Harnessing the Power of LangChain in Healthcare Applications

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About Me

- Founder, **Recursive Awesome & Lab651** – AI Consulting and Training & Software Development
- Co-founder, **Captovation** – AI powered online presentation coaching platform
- Owner, **Applied AI Weekly** – Publication covering AI
- Host of the "**Conversations on Applied AI Podcast**"
- Adjunct Professor, **University of Saint Thomas** – Teaching graduate courses on IoT & AI/ML
- Co-founder, **AppliedAI.MN** – 501(c)(3) non-profit: Monthly meetups, conferences, videos and podcasts on AI/ML
- AI Conference on May 10th! Visit us at AppliedAIConf.com

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Agenda

- What is an LLM
  - What are they good at?
  - What are they not so good at?
- What is LangChain
  - How does it work
  - Components
- LangChain in action
- Streamlit for easy deployment!

LLMs and What Are They Good At?

A large language model is a type of artificial neural network that uses deep learning techniques to process, understand, and generate human-like text.

- **Content Generation:** Used for creating articles, reports, stories, and even poetry
- **Language Translation:** High-quality translations between numerous languages
- **Learning and Research:** Assist in educational and research activities by summarizing information
- **Conversation:** Human-like dialogue makes them useful for chatbots and virtual assistant

What Are LLMs NOT Good At?

ChatGPT 3.5

You

Who won the World Series in 2023?

‹ 2 / 2 ›

ChatGPT

I'm sorry, but I don't have access to information beyond my knowledge cutoff date of January 2022. Therefore, I cannot provide information on the winner of the 2023 World Series. I recommend checking a reliable sports news source or conducting an online search to find the most up-to-date information on the 2023 World Series winner.

What Are LLMs NOT Good At?

- **Fixed Knowledge Base:** Knowledge is static and limited to what was available when it was trained.
  - Systems like Retrieval Augmented Generation (RAG) addressing this
- **Understanding Context Depth:** Lack common sense reasoning, so they struggle with domain specific context. Prone to hallucinations!
  - Smaller, Fine-Tuned Models addressing this
- **Conversational Continuity:** Generally don't maintain continuity over long conversations and lose track of previous conversations.
  - Larger context windows and frameworks are helping with this
- **Dependency on User Input:** Relies heavily on the quality and clarity of user queries (prompts).
  - Experience in giving good prompts are helping

LangChain – What Is it?

- Open source framework for developing applications powered by language models. Been around since October 2022.
- Enables applications to be:
  - Context Aware – Current events / documents, vocabulary, etc.
  - Reason – Custom functions, agents, memory / history, etc.
  - Consistency – Prompt templates
- Examples
  - Chatbots
  - Retrieval-Augmented Generation (RAG)
  - Summarization
- Model agnostic

Gaining in Popularity!

LangChain lands $25M round, launches platform to support entire LLM application lifecycle

5M+
Monthly Downloads

50K+
Apps Powered

75K+
GitHub Stars

2K+
Contributors

The biggest developer community in GenAI

Learn alongside the 100K+ practitioners who are pushing the industry forward.

Explore LangChain ↗

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Making LLMs Context Aware

ChatGPT 4

You

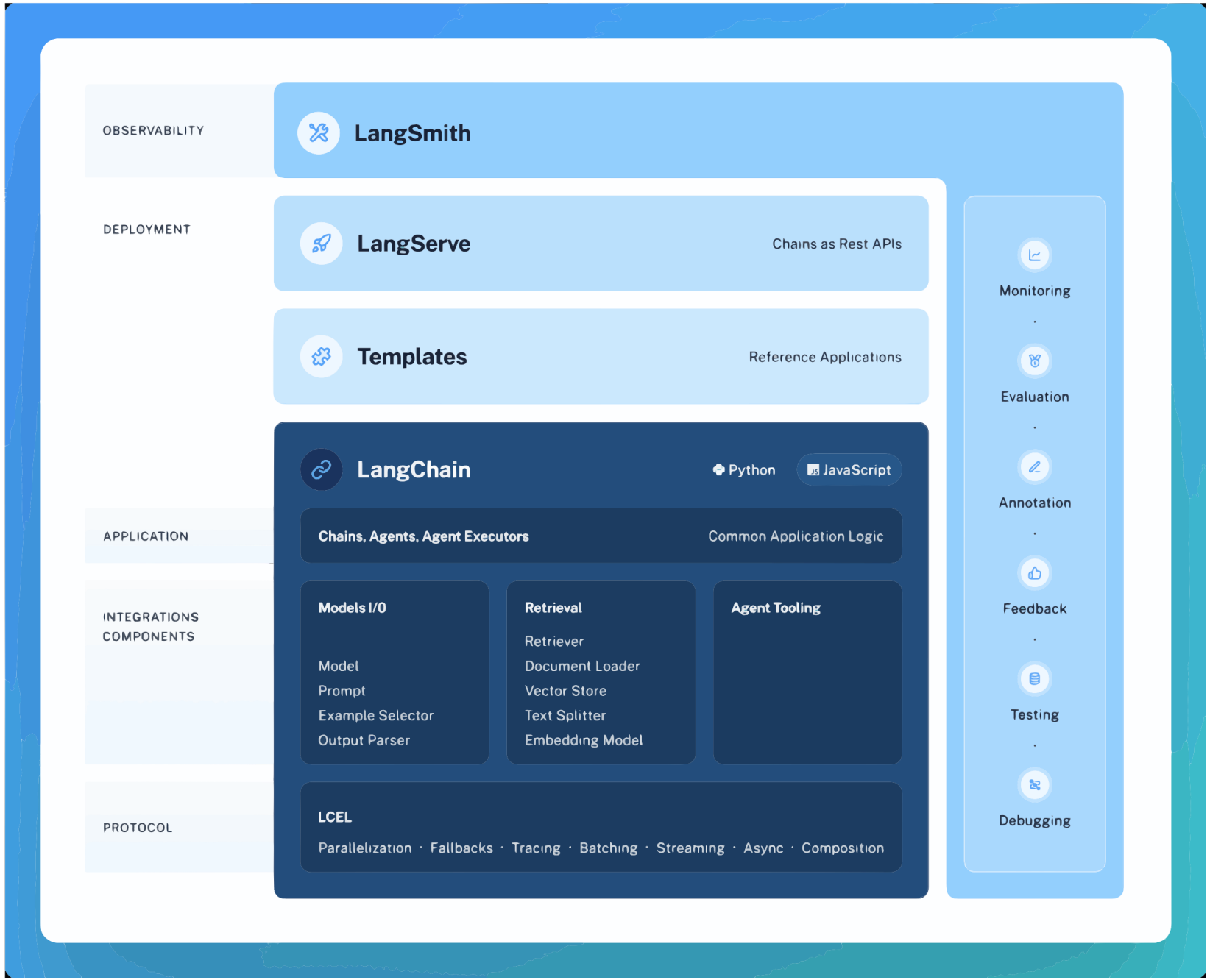
Who won the world series in 2023?

