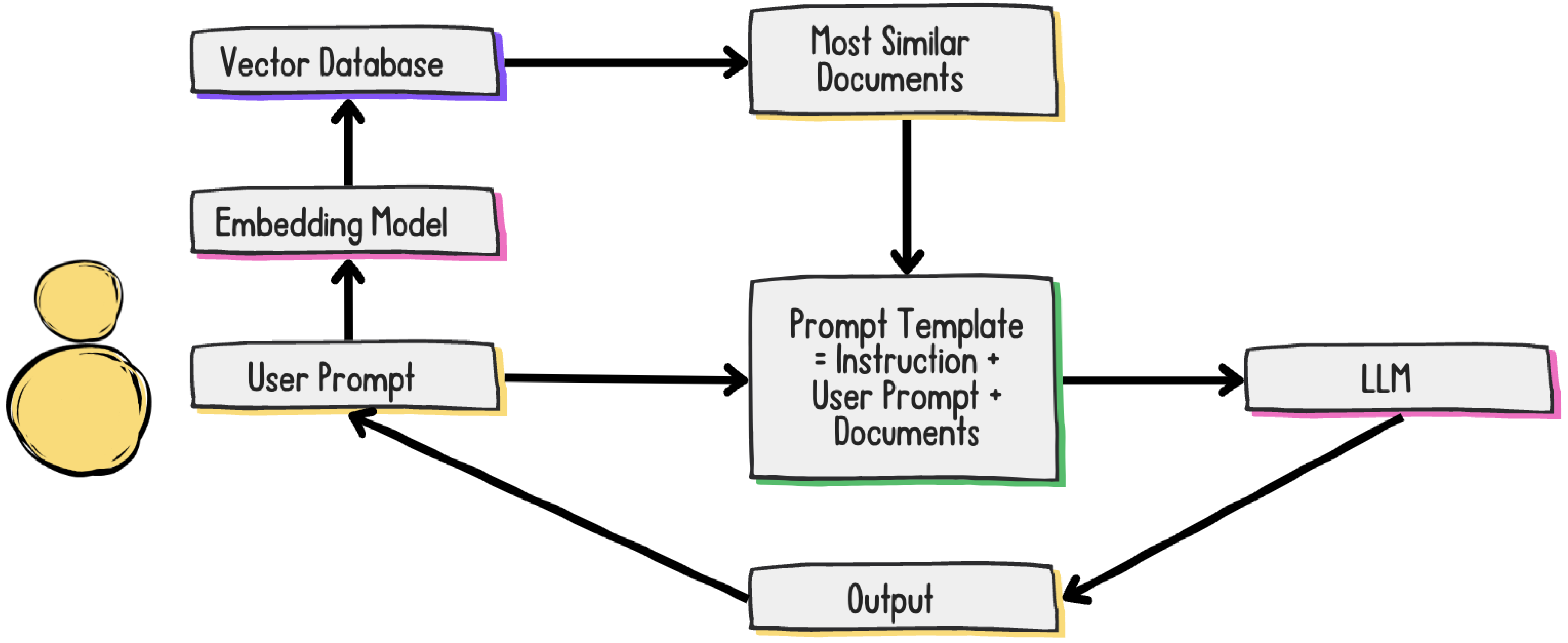
Integrating document loaders

DEVELOPING LLM APPLICATIONS WITH LANGCHAIN

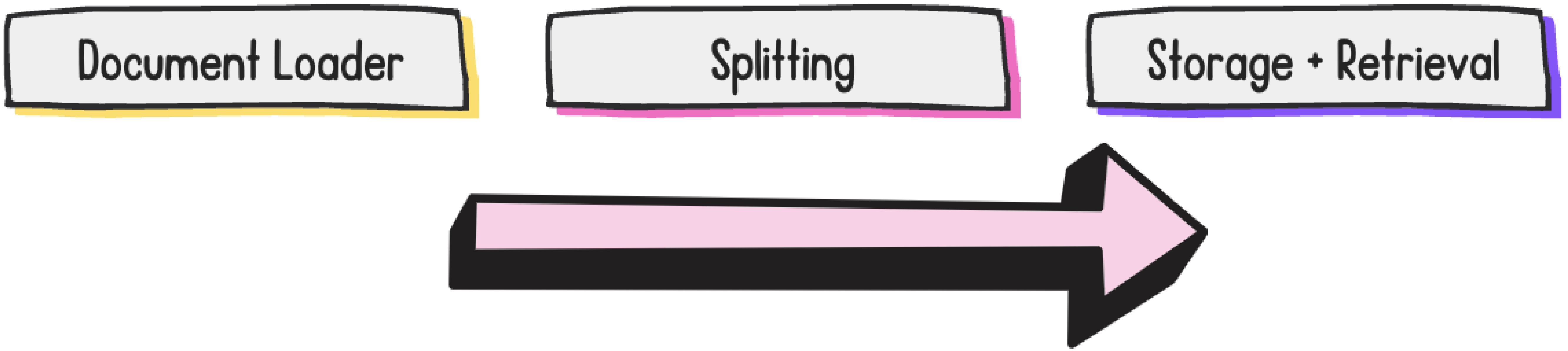
Jonathan Bennion
AI Engineer & LangChain Contributor

Retrieval Augmented Generation (RAG)

- Use **embeddings** to *retrieve* relevant information to integrate into the *prompt*



RAG development steps



LangChain document loaders

- Classes designed to *load* and *configure* documents for system integration
- Document loaders for common file types: `.pdf`, `.csv`
- 3rd party loaders: S3, `.ipynb`, `.wav`

[1] https://python.langchain.com/docs/integrations/document_loaders

PDF document loader

- *Requires installation of the `pypdf` package: `pip install pypdf`*

```python
from langchain_community.document_loaders import PyPDFLoader
loader = PyPDFLoader("path/to/file/attention_is_all_you_need.pdf")

data = loader.load()
print(data[0])
```

```
Document(page_content='Provided proper attribution is provided, Google hereby grants
permission to\nreproduce the tables and figures in this paper solely for use in [...]
```

CSV document loader

```python
from langchain_community.document_loaders.csv_loader import CSVLoader

loader = CSVLoader('fifa_countries_audience.csv')

data = loader.load()
print(data[0])
```

```
Document(page_content='country: United States\nconfederation: CONCACAF\npopulation_share: [...]
```

HTML document loader

- *Requires installation of the `unstructured` package: `pip install unstructured`*

```python
from langchain_community.document_loaders import UnstructuredHTMLLoader

loader = UnstructuredHTMLLoader("white_house_executive_order_nov_2023.html")
data = loader.load()

print(data[0])
print(data[0].metadata)
```

```
page_content="To search this site, enter a search term\n\nSearch\n\nExecutive Order on the Safe, Secure,
and Trustworthy Development and Use of Artificial Intelligence\n\nHome\n\nBriefing Room\n\nPresidential
Actions\n\nBy the authority vested in me as President by the Constitution and the laws of the United
States of America, it is hereby ordered as follows: ..."

{'source': 'white_house_executive_order_nov_2023.html'}
```

Let's practice!

