

# The LangChain ecosystem

DEVELOPING LLM APPLICATIONS WITH LANGCHAIN



**Jonathan Bennion**

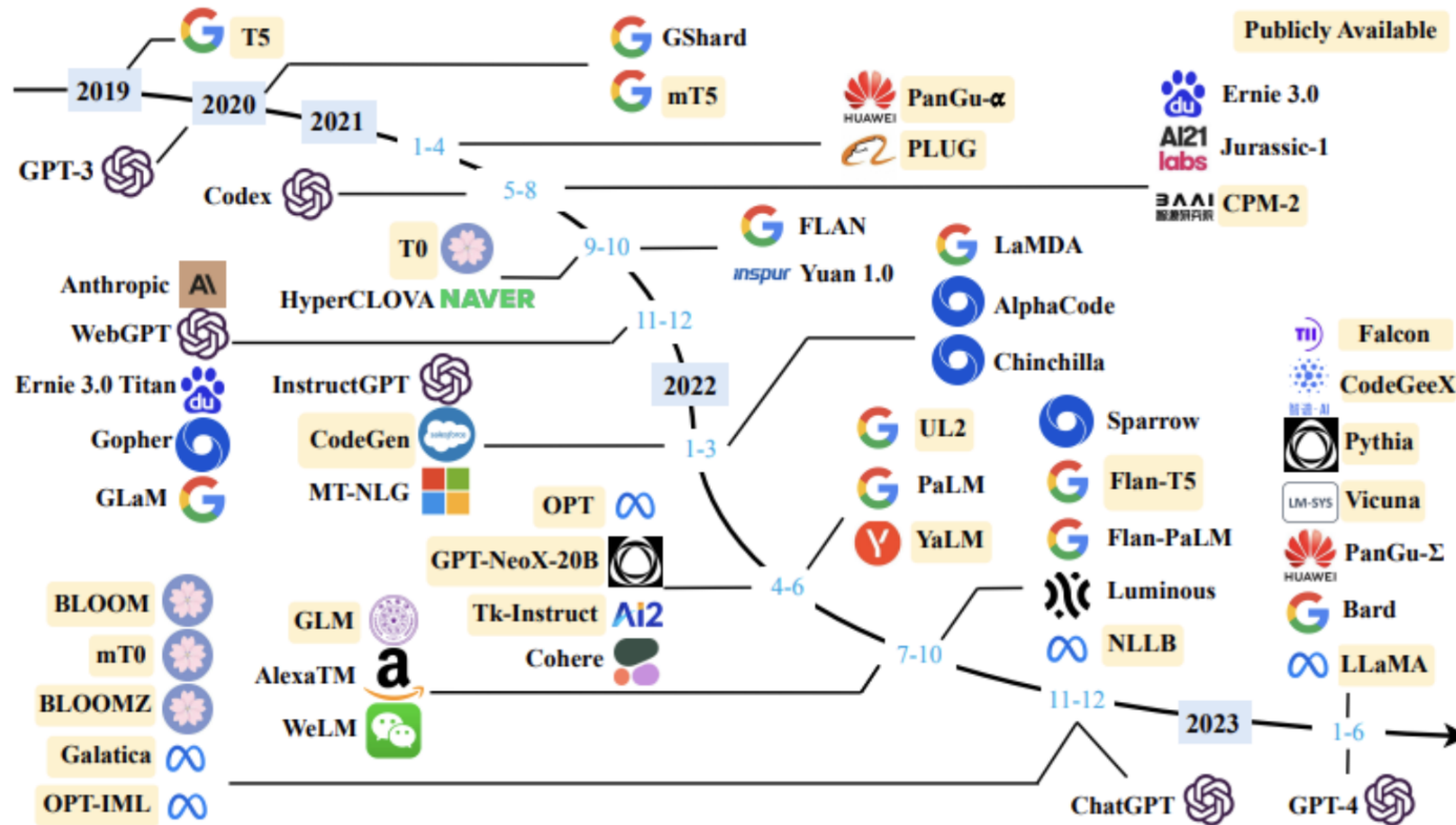
AI Engineer & LangChain Contributor

# Meet your instructor...



- Jonathan Bennion, **AI Engineer**
- ML & AI at Facebook, Google, Amazon, Disney, EA
- Created *Logical Fallacy chain* in LangChain
- Contributor to **DeepEval**