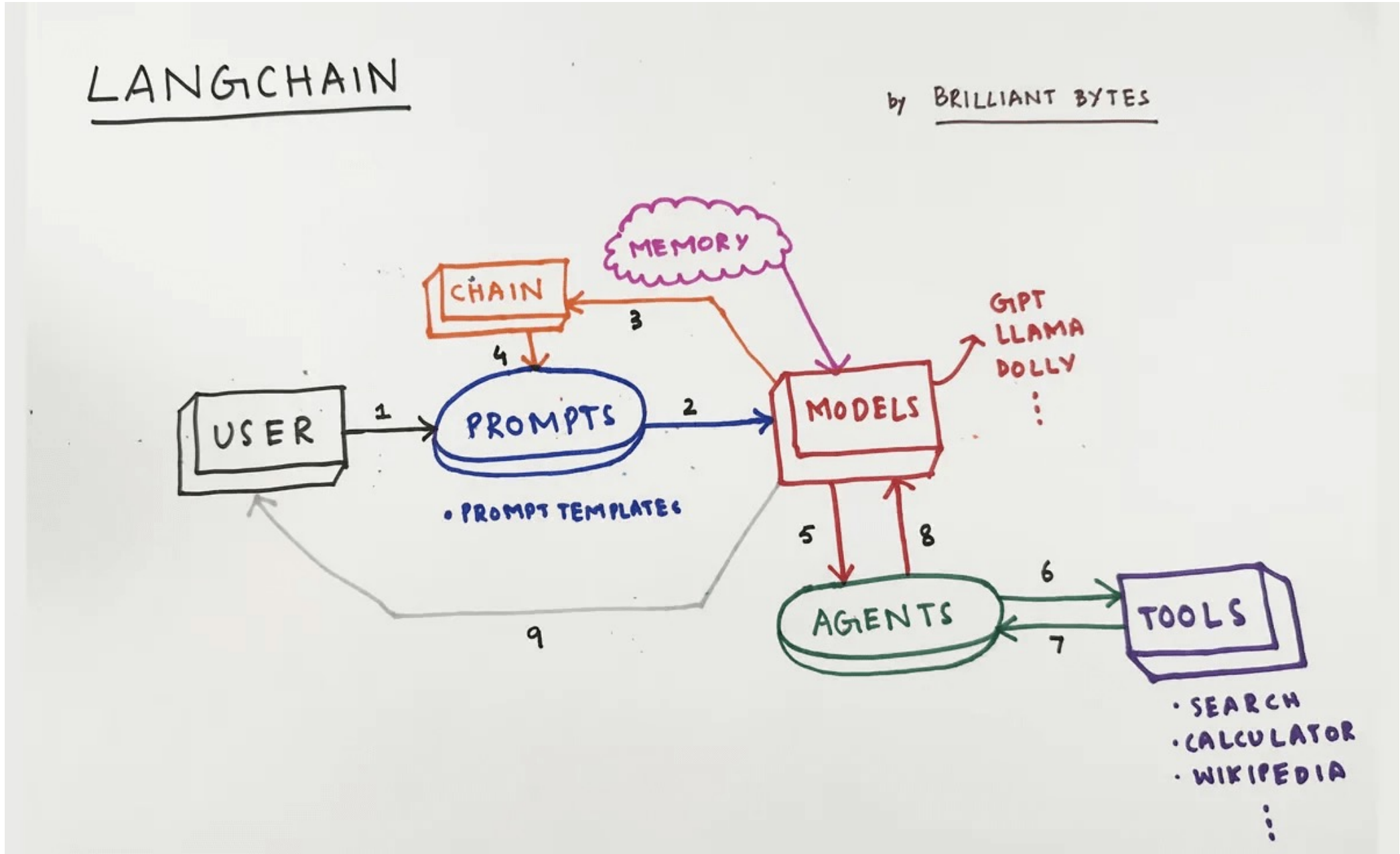
‹ 4 / 4 ›

ChatGPT

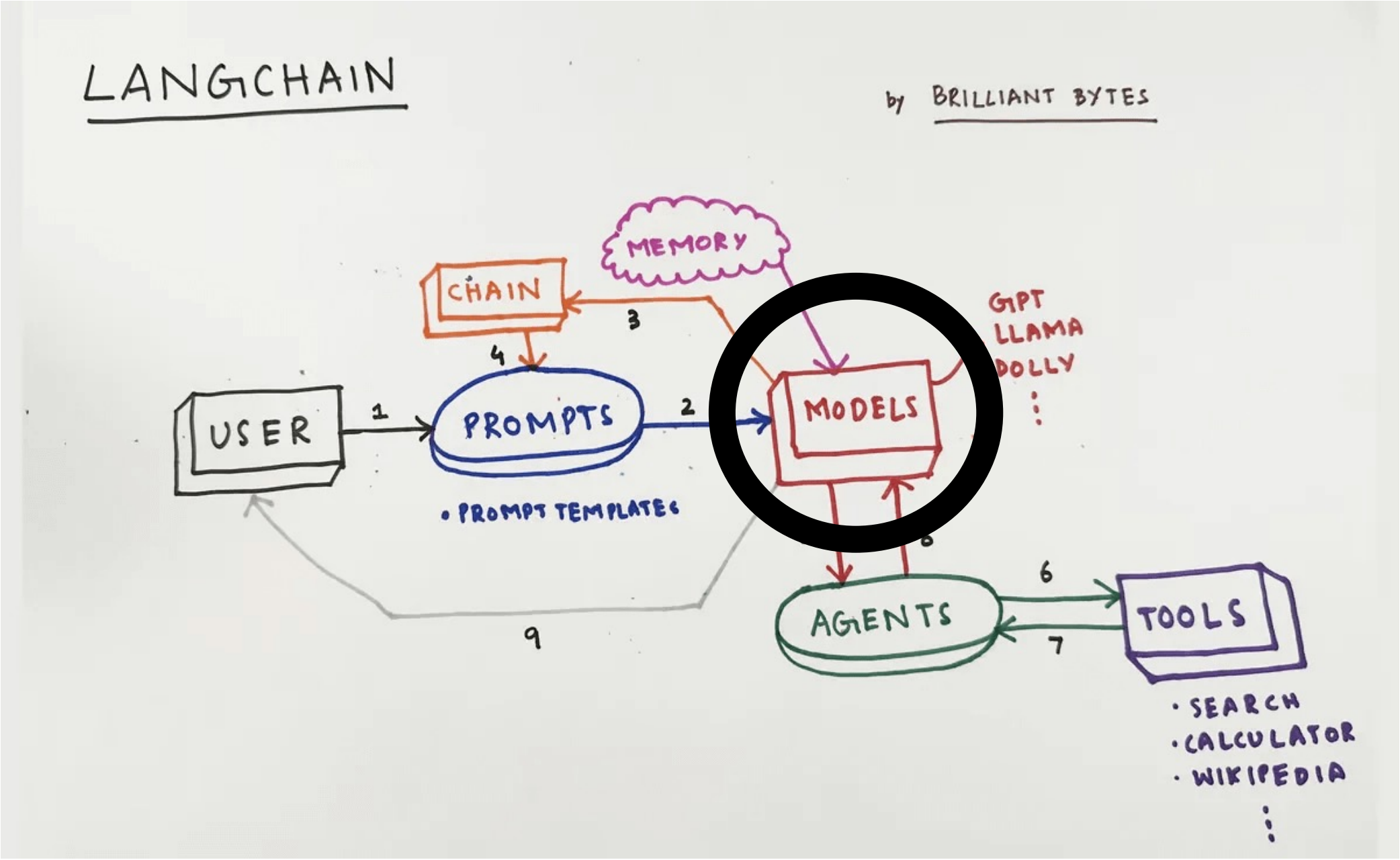
I did a quick search for more information and here's what I discovered.

The Texas Rangers won the 2023 World Series, securing their first championship in franchise history. They achieved this victory by defeating the Arizona Diamondbacks with a score of 5-0 in Game 5 of the series.