DEVELOPING LLM APPLICATIONS WITH LANGCHAIN

Splitting external data for retrieval

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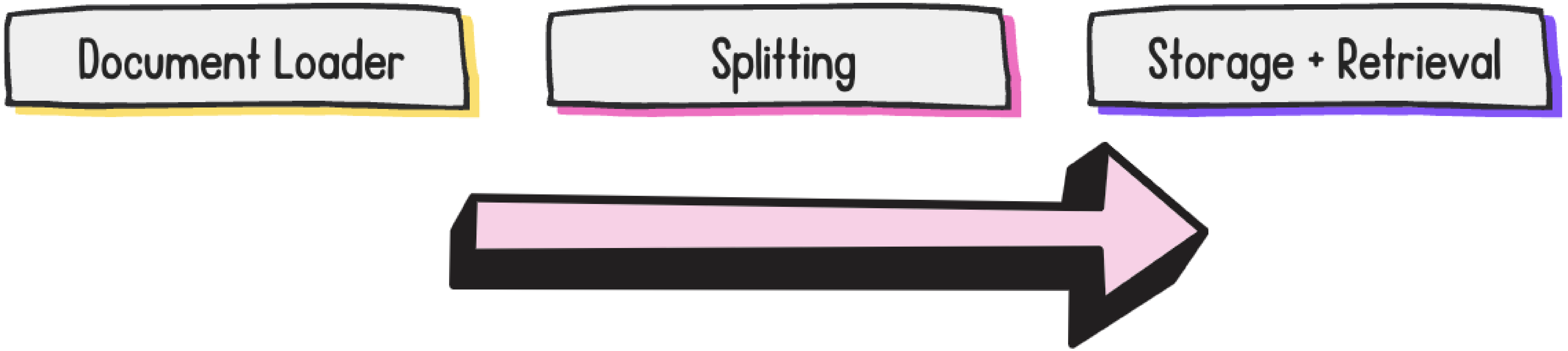
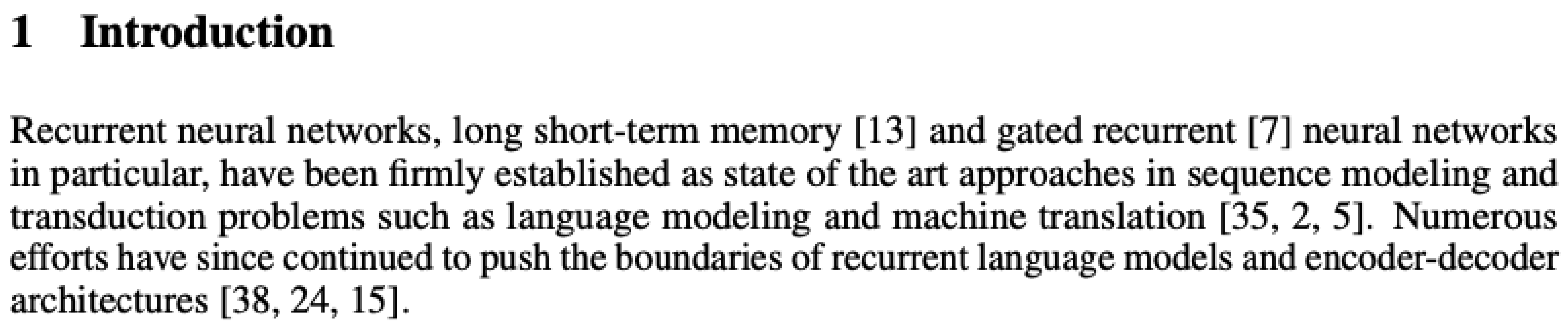
RAG development steps



- **Document splitting:** split document into *chunks*
- Break documents up to fit within an LLM's *context window*

Thinking about splitting...



1 Introduction

Recurrent neural networks, long short-term memory [13] and gated recurrent [7] neural networks in particular, have been firmly established as state of the art approaches in sequence modeling and transduction problems such as language modeling and machine translation [35, 2, 5]. Numerous efforts have since continued to push the boundaries of recurrent language models and encoder-decoder architectures [38, 24, 15].

Line 1:

