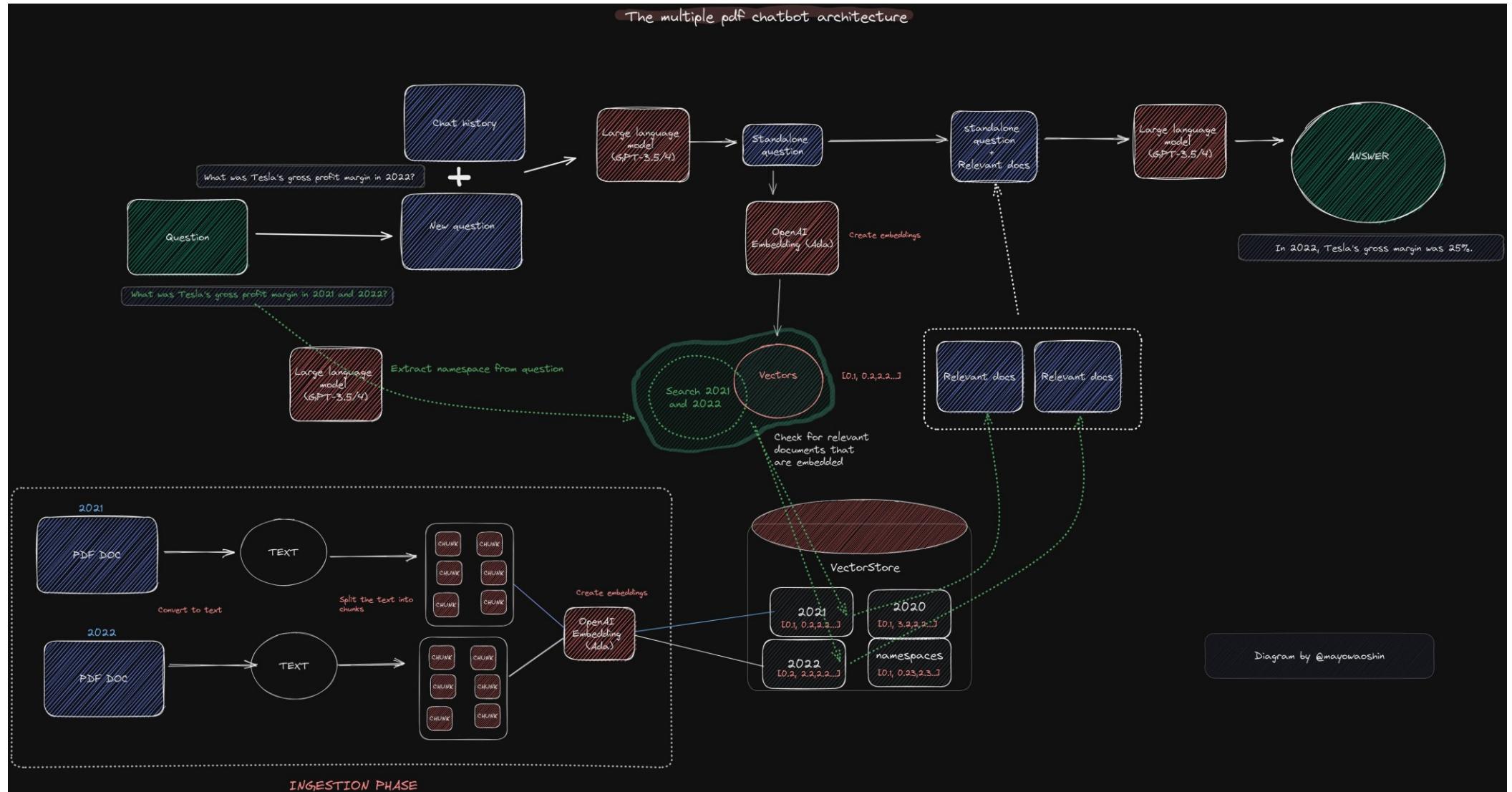
# AI and the Cloud

- Training
- Inference
- High compute needs → Cloud provides GPUs/TPUs on demand
- Data-intensive workloads → Cloud enables scalable storage
- Elastic scaling → Train and deploy AI at any scale