OBSERVABILITY
LangSmith
DEPLOYMENT
LangServe
Chains as Rest APIs
Templates
Reference Applications
LangChain
Python
JavaScript
APPLICATION
Chains, Agents, Agent Executors
Common Application Logic
INTEGRATIONS
COMPONENTS
Models I/O
Model
Prompt
Example Selector
Output Parser
Retrieval
Retriever
Document Loader
Vector Store
Text Splitter
Embedding Model
Agent Tooling
PROTOCOL
LCEL
Parallelization · Fallbacks · Tracing · Batching · Streaming · Async · Composition
Monitoring
Evaluation
Annotation
Feedback
Testing
Debugging



Credit: https://www.reddit.com/user/BrilliantBytes/



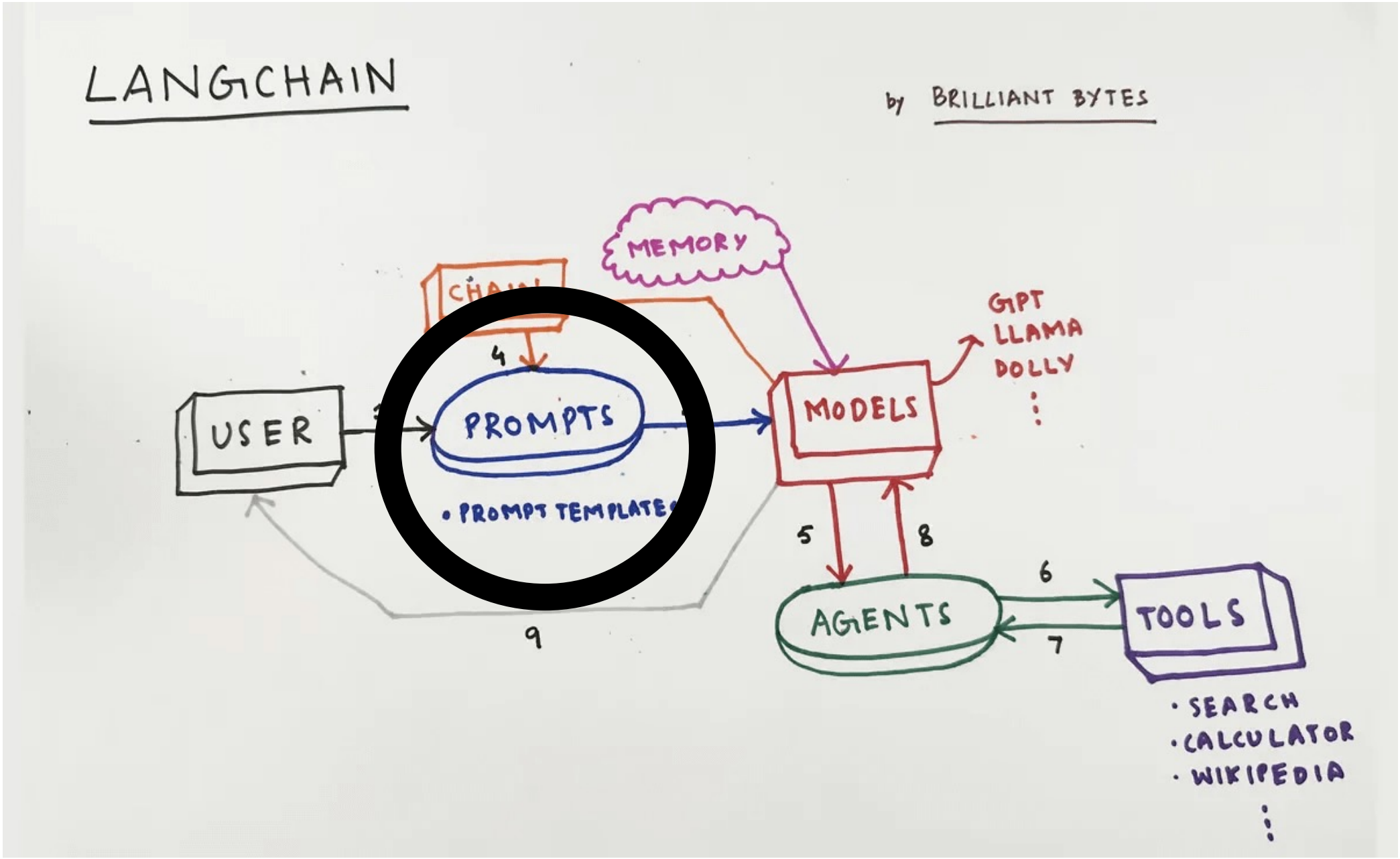
Let's start with the models!

Models

Model agnostic – OpenAI, Anthropic, Google and many others!

```
from langchain.chat_models.openai import ChatOpenAI
from langchain_community.chatmodels import ChatAnthropic
from langchain_google_genai import ChatGoogleGenerativeAI

llm = ChatOpenAI(model_name='gpt-3.5-turbo’, temperature=1)
llm = ChatAnthropic()
llm = ChatGoogleGenerativeAI(model_name=‘gemini-pro-vision’)
```



Next, Let's move to the prompts & prompt templates

Prompts – Zero Shot

Zero-shot learning enables a model to make predictions about data it has never seen during training.

```
from langchain.chat_models.openai import ChatOpenAI

llm = ChatOpenAI(model_name='gpt-3.5-turbo', temperature=1,
max_tokens = 256)
prompt = "Generate for me a haiku about a dog"
print(llm.invoke(prompt))

Output: 'Loyal pup so sweet, Tail wagging, love complete,
Boundless joy we meet.'
```