# The state of Large Language Models (LLMs)



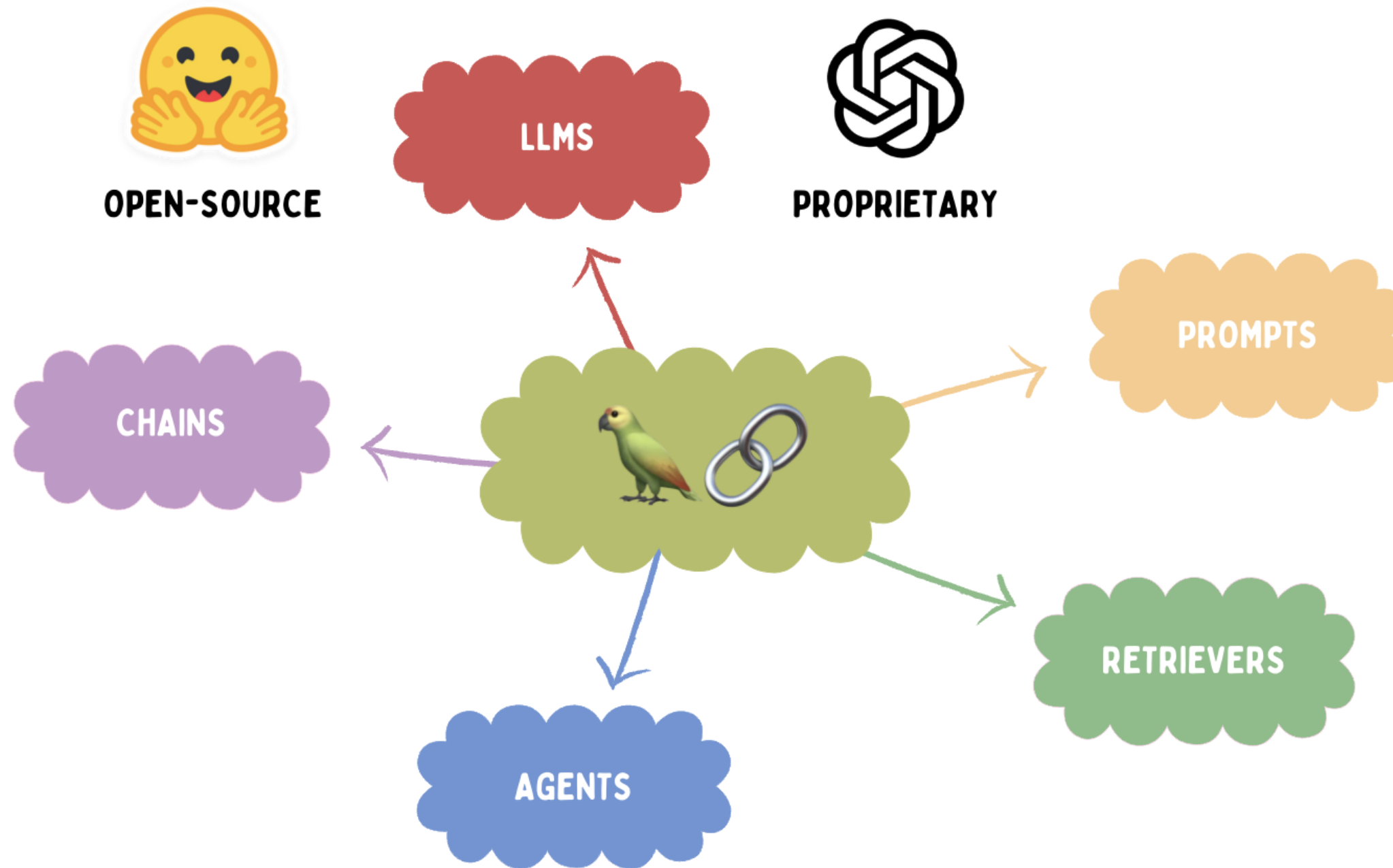
<sup>1</sup> <https://arxiv.org/pdf/2303.18223.pdf>