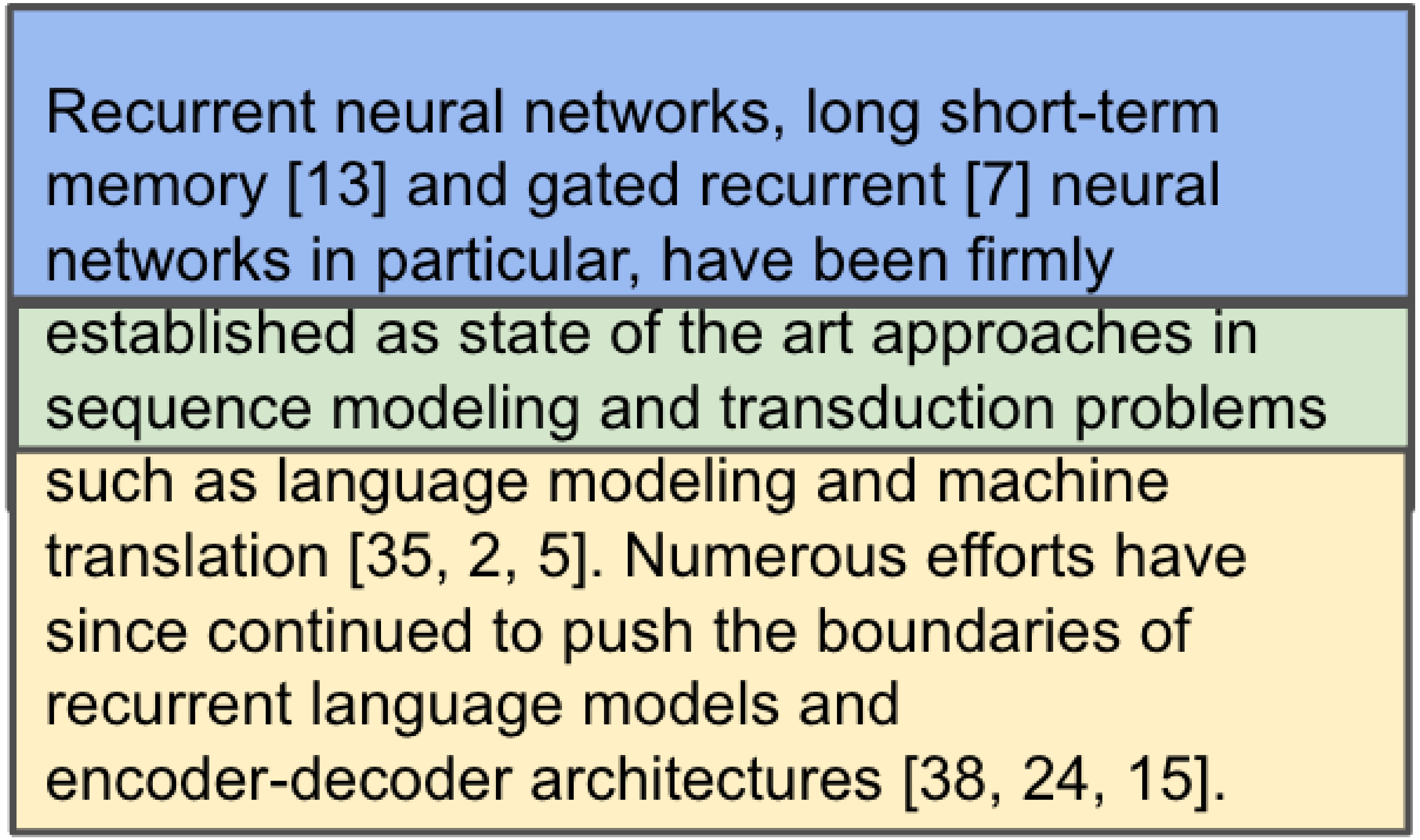
```
Recurrent neural networks, long short-term memory [13] and gated recurrent [7] neural networks
```

Line 2:

```
in particular, have been firmly established as state of the art approaches in sequence modeling and
```

[1] https://arxiv.org/abs/1706.03762

Chunk overlap



Recurrent neural networks, long short-term memory [13] and gated recurrent [7] neural networks in particular, have been firmly established as state of the art approaches in sequence modeling and transduction problems such as language modeling and machine translation [35, 2, 5]. Numerous efforts have since continued to push the boundaries of recurrent language models and encoder-decoder architectures [38, 24, 15].

What is the best document splitting strategy?

1. `CharacterTextSplitter`
2. `RecursiveCharacterTextSplitter`
3. Many others

[1] Wikipedia Commons

```python
quote = '''One machine can do the work of fifty ordinary humans.\nNo machine can do
the work of one extraordinary human.'''
```

```python
len(quote)
```

```
103
```

```python
chunk_size = 24
chunk_overlap = 3
```

[1] Elbert Hubbard

```python
from langchain_text_splitters import CharacterTextSplitter

ct_splitter = CharacterTextSplitter(
    separator='.',
    chunk_size=chunk_size,
    chunk_overlap=chunk_overlap)

docs = ct_splitter.split_text(quote)
print(docs)
print([len(doc) for doc in docs])
```

```
['One machine can do the work of fifty ordinary humans',
 'No machine can do the work of one extraordinary human']
[52, 53]
```

- Split on separator so < `chunk_size`, but **may not always succeed!**

```python
from langchain_text_splitters import RecursiveCharacterTextSplitter

rc_splitter = RecursiveCharacterTextSplitter(
    separators=["\n\n", "\n", " ", ""],
    chunk_size=chunk_size,
    chunk_overlap=chunk_overlap)

docs = rc_splitter.split_text(quote)
print(docs)
```

RecursiveCharacterTextSplitter

- `separators=["\n\n", "\n", " ", ""]`

```
['One machine can do the',
 'work of fifty ordinary',
 'humans.',
 'No machine can do the',
 'work of one',
 'extraordinary human.']
```

1. Try splitting by paragraph: `"\n\n"`
2. Try splitting by sentence: `"\n"`
3. Try splitting by words: `" "`

RecursiveCharacterTextSplitter with HTML

```python
from langchain_community.document_loaders import UnstructuredHTMLLoader
from langchain_text_splitters import RecursiveCharacterTextSplitter

loader = UnstructuredHTMLLoader("white_house_executive_order_nov_2023.html")
data = loader.load()

rc_splitter = RecursiveCharacterTextSplitter(
    chunk_size=chunk_size,
    chunk_overlap=chunk_overlap,
    separators=['.'])

docs = rc_splitter.split_documents(data)
print(docs[0])
```

```
Document(page_content="To search this site, enter a search term [...]
```

Let's practice!