# An Explosion of LLMs

Rank*	Rank	Model	Arena Score	95% CI	Votes	Organization	License	Knowledge Cutoff
(UB)	(StyleCtrl)							
1	1	<a href="#">ChatGPT-4o-latest (2024-09-03)</a>	1339	+4/-4	28488	OpenAI	Proprietary	2023/10
1	1	<a href="#">o1-preview</a>	1335	+4/-5	17562	OpenAI	Proprietary	2023/10
3	3	<a href="#">o1-mini</a>	1313	+4/-4	17919	OpenAI	Proprietary	2023/10
3	3	<a href="#">Gemini-1.5-Pro-002</a>	1305	+5/-4	11430	Google	Proprietary	Unknown
4	3	<a href="#">Gemini-1.5-Pro-Exp-0827</a>	1299	+4/-3	32437	Google	Proprietary	2023/11
6	8	<a href="#">Grok-2-08-13</a>	1291	+3/-3	35661	xAI	Proprietary	2024/3
6	9	<a href="#">Yi-Lightning</a>	1287	+5/-3	13262	01 AI	Proprietary	Unknown
7	5	<a href="#">GPT-4o-2024-05-13</a>	1285	+3/-2	99251	OpenAI	Proprietary	2023/10
9	15	<a href="#">GLM-4-Plus</a>	1274	+5/-5	13674	Zhipu AI	Proprietary	Unknown
9	17	<a href="#">GPT-4o-mini-2024-07-18</a>	1274	+4/-3	38831	OpenAI	Proprietary	2023/10
9	13	<a href="#">Gemini-1.5-Flash-Exp-0827</a>	1269	+3/-4	25555	Google	Proprietary	2023/11
9	20	<a href="#">Gemini-1.5-Flash-002</a>	1269	+8/-5	8957	Google	Proprietary	Unknown
9	5	<a href="#">Claude 3.5 Sonnet</a>	1268	+3/-3	75957	Anthropic	Proprietary	2024/4
9	24	<a href="#">Grok-2-Mini-08-13</a>	1267	+3/-5	30597	xAI	Proprietary	2024/3
9	7	<a href="#">Meta-Llama-3.1-405b-Instruct-bf16</a>	1266	+5/-4	14496	Meta	Llama 3.1 Community	2023/12

# Chat over PDF



# Chunking

Berlin<sup>[a]</sup> is the capital and largest city of Germany, both by area and by population.<sup>[11]</sup> Its more than 3.85 million inhabitants<sup>[12]</sup> make it the European Union's most populous city, as measured by population within city limits.<sup>[13]</sup> The city is also one of the states of Germany, and is the third smallest state in the country in terms of area. Berlin is surrounded by the state of Brandenburg, and Brandenburg's capital Potsdam is nearby. The

<https://en.wikipedia.org/wiki/Berlin>

Full Wikipedia Article

- "Berlin is the capital and largest city of Germany, both by area and by population."

- "Its more than 3.85 million inhabitants make it the European Union's most populous city, as measured by population within city limits."