# What is LangChain?



- **Open-source** framework for connecting:
  - Large Language Models (LLMs)
  - Data sources
  - Other functionality under a **unified syntax**
- Allows for scalability
- Contains modular components
- Supports **Python** and **JavaScript**

# Core components of LangChain



# Hugging Face



- **Open-source** repository of models, datasets, and tools

Creating a Hugging Face API key:

1. Sign up for a Hugging Face account
2. Navigate to `https://huggingface.co/settings/tokens`
3. Select New token and copy the key

## Hugging Face (*Falcon-7b*):

```
from langchain_huggingface import HuggingFaceEndpoint

llm = HuggingFaceEndpoint(
    repo_id='tiiuae/falcon-7b-instruct',
    huggingfacehub_api_token=huggingfacehub_api_token
)

question = 'Can you still have fun'
output = llm.invoke(question)

print(output)
```

```
in the rain?
Yes, you can still have fun in the
rain! There are plenty of
```

## OpenAI (`gpt-3.5-turbo-instruct`):

```
from langchain_openai import OpenAI

llm = OpenAI(
    model="gpt-3.5-turbo-instruct",
    api_key=openai_api_key
)

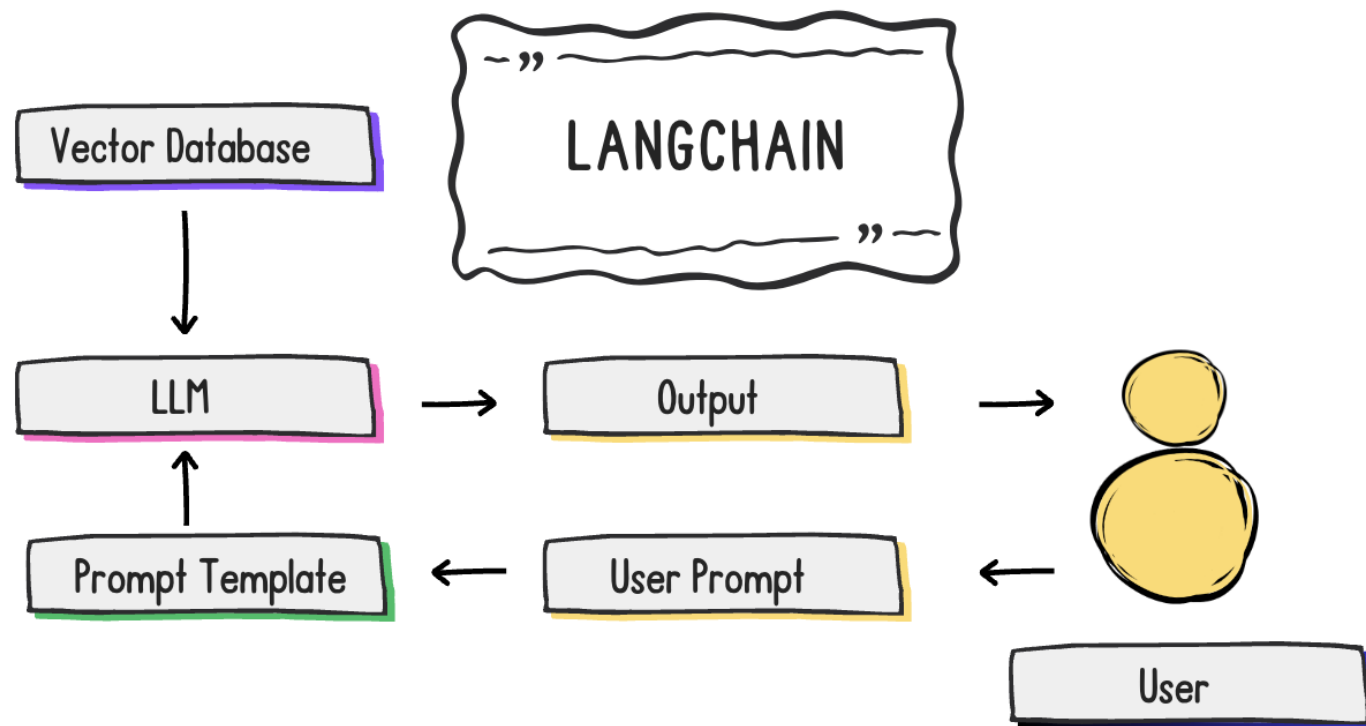
question = 'Can you still have fun'
output = llm.invoke(question)

print(output)
```

```
without spending a lot of money?

Yes, you can still have fun without
spending a lot of money. You could do
activities like hiking, biking, playing
sports, going to the beach, camping...
```