DEVELOPING LLM APPLICATIONS WITH LANGCHAIN

RAG storage and retrieval using vector databases

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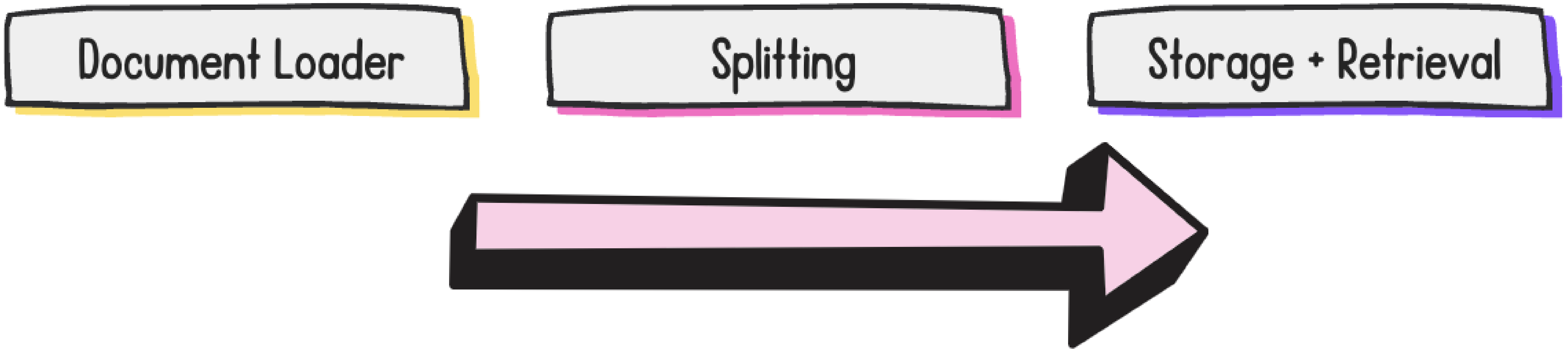
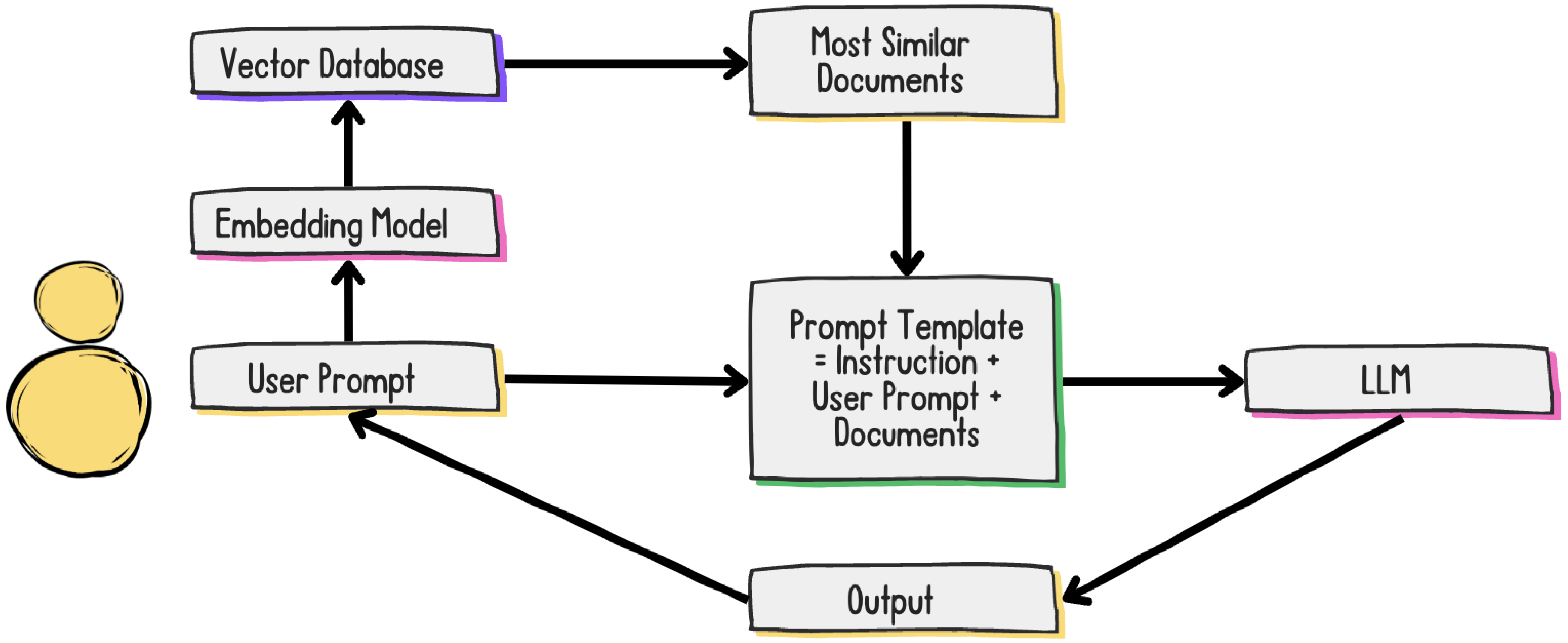
RAG development steps