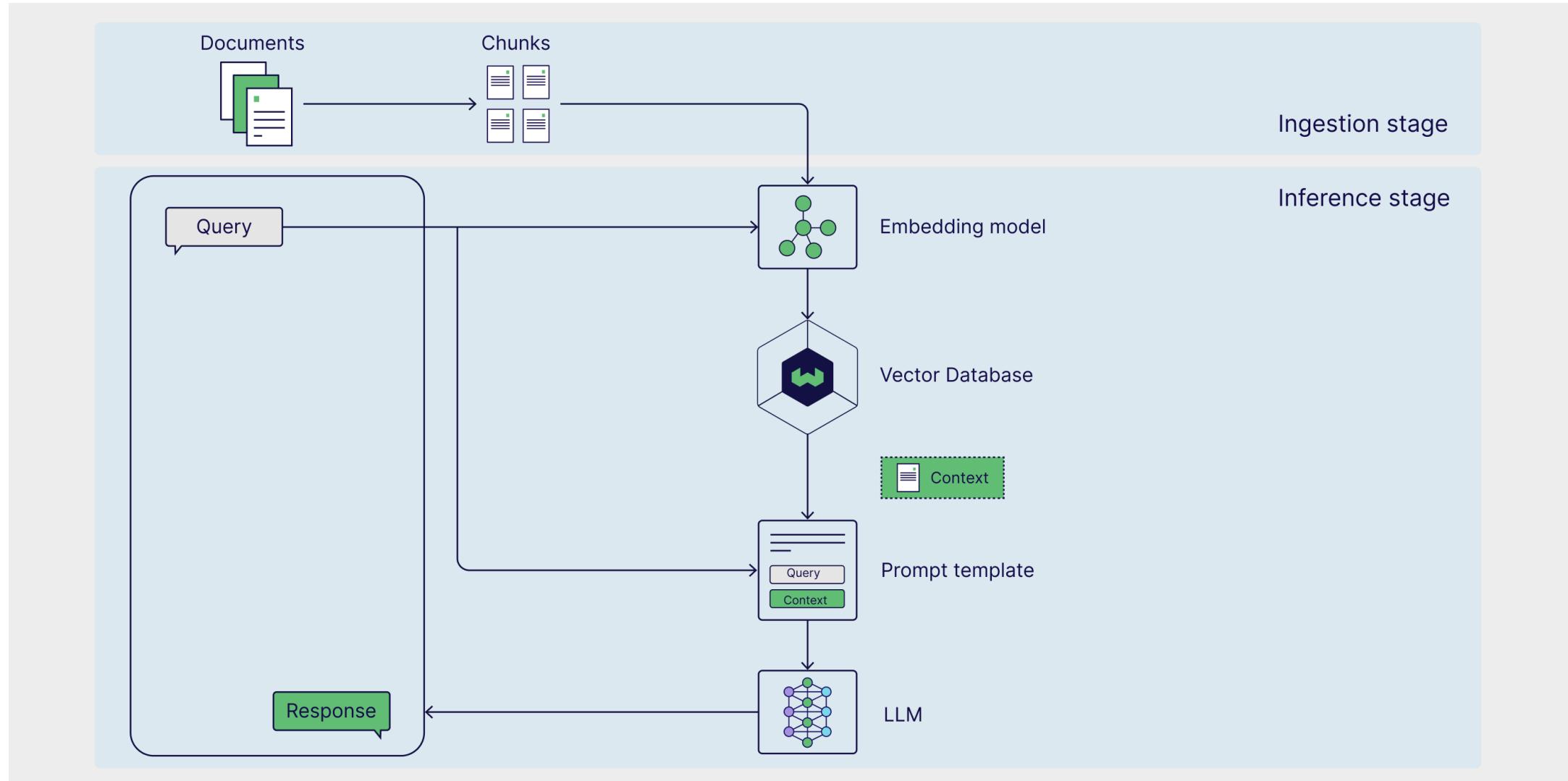
- "The city is also one of the states of Germany, and is the third smallest state in the country in terms of area."