# Real-world usage



## Examples:

- Natural language conversations with documents
- Automate tasks
- Data analysis

**Note:** course uses `langchain==0.2.5`



# Let's practice!

DEVELOPING LLM APPLICATIONS WITH LANGCHAIN

# Prompting strategies for chatbots

DEVELOPING LLM APPLICATIONS WITH LANGCHAIN



**Jonathan Bennion**

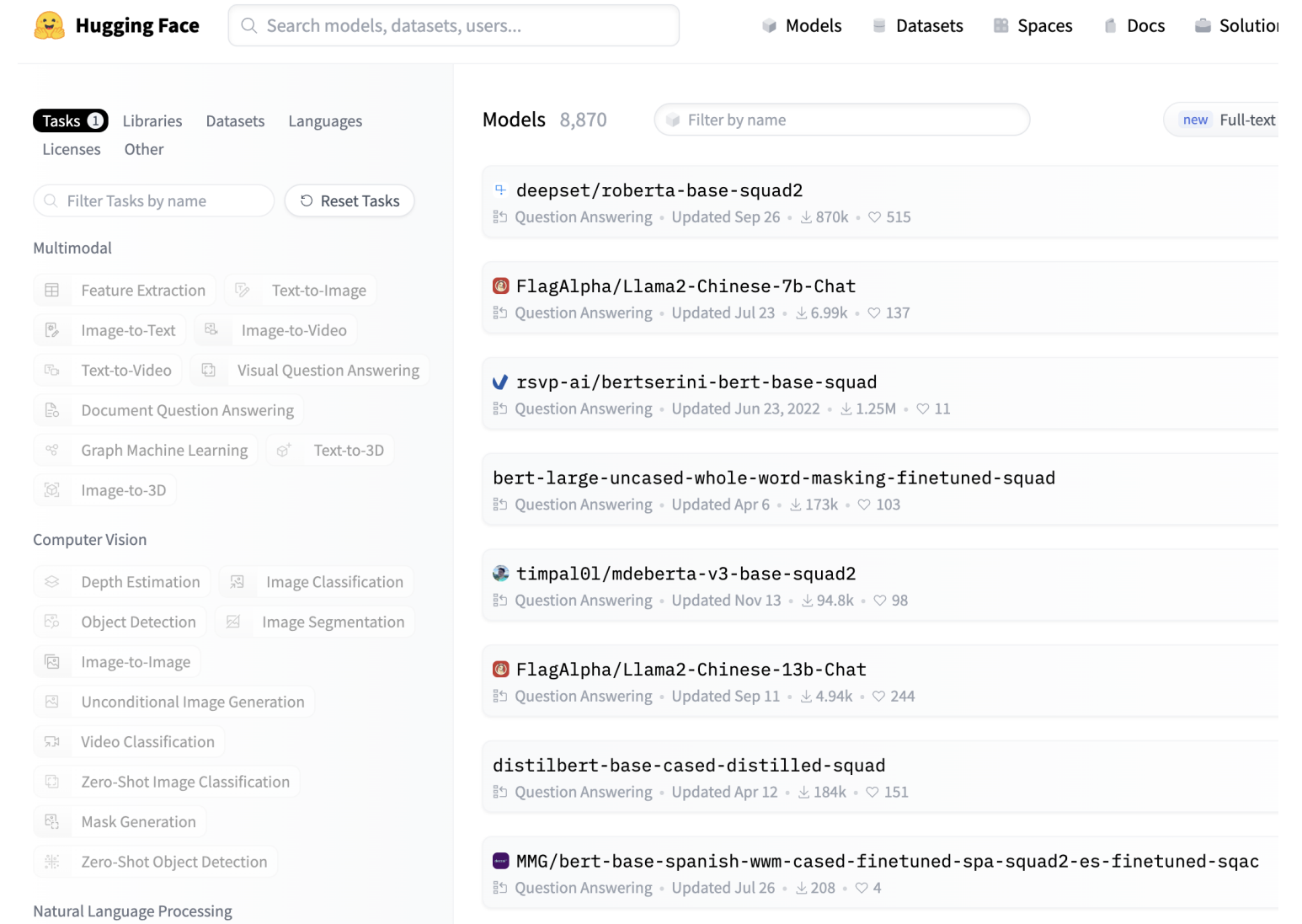
AI Engineer & LangChain Contributor

# Finding the right model



Hugging Face is a searchable hub for chat models

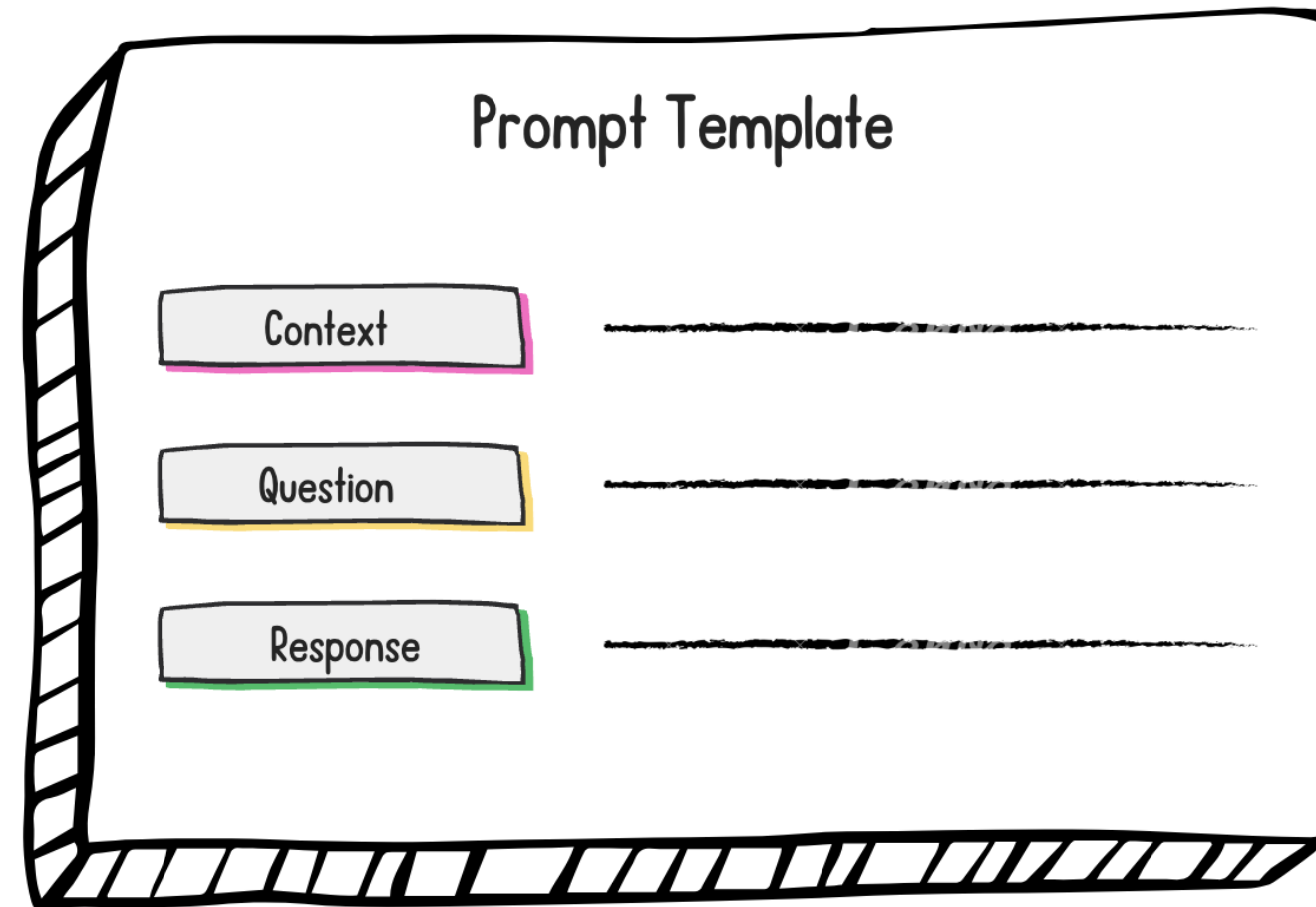
- *Fine-tuned models* for more domain-specific use cases



