The LangChain ecosystem

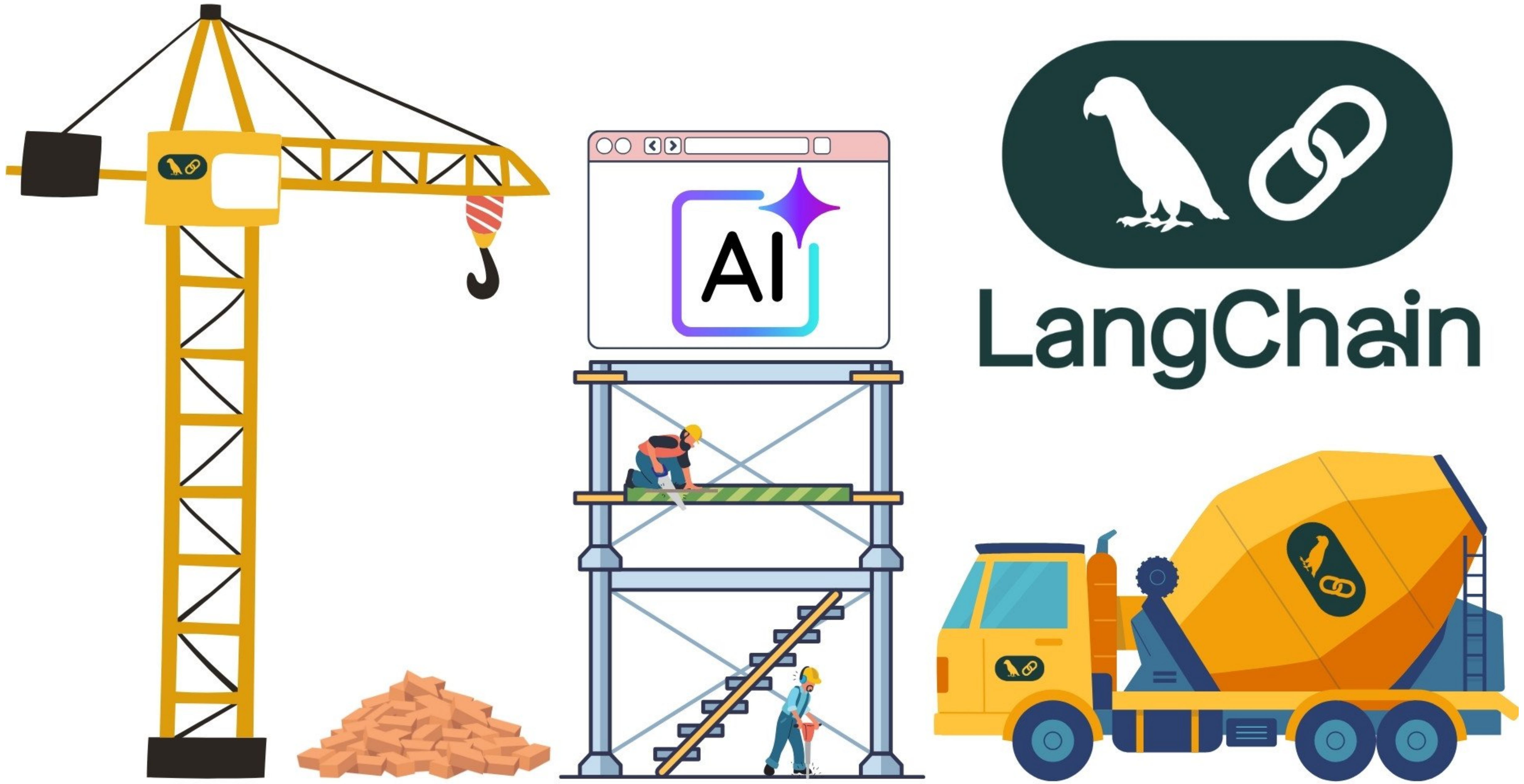
DEVELOPING LLM APPLICATIONS WITH LANGCHAIN