Prompts – Few Shot

Allows a model to learn from a very limited set of examples to apply this knowledge to similar tasks.

```
from langchain.chat_models.openai import ChatOpenAI

llm = ChatOpenAI(model_name='gpt-3.5-turbo’, temperature=1,
max_tokens = 256)
prompt = ”Complete given the equipment used for each sport
Tennis: Racquet
Baseball: Bat
Golf:”
print(llm.invoke(prompt))

Output: ‘Club'
```

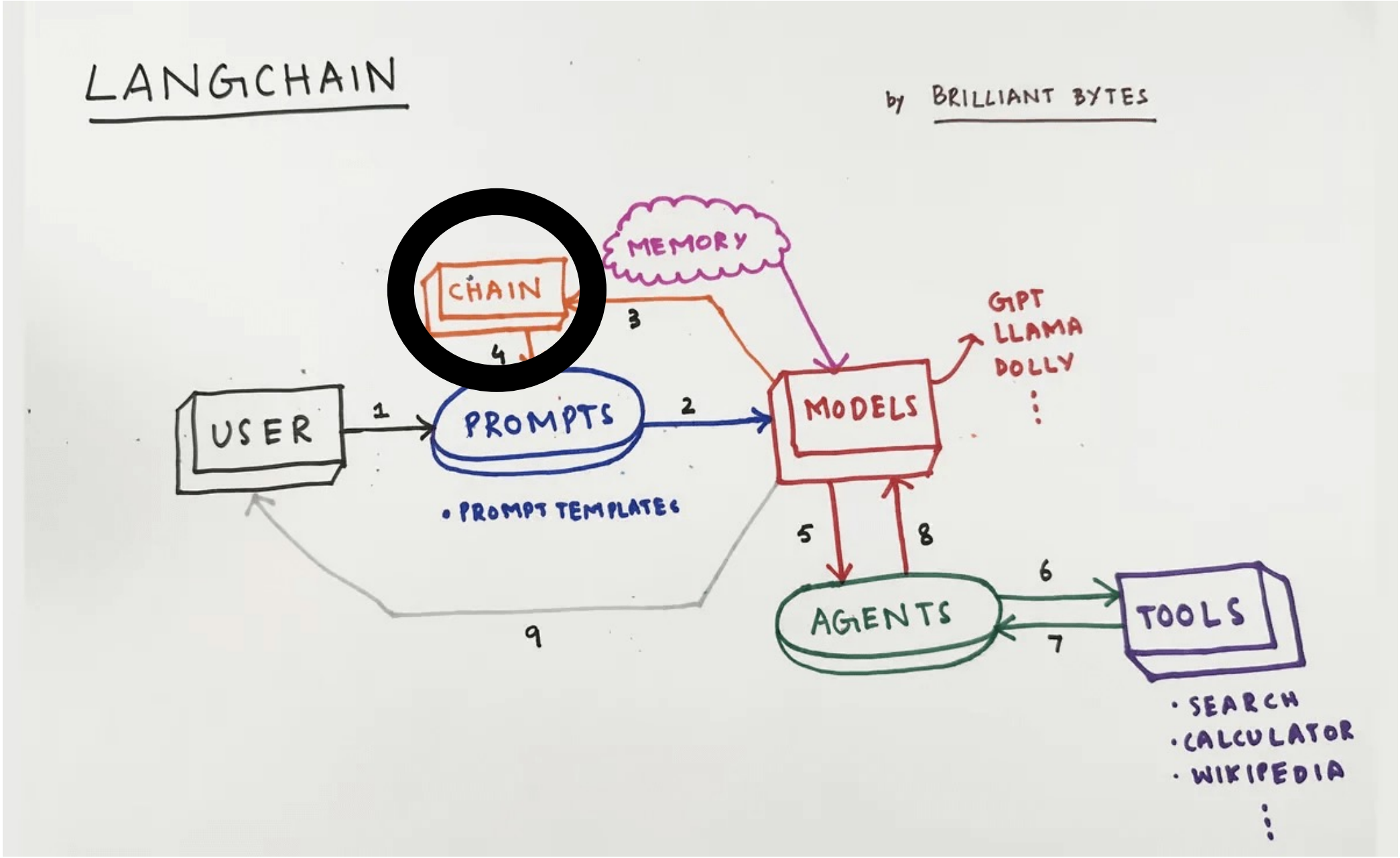
Prompts – Templates

Allows defining of prompts with variables to be passed in. Note: We defined our first chain in this example!

```
from langchain.prompts import PromptTemplate
from langchain.chains import LLMChain

prompt = PromptTemplate(
input_variables=["city"],
template="Describe a perfect day in {city}?",
)
llmchain = LLMChain(llm=llm, prompt=prompt)
llmchain.run("Paris")


Output: 'A perfect day in Paris would start with a leisurely breakfast
at a charming café, sipping on a freshly brewed coffee and indulging in
a buttery croissant…'
```



Now the chains

Chains – Simple Chain

Generating text based on topic and language inputs

```
from langchain.prompts import PromptTemplate
from langchain.chains import LLMChain

title_template = PromptTemplate(
input_variables=["topic","language"],
template=”Create the title of blog post on {topic} in {language}")

title_chain = LLMChain(llm=llm, prompt=title_template)
title_chain.run({'topic': 'the best way to learn a language',
'language': 'french’})

"Le Meilleur Moyen d\'Apprendre une Langue : Guide Complet en Français"
```