<sup>1</sup> [https://huggingface.co/models?pipeline\\_tag=question-answering&sort=trending](https://huggingface.co/models?pipeline_tag=question-answering&sort=trending)

# Prompt templates

- Recipes for generating prompts
- *Flexible* and *modular*
- Can contain: instructions, examples, and additional context



# Prompt templates

```
from langchain_core.prompts import PromptTemplate

template = "You are an artificial intelligence assistant, answer the question. {question}"
prompt_template = PromptTemplate(template=template, input_variables=["question"])

print(prompt_template.invoke({"question": "What is LangChain?"}))
```

```
text='You are an artificial intelligence assistant, answer the question. What is LangChain?'
```

# Integrating PromptTemplate with LLMs

```
from langchain_huggingface import HuggingFaceEndpoint

llm = HuggingFaceEndpoint(repo_id='tiiuae/falcon-7b-instruct', huggingfacehub_api_token=huggingfacehub_api_token)
llm_chain = prompt_template | llm

question = "What is LangChain?"
print(llm_chain.invoke({"question": question}))
```

LangChain is an artificial intelligence language model that uses a neural network to generate human-like text

- LangChain Expression Language (LCEL)
- **Chain:** connect calls to different components

# Chat models

```
from langchain_core.prompts import ChatPromptTemplate

prompt_template = ChatPromptTemplate.from_messages(
    [
        ("system", "You are soto zen master Roshi."),
        ("human", "What is the essence of Zen?"),
        ("ai", "When you are hungry, eat. When you are tired, sleep."),
        ("human", "Respond to the question: {question}")
    ]
)
```

# Integrating ChatPromptTemplate

```
from langchain_openai import ChatOpenAI

llm = ChatOpenAI(model="gpt-4o-mini", api_key=openai_api_key)

llm_chain = prompt_template | llm
question='What is the sound of one hand clapping?'

response = llm_chain.invoke({"question": question})
print(response.content)
```

The sound of one hand clapping is not something that can be easily explained or understood through words alone. It is a question that has been pondered by Zen practitioners for centuries, and its purpose is to provoke a deeper inquiry into the nature of reality and the self. In Zen practice, we often engage...