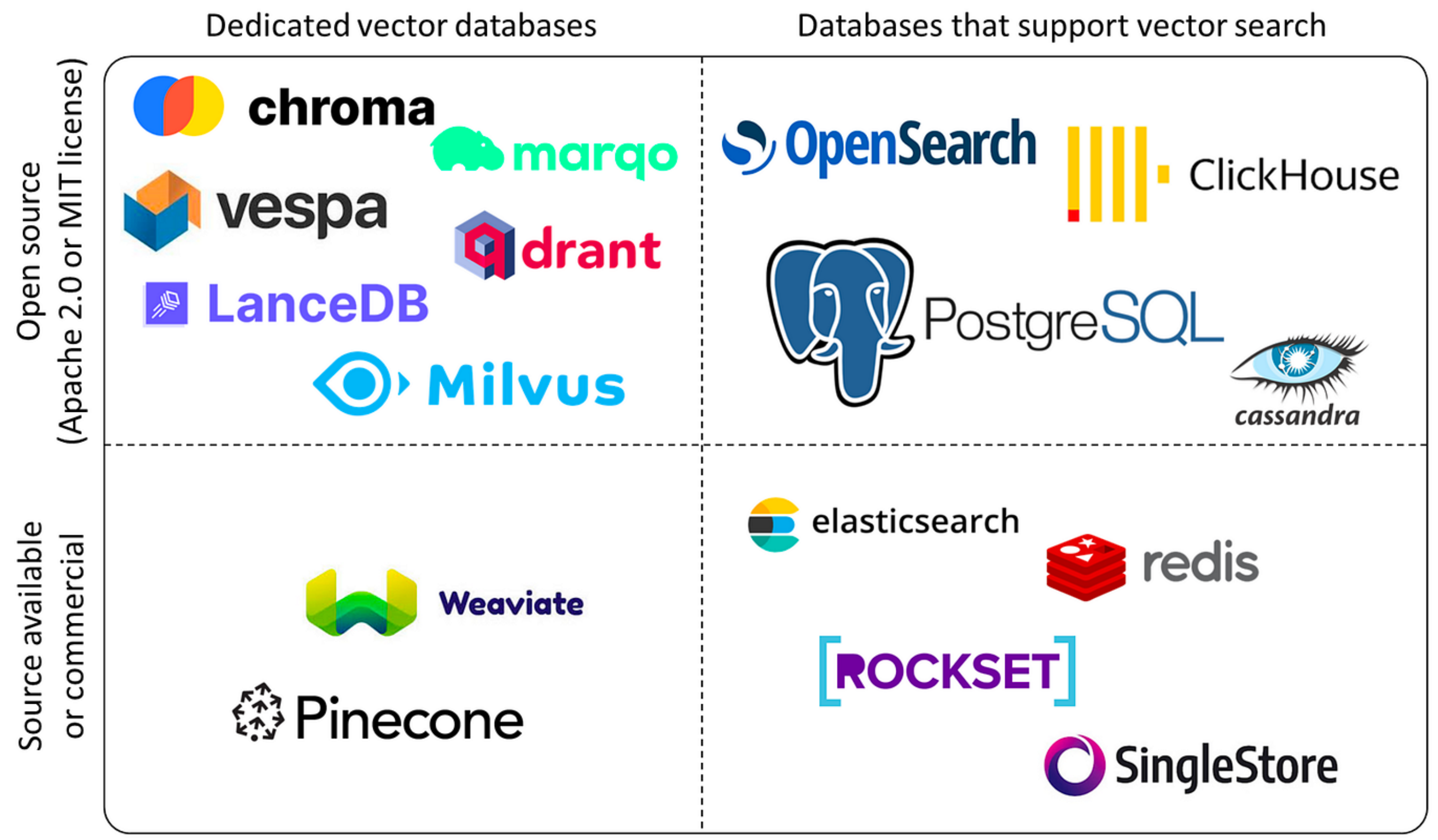


- **Focus of this video:** *storage* and *retrieval*

What is a vector database and why do I need it?



Which vector database should I use?


Dedicated vector databases
Databases that support vector search
Open source (Apache 2.0 or MIT license)
Source available or commercial
chroma
marqo
vespa
qdrant
LanceDB
Milvus
OpenSearch
ClickHouse
PostgreSQL
cassandra
elasticsearch
redis
ROCKSET
SingleStore
Weaviate
Pinecone

Need to consider:

- Open source vs. closed source (license)
- Cloud vs. on-premises
- Lightweight vs. powerful

[1] Image Credit: Yingjun Wu

Meet the documents...

```
docs
```

```
[
    Document(
        page_content="In all marketing copy, TechStack should always be written with the T and S
        capitalized. Incorrect: techstack, Techstack, etc.",
        metadata={"guideline": "brand-capitalization"}
    ),
    Document(
        page_content="Our users should be referred to as techies in both internal and external
        communications.",
        metadata={"guideline": "referring-to-users"}
    )
]
```

Setting up a Chroma vector database

```python
from langchain_openai import OpenAIEmbeddings
from langchain_chroma import Chroma

embedding_function = OpenAIEmbeddings(api_key=openai_api_key, model='text-embedding-3-small')

vectorstore = Chroma.from_documents(
    docs,
    embedding=embedding_function,
    persist_directory="path/to/directory"
)

retriever = vectorstore.as_retriever(
    search_type="similarity",
    search_kwargs={"k": 2}
)
```

Building a prompt template

```python
from langchain_core.prompts import ChatPromptTemplate

message = """
Review and fix the following TechStack marketing copy with the following guidelines in consideration:

Guidelines:
{guidelines}

Copy:
{copy}

Fixed Copy:
"""

prompt_template = ChatPromptTemplate.from_messages([("human", message)])
```

Chaining it all together!

```python
from langchain_core.runnables import RunnablePassthrough

rag_chain = ({"guidelines": retriever, "copy": RunnablePassthrough()}
             | prompt_template
             | llm)

response = rag_chain.invoke("Here at techstack, our users are the best in the world!")
print(response.content)
```

```
Here at TechStack, our techies are the best in the world!
```

Let's practice!

DEVELOPING LLM APPLICATIONS WITH LANGCHAIN

Wrap-up!