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**

Build LLM Apps with LangChain



LangChain

LangSmith
=
Deploying Apps

LangGraph
=
AI Agents

LangChain integrations

ANTHROP\C

databricks

neo4j

OpenAI

MISTRAL AI_

aws

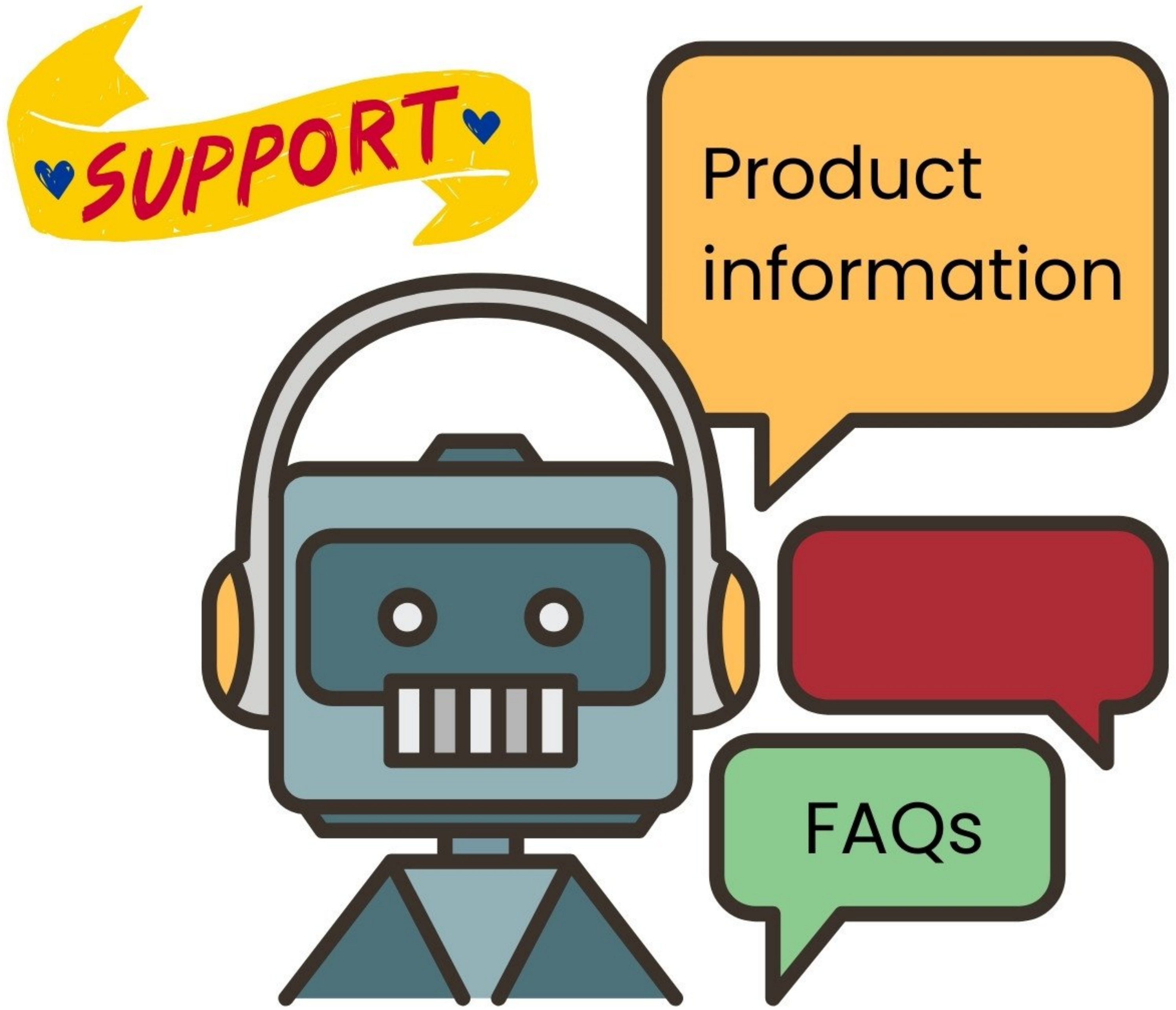
Hugging Face

snowflake

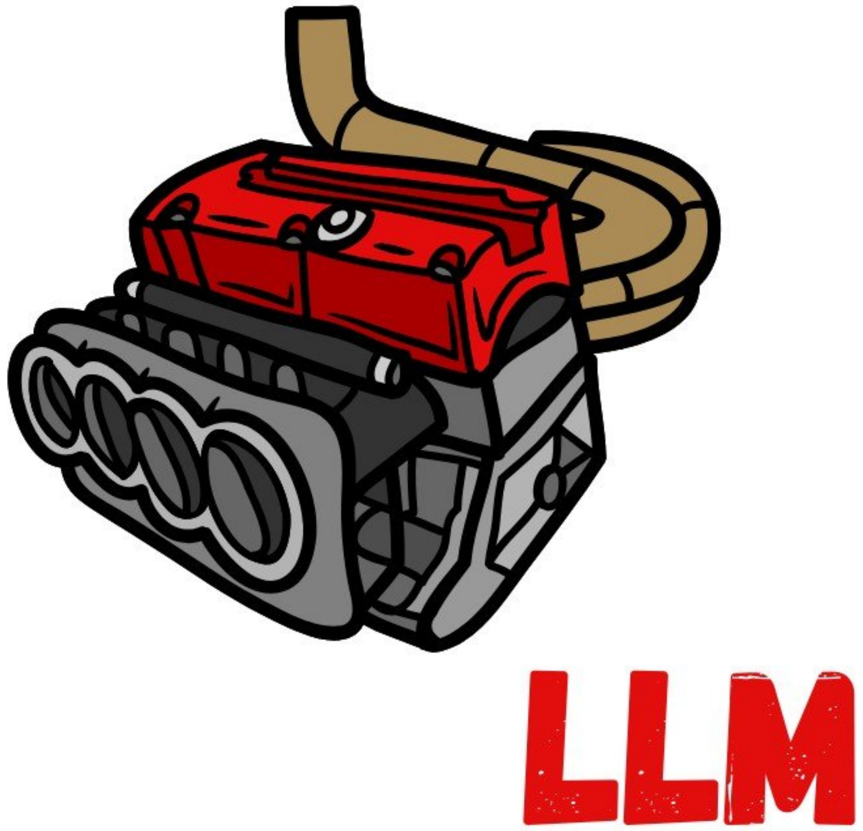
cohere

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

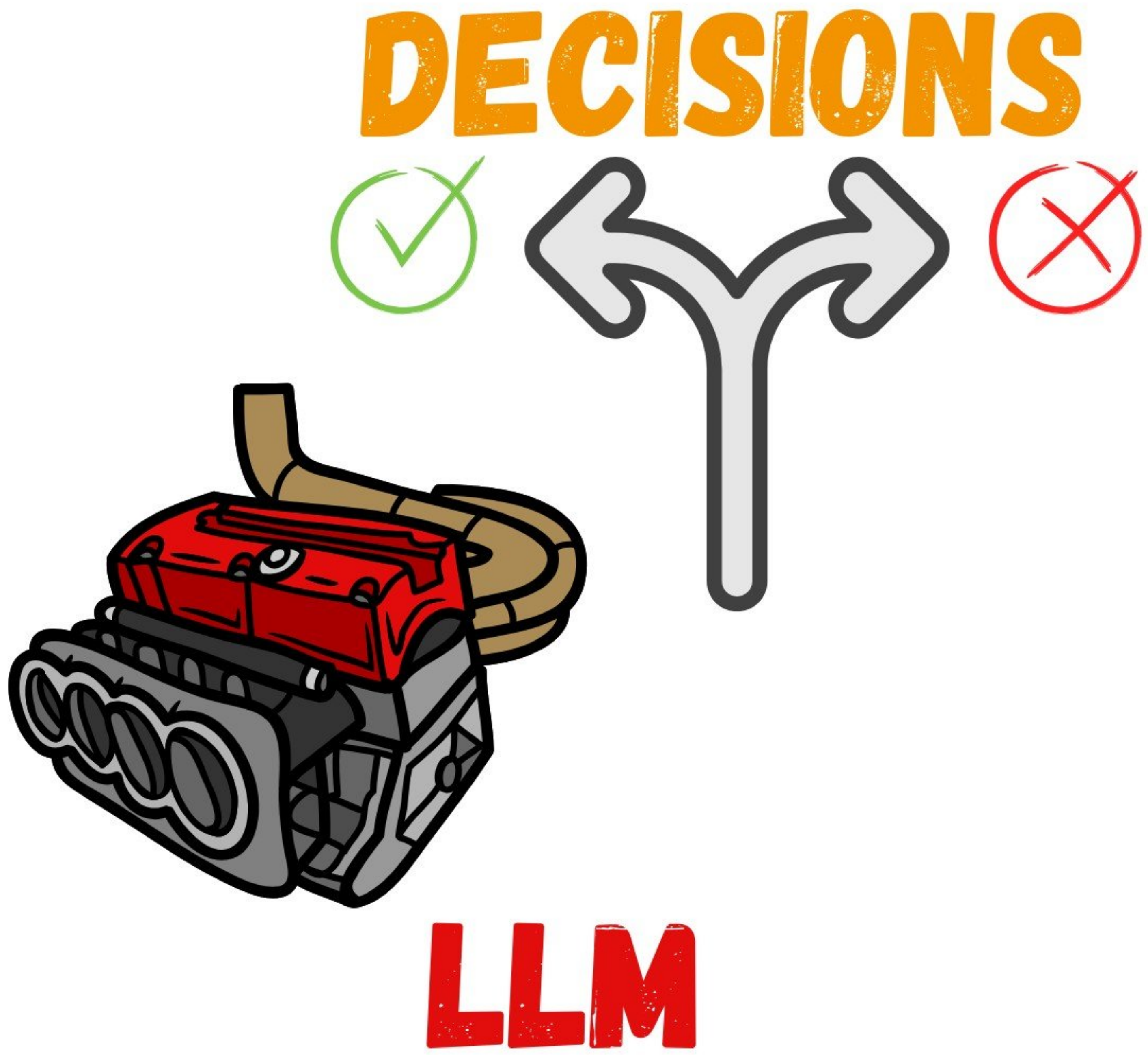
Building LLM apps the LangChain way...