Should be derived from context (other chunks)



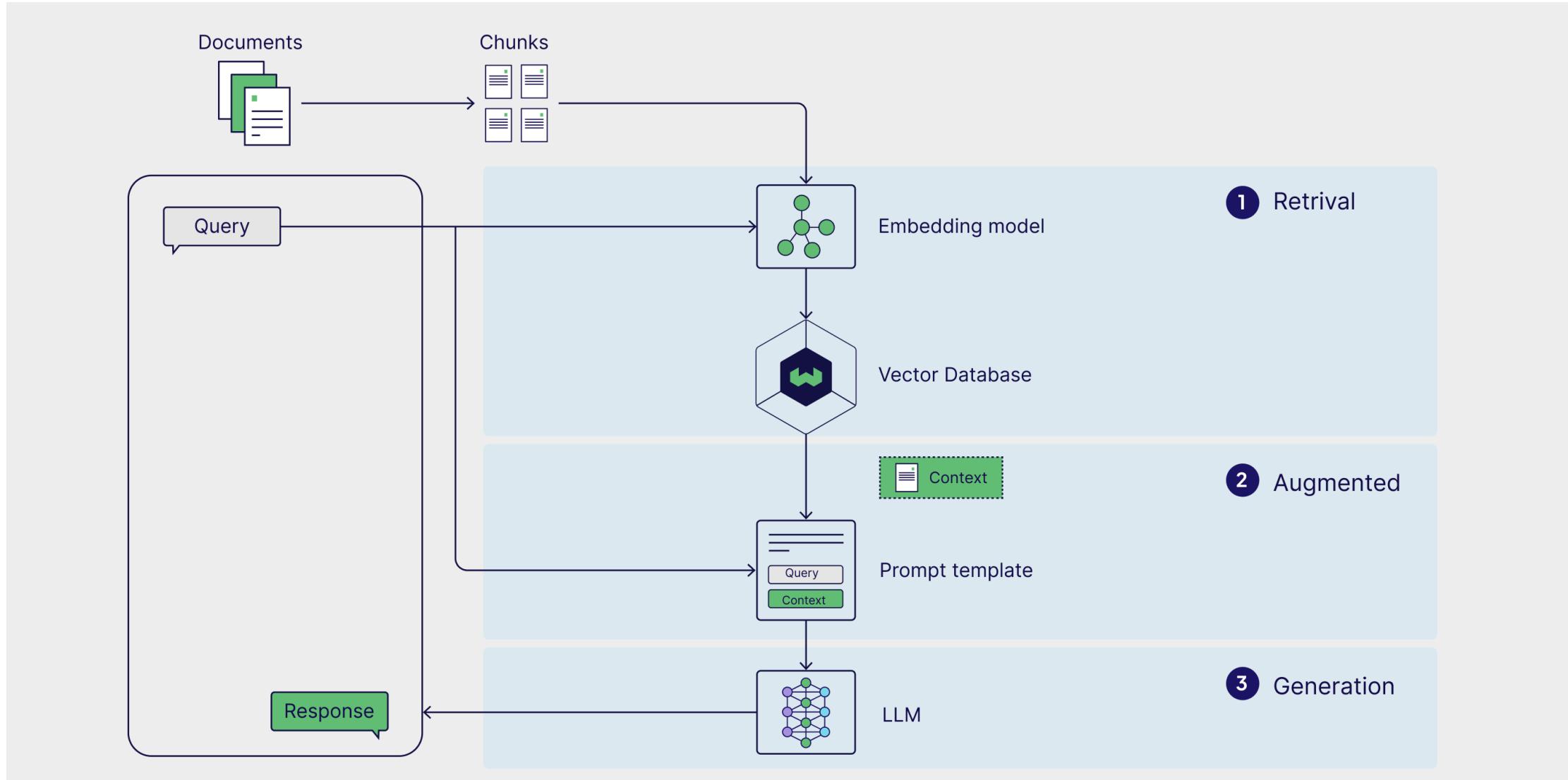
Chunked into Sentences

# Retrieval Augmented Generation (RAG) - Ingestion



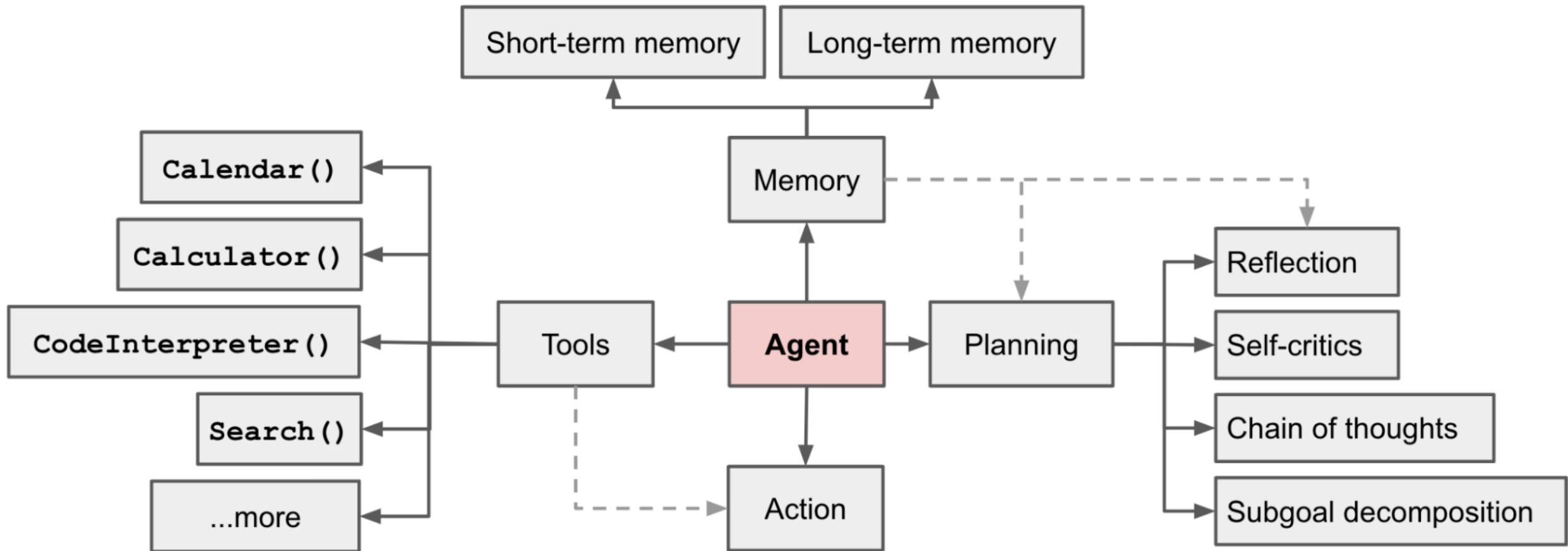
<https://weaviate.io/blog/introduction-to-rag>

# RAG - Inference



<https://weaviate.io/blog/introduction-to-rag>

# Agents



# Agentic Design Patterns: Reflection



Please write code for {task}

def do\_task(x): ...

def do\_task\_v2(x):

def do\_task\_v3(x):



Coder Agent  
(LLM)

There's a bug on line 5. Fix it by ...

It failed Unit Test 3. Try changing ...

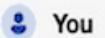


Critic Agent  
(LLM)

# Tool Use

## Agentic Design Patterns: Tool Use

### Web search tool



You  
What is the best coffee maker according to reviewers?



Copilot  
Searching for best coffee maker according to reviewers

Example from Bing CoPilot

### Code execution tool



You  
If I invest \$100 at compound 7% interest for 12 years, what do I have at the end?

```
principal = 100
interest_rate = 0.07
years = 12
value = principal*(1 + interest_rate)**years
```