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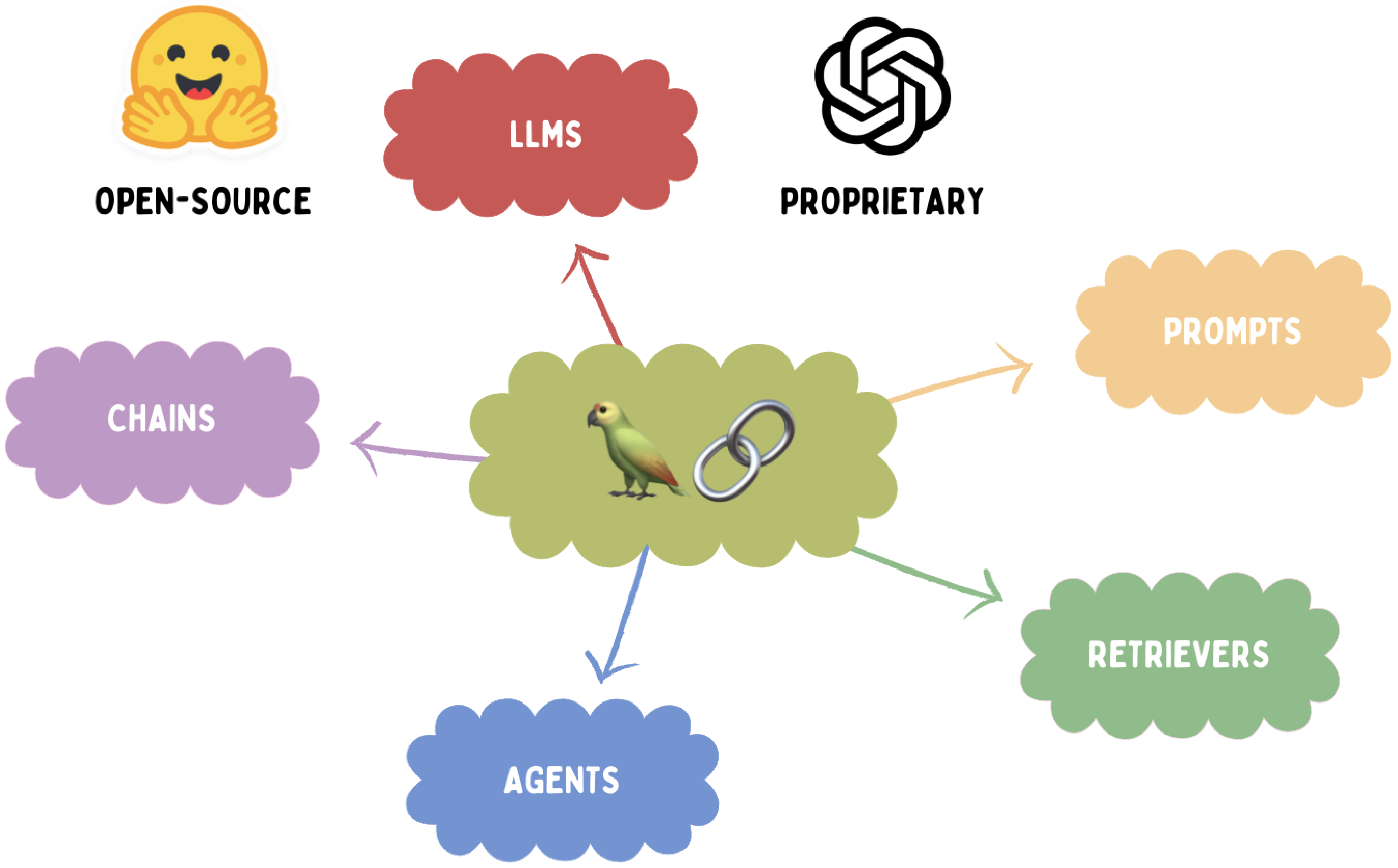
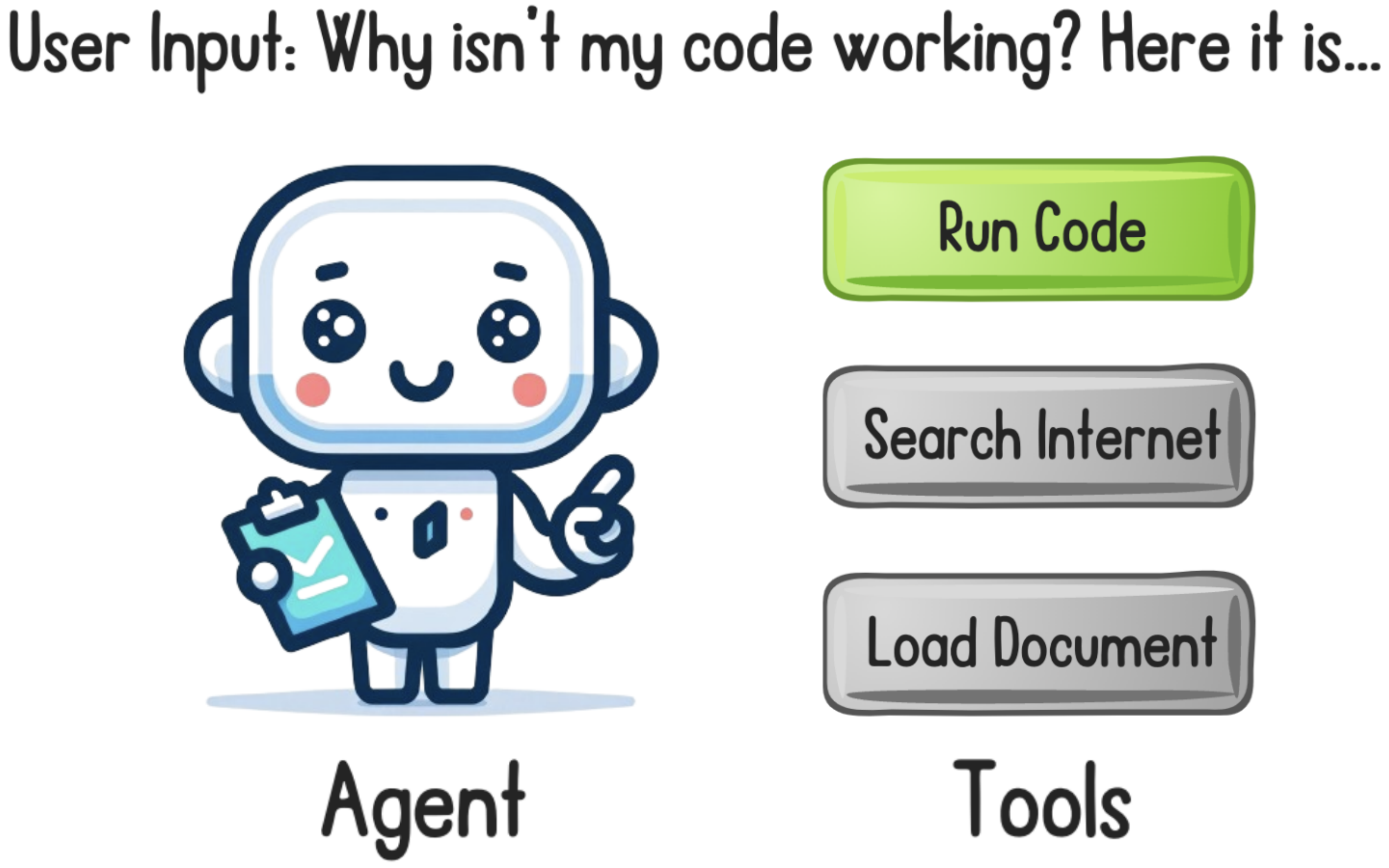
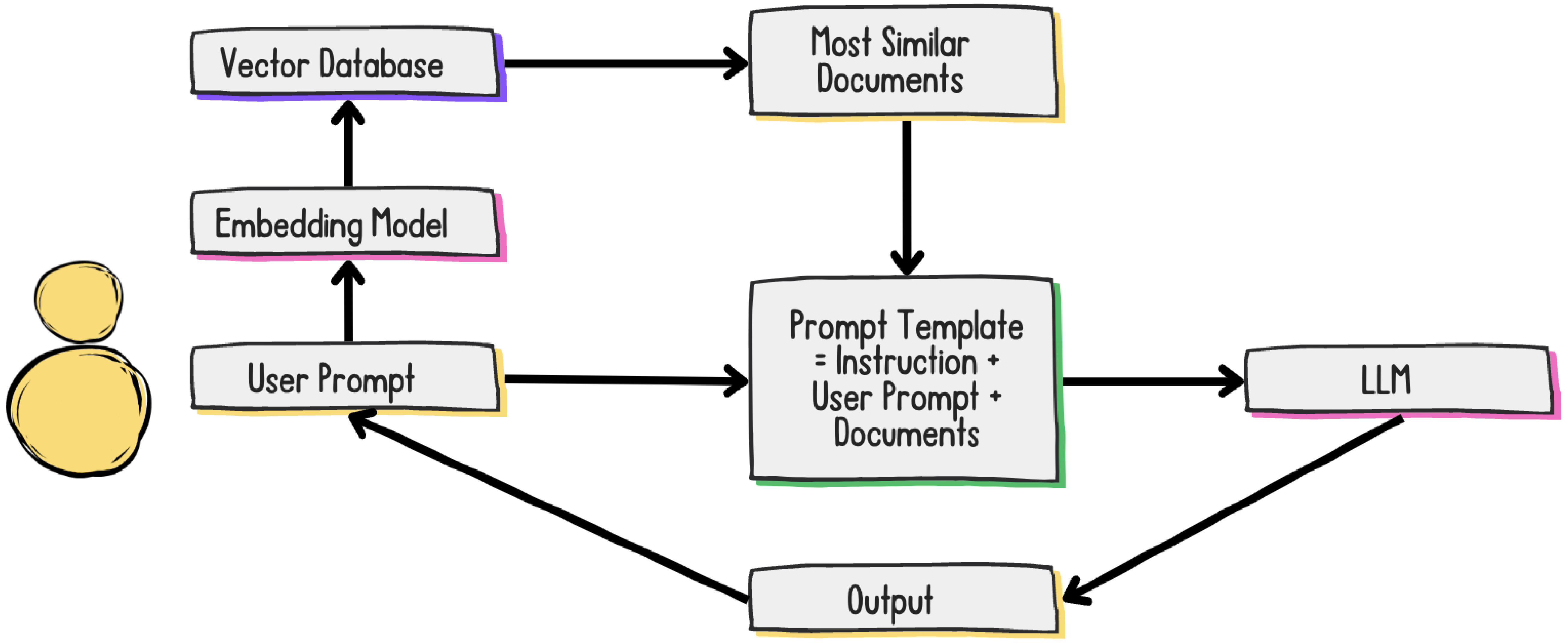
LangChain's core components