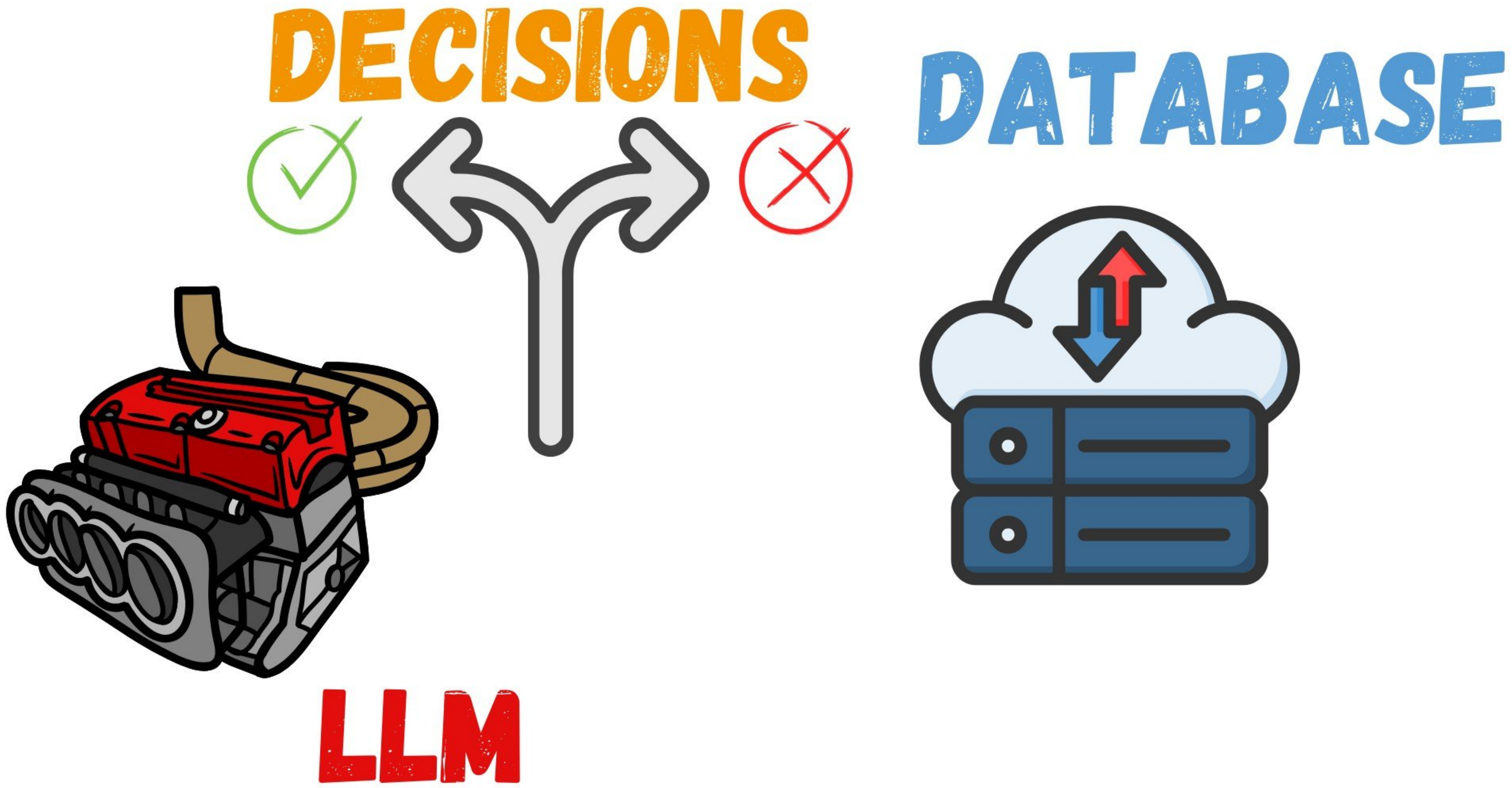
Building LLM apps the LangChain way...