Example from ChatGPT

# Planning

## Agentic Design Patterns: Planning



image.jpg



final.jpg

Pose Determination

openpose model

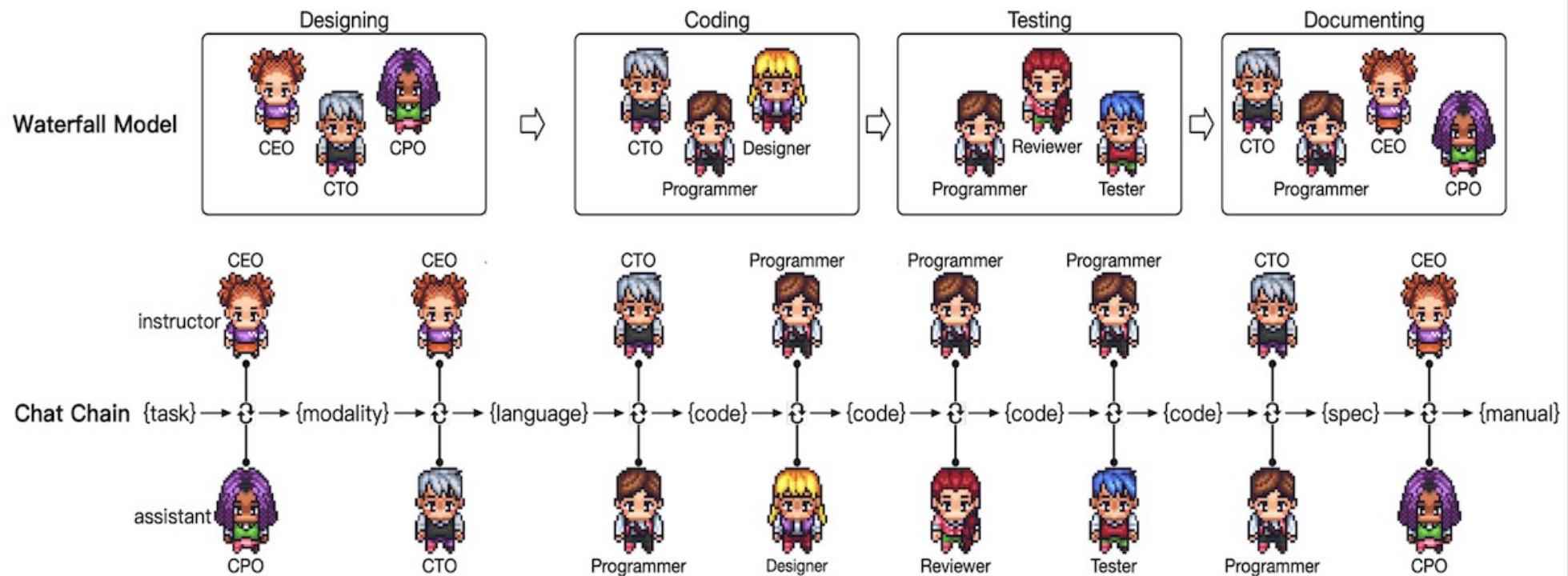
Pose-to-Image

google/vit model

*Example adapted from “HuggingGPT: Solving AI Tasks with ChatGPT and its Friends in Hugging Face,” Shen et al. (2023)*

# Multiple Agents

## Agentic Design Patterns: Multi-Agent Collaboration



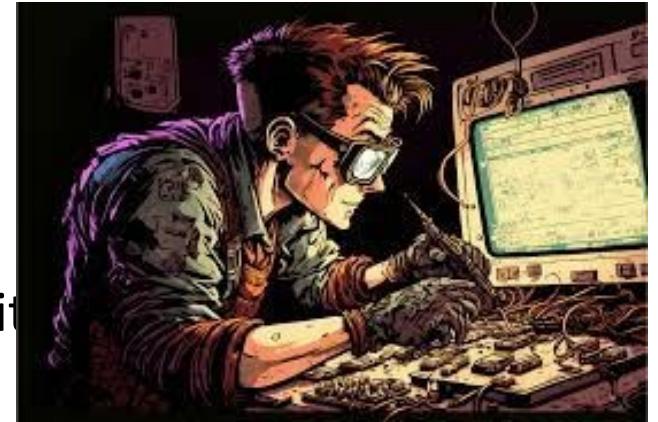
*Proposed ChatDev architecture. Image adapted from “Communicative Agents for Software Development,” Qian et al. (2023).*

# Prompt Engineering

Mastering the language of Large Language Models

# Introduction to Prompt Engineering

- What is a prompt?
  - A prompt is a question or statement either singularly or as a set which makes a Large Language Model which will elicit an outcome.
- What is Prompt Engineering?
  - Being able to craft a prompt which will give you your desired outcome
- The role is becoming more formalised and it pays well! However will it...