Chains – Sequential Chains

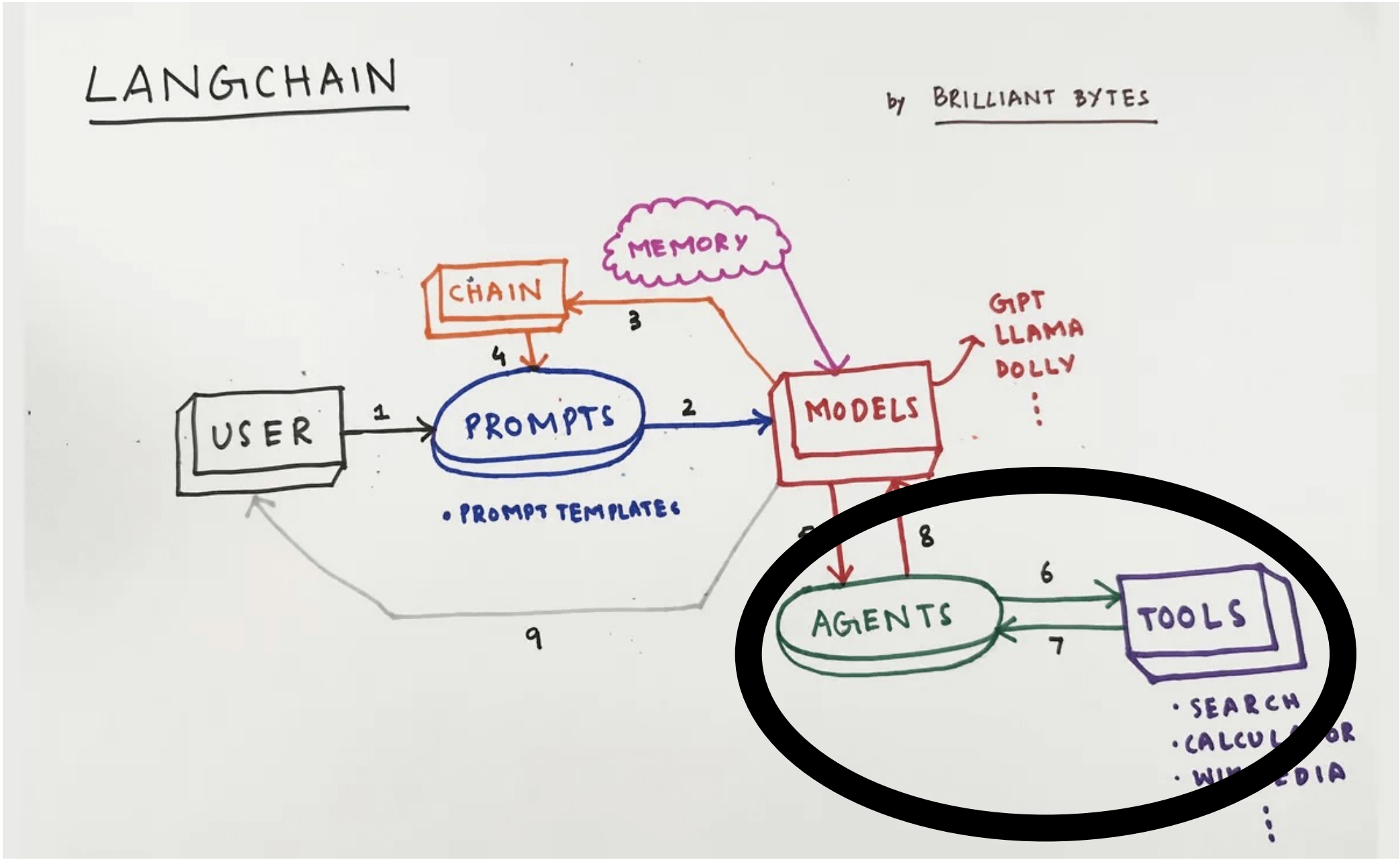
```
title_template = PromptTemplate(
input_variables=["topic"],
template="Create the title for a blog post on {topic}")

article_template = PromptTemplate(
input_variables=["title"],
template="Create a blog post on the topic of {title}")

title_chain = LLMChain(llm=llm, prompt=title_template)
article_chain = LLMChain(llm=llm2, prompt=article_template)

overall_chain = SimpleSequentialChain(chains=[title_chain,
article_chain], verbose=True)
overall_chain.run('How to run a marathon’)
```

”Title: Mastering the Marathon: A Comprehensive Guide to Training and Finishing Strong - Introduction: Running a marathon is a remarkable achievement that requires dedication, perseverance...”



Finally, the agents and the tools

Agents & Tools

- Think of an agent as the “conductors” of an orchestra
  - Agents leverages the LLM for the next action
  - Prompt: “What the current age of the president divided by 2?”

```
> Entering new AgentExecutor chain...
 I should use a search engine to find the current age of the United States President.
Action: Search
Action Input: "United States President current age"
Observation: 81 years
Thought: I should use a calculator to divide the current age by 2.
Action: Calculator
Action Input: 81 / 2
Observation: Answer: 40.5
Thought: I now know the final answer.
Final Answer: The United States President's current age divided by 2 is 40.5 years.

> Finished chain.
```

Components > Tools

Tools

Need something done? There's a tool for that!