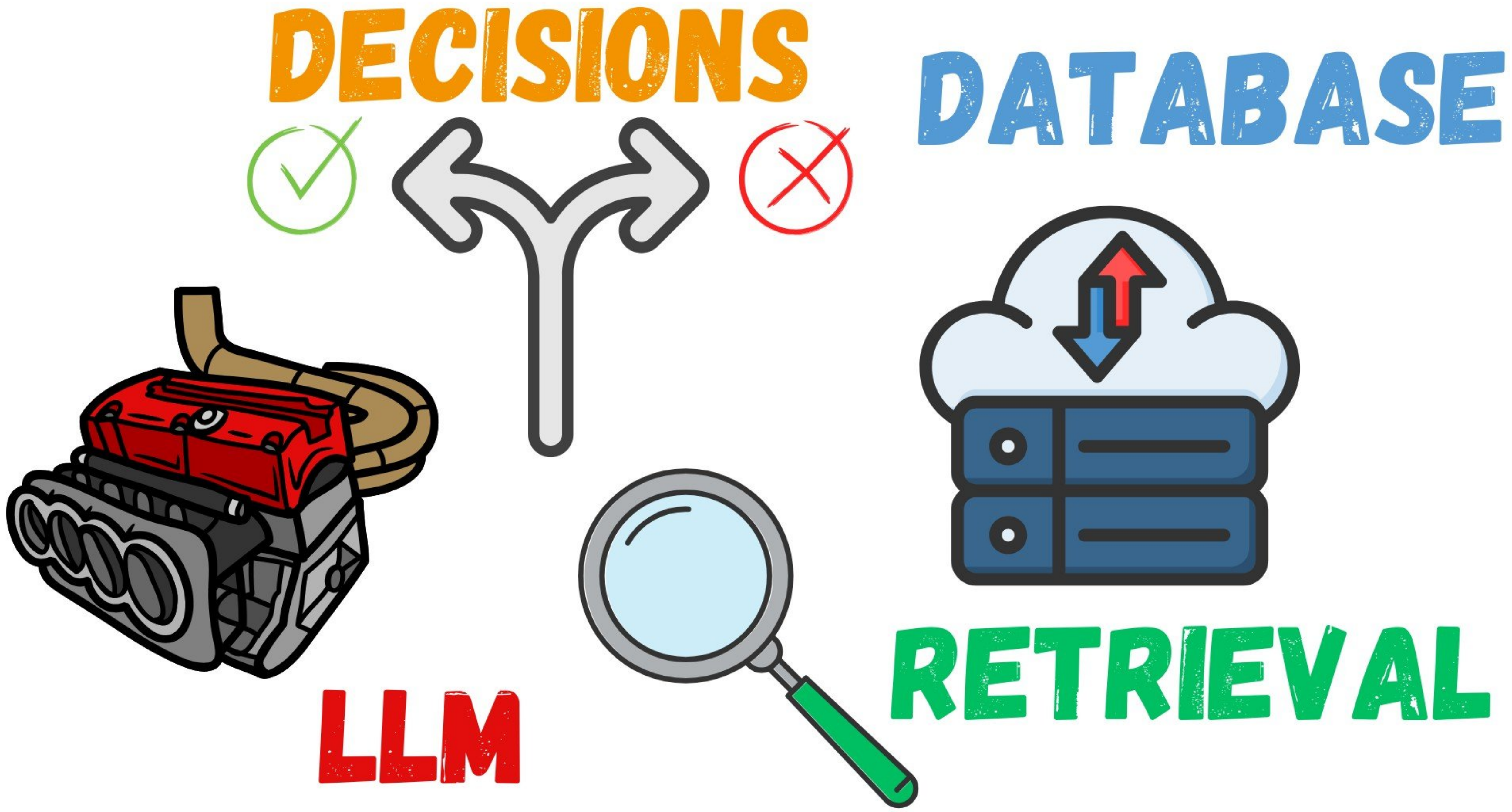
Building LLM apps the LangChain way...