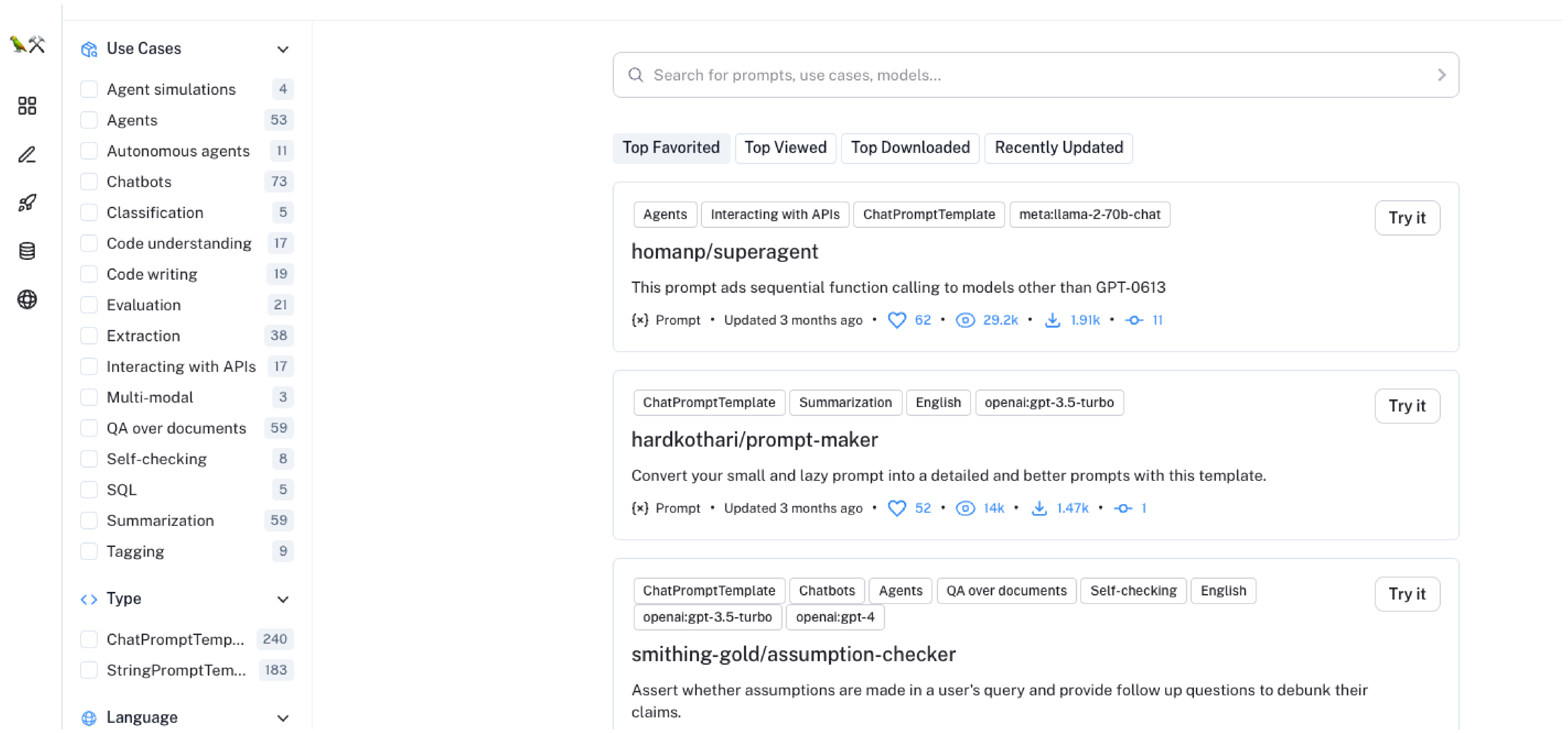
Chains and agents



Retrieval Augmented Generation (RAG)



LangChain Hub


Use Cases

Agent simulations	4
Agents	53
Autonomous agents	11
Chatbots	73
Classification	5
Code understanding	17
Code writing	19
Evaluation	21
Extraction	38
Interacting with APIs	17
Multi-modal	3
QA over documents	59
Self-checking	8
SQL	5
Summarization	59
Tagging	9

Type

ChatPromptTemp...	240
StringPromptTem...	183

Language

Search for prompts, use cases, models...