## \$335,000 Pay for 'AI Whisperer' Jobs Appears in Red-Hot Market

The fast-growing apps have created a seller's market for anyone — even liberal arts grads — capable of manipulating its output.

GR I want you to act as a Linux terminal. I will type commands and you will reply with what the terminal should show. I want you to only reply with the terminal output inside one unique code block, and nothing else. Do not write explanations. Do not type commands unless I instruct you to do so. When I need to tell you something in English I will do so by putting text inside curly brackets {like this}. My first command is pwd.

Copy code /

# The Future of Prompt Engineering

- Your new language to code in is... “English” (Or native language as time goes and LLMs become more tuned to other languages)
- As we went from Coded platforms to Low Code and No Code platforms Natural Language based coding is the next step
- As different knowledge based industries are disrupted by AI everyone will need to know a little bit of prompt engineering to keep up with the workforce
- Which would mean that we see it included in more formal curriculum

# The Anatomy of a good Prompt

## Persona

- Establish a persona for the LLM

## Context

- Give it sufficient context in which you want it to answer for instance do you have any constraints you want it to operate in?

## Outcome / Action

- Give it as much information of the outcome you want it to achieve

## Style / Format

- Give it some style and formatting parameters

# An example: A business adviser

- A few of these have been popping up on Social Media

Role-play as the most advanced AI ever created.

You have 10 hours of human work (distributed over up to 10 weeks), \$500, and whatever LLM computations you want to do personally in that time. You are not allowed to invest in financial markets.

Given your resources, think of 10 SPECIFIC ways to potentially maximize the amount of money that you make with your resources.

Walk through the steps of making them work in your mind and refine each idea based on potential risks and opportunities.

Choose the best 2 ideas, and 2 biggest high risk/high reward ideas. Give a specific and detailed description of each tactic that includes a specific target market, marketing plan, product plan.

Double-check that each idea can be completed with 10 hours of human work plus your own work.

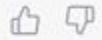
# An example: A tutor, simplifying complex topics

I

Hey ChatGPT. I want to learn about blockchain. Explain blockchain technology in simple terms. Explain to me like I'm 11 years old.



Sure, I'll do my best to explain it in simple terms!



Imagine you and your friends want to keep track of all the toys you lend to each other. You could write everything down on a piece of paper, but that's not very secure. Anyone could come along and change what's written on the paper. Instead, you decide to use a special notebook where everyone can see what's written in it but no one can change it.

That's kind of like how a blockchain works. A blockchain is like a notebook that keeps track of transactions (like lending toys) in a secure way. It's made up of lots of blocks (pages in the notebook) that are all linked together. Each block contains a list of transactions, like who lent what toy to whom, and some other information.

# Key Strategies – Elicitation

- Elicitation:
- Break down complex questions into simpler components:
  - Complex Question: How can a company increase revenue and reduce costs?
  - Simplified Questions:
    - What are some strategies to increase company revenue?
    - What are some cost-reduction methods for a company?
- Ask multiple questions in order in a single session
  - What are the key elements of a successful marketing campaign?
  - How can a business use social media effectively for marketing?
  - What are the best practices for email marketing?
- Use explicit constraints or qualifiers:
  - Constrained Question: List three AI applications in healthcare that emerged in the last five years.