# Let's practice!

DEVELOPING LLM APPLICATIONS WITH LANGCHAIN

# Managing chat model memory

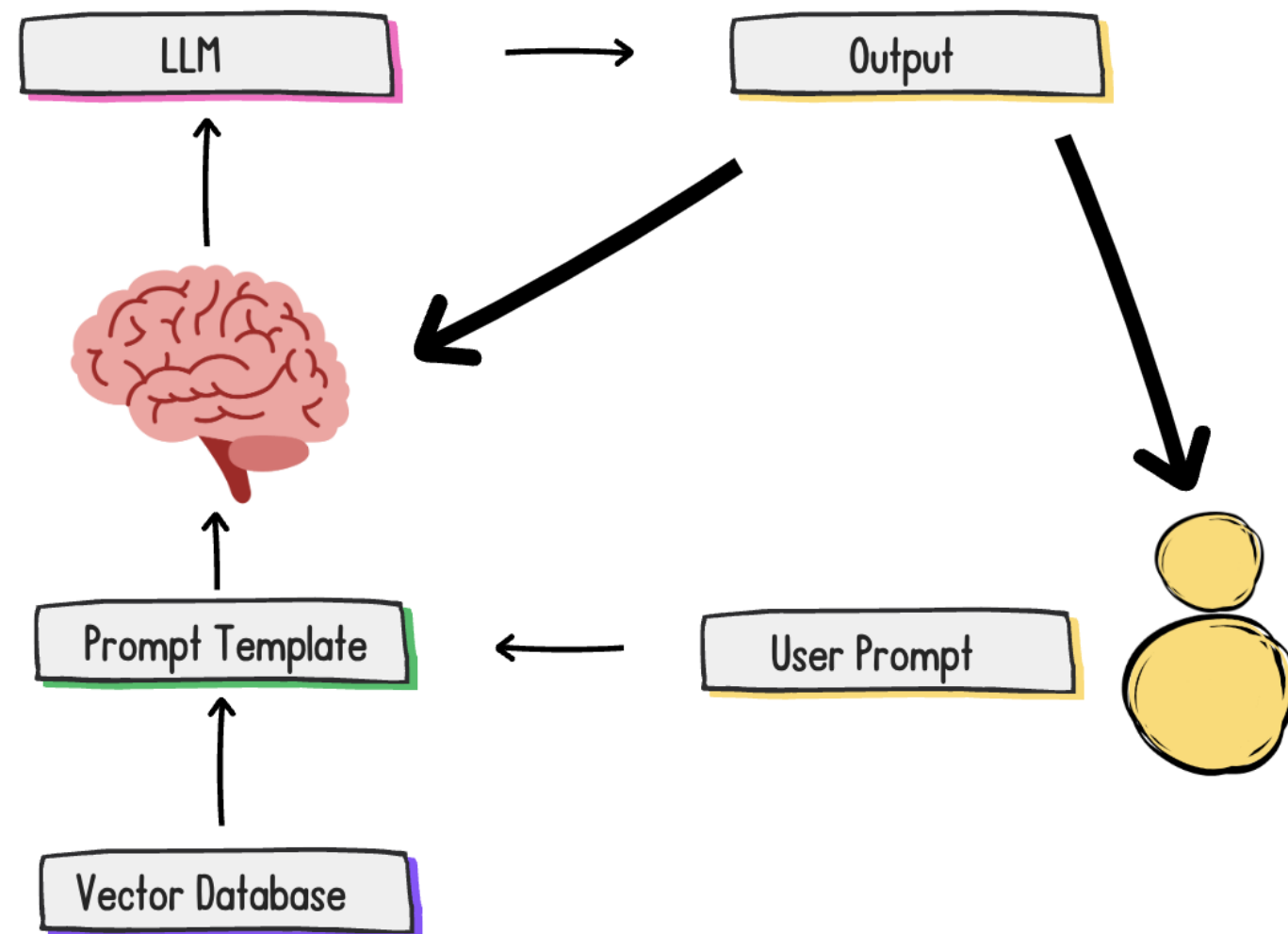
DEVELOPING LLM APPLICATIONS WITH LANGCHAIN