Alpha Vantage
Alpha Vantage Alpha Vantage provides

Apify
This notebook shows how to use the [Apify

ArXiv
This notebook goes over how to

AWS Lambda

Shell (bash)
Giving agents access to the shell

Bing Search
Microsoft Bing, commonly referre

ChatGPT Plugins
This example shows how to use C

Eleven Labs Text2Speech
This notebook shows how to interact with the ElevenLabs API to ...

File System
LangChain provides tools for interacting with

Golden Query
Golden provides a set of natural language APIs

Google Cloud Text-to-Spee
Google Cloud Text-to-Speech

Google Drive
This notebook walks through connecting a LangChain to the

Google Finance
This notebook goes over how to use the Goog

Google Jobs
This notebook goes over how to use the Google Jobs Tool to fetc...

Google Lens
This notebook goes over how to use the Goog

Google Places
This notebook goes through how to use Google Places API

Google Scholar
This notebook goes through how to use Goog

Requests
The web contains a lot of information that LLMs do not have acce...

SceneXplain
SceneXplain is an ImageCaptioning service

Search Tools
This notebook shows off usage of various search tools.

SearchApi
This notebook shows examples of how to use SearchApi to searc...

SearxNG Search
This notebook goes over how to use a self hosted SearxNG searc...

Semantic Scholar API Tool
This notebook demos how to use the semantic scholar tool with a...

SerpAPI
This notebook goes over how to use the SerpAPI component to s...

StackExchange
This notebook goes over how to use the stack exchange compon...

Tavily Search
Tavily's Search API is a search engine built

Twilio
This notebook goes over how to use the Twilio

Wikipedia
Wikipedia is a multilingual free online

Wolfram Alpha
This notebook goes over how to use the wolfram alpha component.

Yahoo Finance News
This notebook goes over how to use the yahoofinancenews tool ...

YouTube
YouTube Search package

Let’s See Some Examples!

Streamlit

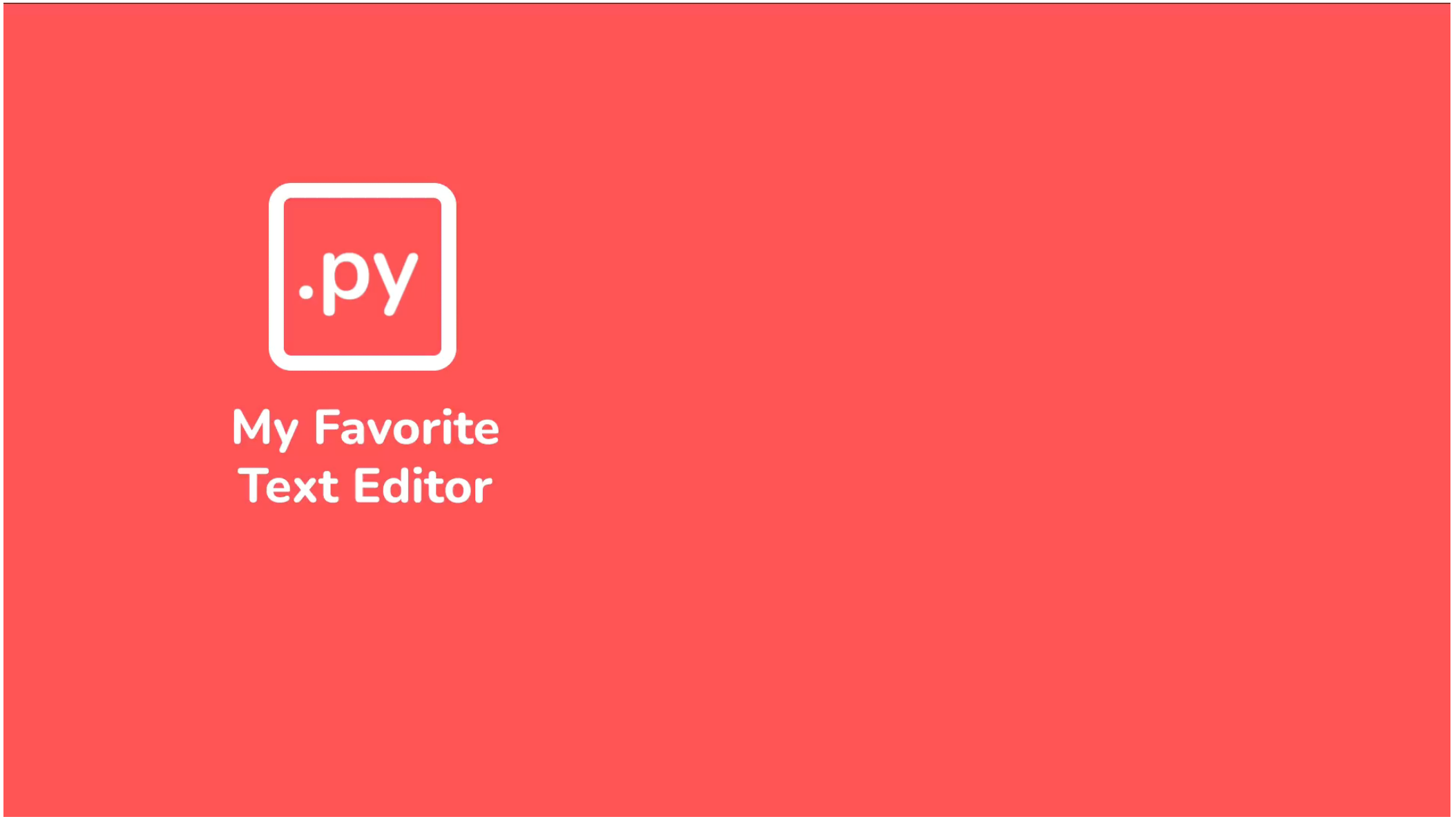
A faster way to build and share data apps