Top Favorited | Top Viewed | Top Downloaded | Recently Updated

Agents | Interacting with APIs | ChatPromptTemplate | meta:llama-2-70b-chat — Try it

homanp/superagent

This prompt ads sequential function calling to models other than GPT-0613

{x} Prompt • Updated 3 months ago • 62 • 29.2k • 1.91k • 11

ChatPromptTemplate | Summarization | English | openai:gpt-3.5-turbo — Try it

hardkothari/prompt-maker

Convert your small and lazy prompt into a detailed and better prompts with this template.

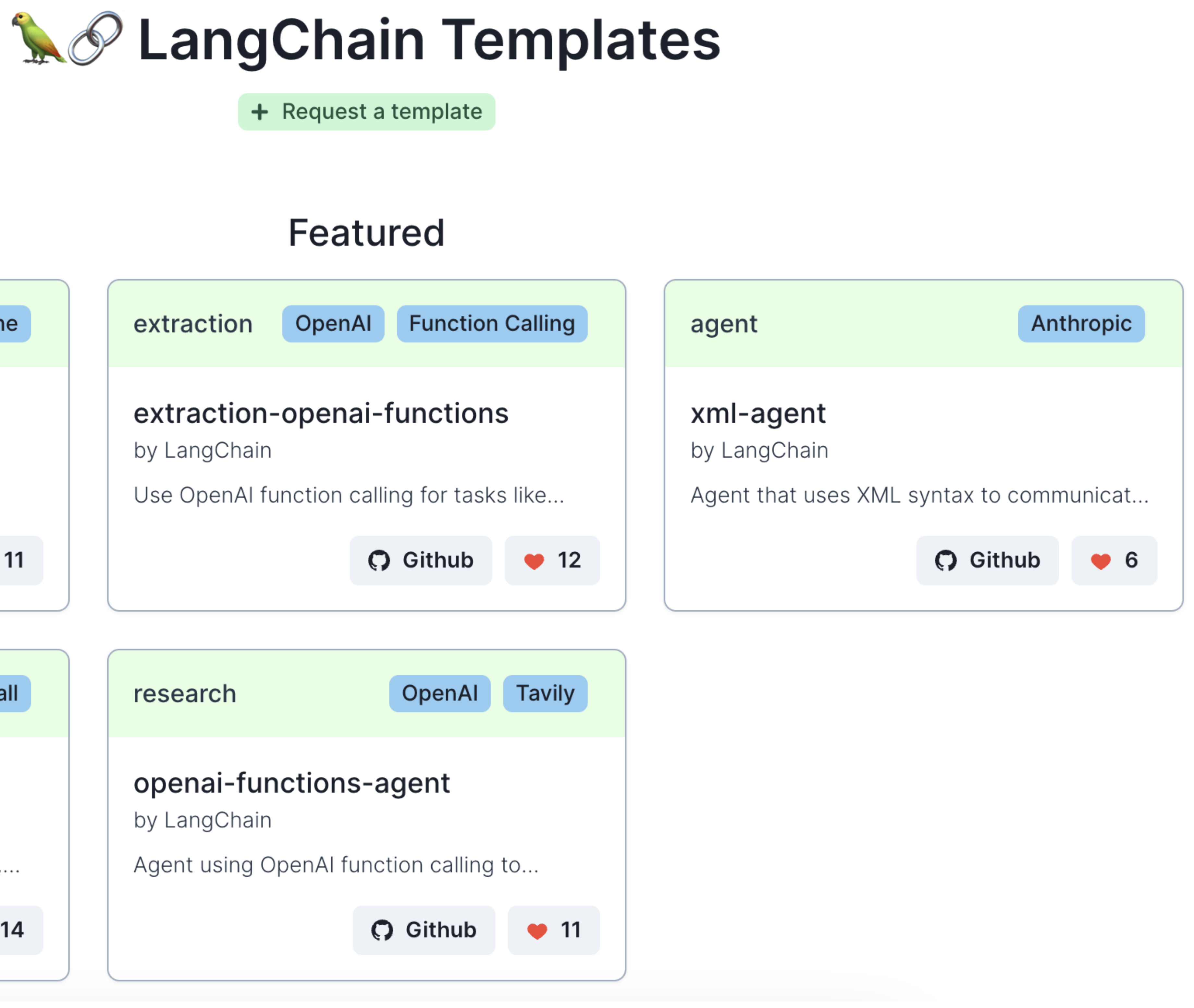
{x} Prompt • Updated 3 months ago • 52 • 14k • 1.47k • 1

ChatPromptTemplate | Chatbots | Agents | QA over documents | Self-checking | English | openai:gpt-3.5-turbo | openai:gpt-4 — Try it

smithing-gold/assumption-checker

Assert whether assumptions are made in a user's query and provide follow up questions to debunk their claims.

Access the LangChain Hub at: https://smith.langchain.com/hub



🦜🔗 LangChain Templates

+ Request a template

Featured

rag — OpenAI, Pinecone
rag-conversation
by Elastic
Conversational RAG using Pinecone
Github ❤ 11

extraction — OpenAI, Function Calling
extraction-openai-functions
by LangChain
Use OpenAI function calling for tasks like...
Github ❤ 12

agent — Anthropic
xml-agent
by LangChain
Agent that uses XML syntax to communicat...
Github ❤ 6

rag — OpenAI, Chroma, Gpt4all
rag-chroma-private
by LangChain
Private RAG using local LLM, embeddings,...
Github ❤ 14

research — OpenAI, Tavily
openai-functions-agent
by LangChain
Agent using OpenAI function calling to...
Github ❤ 11

The LangChain ecosystem

LangSmith: troubleshooting and evaluating applications

LangServe: deploying applications

LangGraph: multi-agent knowledge graphs

Let's practice!

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