**Jonathan Bennion**

AI Engineer & LangChain Contributor

# In-conversation memory



- Follow-up questions
- Response iteration and expansion
- Personalization

**Context window:** amount of input text a model can consider at once

- `ChatMessageHistory`
- `ConversationBufferMemory`
- `ConversationSummaryMemory`

# ChatMessageHistory

- Stores full message history

```
from langchain.memory import ChatMessageHistory
from langchain_openai import ChatOpenAI

llm = ChatOpenAI(model="gpt-4o-mini", api_key=openai_api_key)

history = ChatMessageHistory()
history.add_ai_message("Hi! Ask me anything about LangChain.")
history.add_user_message("Describe a metaphor for learning LangChain in one sentence.")

response = llm.invoke(history.messages)
print(response.content)
```

Learning LangChain is like unraveling a complex tapestry of interconnected languages, each thread revealing a new layer of linguistic understanding.

# ChatMessageHistory

```
history.add_user_message("Summarize the preceding sentence in fewer words")  
  
response = llm.invoke(history.messages)  
print(response.content)
```

```
LangChain is a linguistic bridge that connects learners to a world of new languages.
```

# ConversationBufferMemory

```
from langchain.memory import ConversationBufferMemory
from langchain.chains import ConversationChain

llm = ChatOpenAI(model="gpt-4o-mini", api_key=openai_api_key)
memory = ConversationBufferMemory(size=4)

buffer_chain = ConversationChain(llm=llm, memory=memory)
```

# ConversationBufferMemory

```
buffer_chain.invoke("Describe a language model in one sentence")
buffer_chain.invoke("Describe it again using less words")
buffer_chain.invoke("Describe it again fewer words but at least one word")
buffer_chain.invoke("What did I first ask you? I forgot.")
```

```
{'input': 'What did I first ask you? I forgot.',
 'history': 'Human: Describe a language model in one sentence\nAI: A language model is a ...',
 'response': ' You asked me to describe a language model in one sentence.'}
```

# ConversationSummaryMemory

- *Summarizes* the history to condense information

```
from langchain.memory import ConversationSummaryMemory

llm = ChatOpenAI(model="gpt-4o-mini", api_key=openai_api_key)

memory = ConversationSummaryMemory(llm=llm)

summary_chain = ConversationChain(llm=llm, memory=memory, verbose=True)
```



# ConversationSummaryMemory

```
summary_chain.invoke("Please summarize the future in 2 sentences.")  
summary_chain.invoke("Why?")  
summary_chain.invoke("What will I need to shape this?")
```

```
> Entering new ConversationChain chain...
```

```
...
```

```
> Finished chain.
```

```
{'input': 'What will I need to shape this?', 'history': 'The human asks the AI to summarize the future in  
2 sentences. The AI predicts that rapid technological advancements will lead to increased automation and  
interconnectedness, posing challenges related to ethics, privacy, and the impact of artificial intelligence  
on jobs and daily life. The AI emphasizes that these advancements will shape the future, highlighting the  
need to address ethical concerns and adapt to the changing landscape of technology.', 'response': 'To shape  
the future, you will need to stay informed about emerging technologies, engage in discussions about ethical  
considerations, and be open to adapting to new ways of living and working in a tech-driven world. It will  
also be important to prioritize collaboration, innovation, and continuous learning to navigate the challenges  
and opportunities that come with the evolving future.'}
```

# Let's practice!

DEVELOPING LLM APPLICATIONS WITH LANGCHAIN