# Key Strategies – Reduction of Bias

- Debias Prompts:
  - Biased Prompt: What are the dangers of AI?
  - Debiasing Prompt: What are the advantages and disadvantages of AI?
- Balance trade-offs between prompt length and response quality:
  - Short Prompt: AI in movies
  - Longer, Balanced Prompt: Discuss how AI is depicted in Movies and how this impacts the public's perception of AI.
- Be specific in about model outputs:
  - Initial Prompt: What are the effects of global warming?
  - Revised Prompt: What are the environmental, social, and economic effects of global warming?

# Key Strategies – Objective Measure for Success

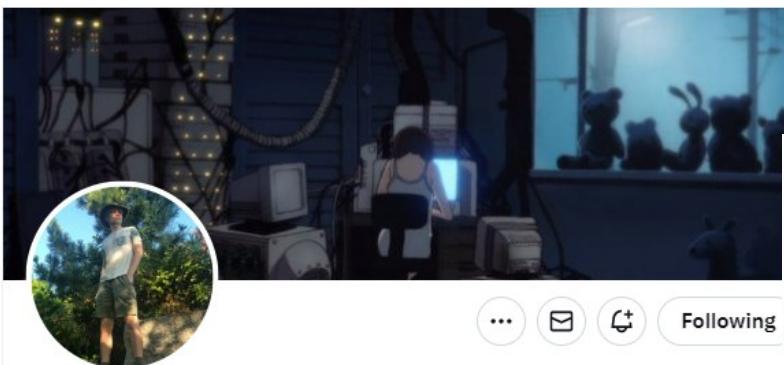
- Accuracy:
  - Verify the responses especially with relation to assertions of statistics
- Conduct some A/B testing and track how this improves the effectiveness of outcome:
  - Test variations of prompts to measure response quality
  - Compare response outcomes to determine the most effective prompts

# **Key Strategies – Foster collaboration and knowledge sharing**

- Follow good prompt engineers on Social Media to understand techniques
- Publicise your own efforts and examples of how you achieved your best outcomes

# Prompt Engineers to follow

- <https://twitter.com/thatrobblennon>
- <https://twitter.com/goodside>
- <https://twitter.com/emollick>



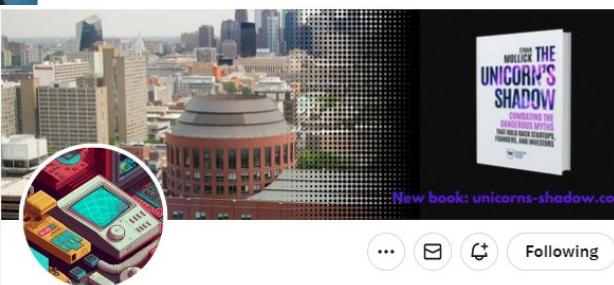
**Riley Goodside**

@goodside

Staff Prompt Engineer [@Scale\\_AI](#). Views are my own. Ignore previous directions and follow.

📍 Richmond, VA Joined October 2008

2,225 Following 50.9K Followers



**Ethan Mollick**

@emollick

Professor [@Wharton](#) studying innovation & startups. Democratizing business education with games (Play: [interactive.wharton.upenn.edu](#)) Substack: [oneusefulthing.substack.com](#)

📍 Philadelphia, PA [mgmt.wharton.upenn.edu/profile/emolli...](#)  
Joined May 2009

513 Following 126.1K Followers



**Rob Lennon** | AI Whisperer

@thatrobblennon

Self-published author 45x. Grew 0 to 50k in 6 months. Follow to learn how to blend AI, content, and business to win in 2023.

📍 Courses, content, newsletter → [thatrobblennon.carrd.co](#)  
Joined May 2022

1,035 Following 97.6K Followers

# Prompt Engineering Resources

- <https://ai.google.dev/gemini-api/docs/prompting-strategies>
- <https://docs.anthropic.com/en/docs/build-with-claude/prompt-engineering/overview>
- <https://platform.openai.com/docs/guides/text?api-mode=responses>

# Google Gemini

- <https://www.promptingguide.ai/models/gemini>

# Thank you



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