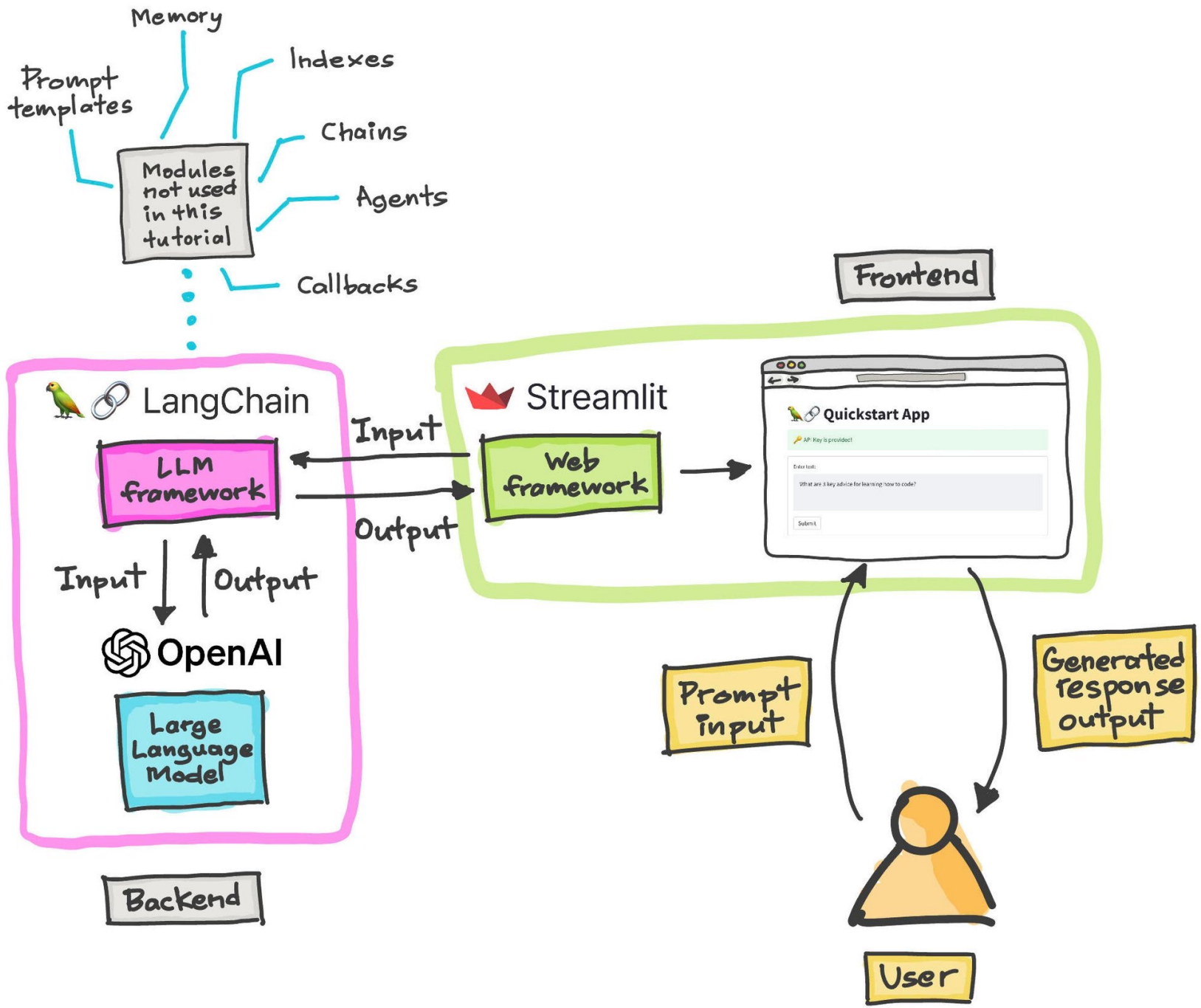
Streamlit turns data scripts into shareable web apps in minutes.
All in pure Python. No front-end experience required.

Try Streamlit now

Deploy on Community Cloud (it's free!)

Streamlit




Memory
Indexes
Prompt templates
Chains
Modules not used in this tutorial
Agents
Callbacks
Frontend
LangChain
Streamlit
Input
LLM framework
Web framework
Output
Quickstart App
Input
Output
OpenAI
Large Language Model
Prompt input
Generated response output
Backend
User

Thank You

Justin Grammens
Founder + CEO

SOURCE CODE

justin@recursiveawesome.com

Please reach out. I would love to connect and continue the conversation on LangChain!

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