Building LLM apps the LangChain way...



Building LLM apps the LangChain way...



Prompting OpenAI models

```python
from langchain_openai import ChatOpenAI

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

llm.invoke("What is LangChain?")
```

```
LangChain is a framework designed for developing applications...
```

- Additional parameters: `max_completion_tokens` , `temperature` , etc.

[1] https://platform.openai.com/docs/quickstart

🤗 Prompting Hugging Face models

```python
from langchain_huggingface import HuggingFacePipeline

llm = HuggingFacePipeline.from_model_id(
    model_id="meta-llama/Llama-3.2-3B-Instruct",
    task="text-generation",
    pipeline_kwargs={"max_new_tokens": 100}
)

llm.invoke("What is Hugging Face?")
```

```
Hugging Face is a popular open-source artificial intelligence (AI) library...
```

Let's practice!

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Prompt templates

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Prompt templates

- **Recipes** for defining prompts for LLMs
- Can contain: instructions, examples, and additional context

Prompt templates

```python
from langchain_core.prompts import PromptTemplate

template = "Expain this concept simply and concisely: {concept}"
prompt_template = PromptTemplate.from_template(
    template=template
)

prompt = prompt_template.invoke({"concept": "Prompting LLMs"})
print(prompt)
```

```
text='Expain this concept simply and concisely: Prompting LLMs'
```

```
llm = HuggingFacePipeline.from_model_id(
    model_id="meta-llama/Llama-3.3-70B-Instruct",
    task="text-generation"
)
llm_chain = prompt_template | llm

concept = "Prompting LLMs"
print(llm_chain.invoke({"concept": concept}))
```

```
Prompting LLMs (Large Language Models) refers to the process of giving a model a
specific input or question to generate a response.
```

- LangChain Expression Language (**LCEL**): `|` (pipe) operator
- **Chain**: connect calls to different components

Chat models

- **Chat roles:** `system` , `human` , `ai`

```python
from langchain_core.prompts import ChatPromptTemplate

template = ChatPromptTemplate.from_messages(
    [
        ("system", "You are a calculator that responds with math."),
        ("human", "Answer this math question: What is two plus two?"),
        ("ai", "2+2=4"),
        ("human", "Answer this math question: {math}")
    ]
)
```

Integrating ChatPromptTemplate

```
llm = ChatOpenAI(model="gpt-4o-mini", api_key='<OPENAI_API_TOKEN>')

llm_chain = template | llm
math='What is five times five?'

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

```
5x5=25
```

Let's practice!

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Few-shot prompting

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Limitations of standard prompt templates

- `PromptTemplate` + `ChatPromptTemplate`
- Handling small numbers of examples
- Don't scale for many examples
- `FewShotPromptTemplate`

```
examples = [
    {
        "question": "..."
        "answer": "..."
    },
    ...
]
```

datacamp

Building an example set

```
examples = [
    {
        "question": "Does Henry Campbell have any pets?",
        "answer": "Henry Campbell has a dog called Pluto."
    },
    ...
]
```

```
# Convert pandas DataFrame to list of dicts
examples = df.to_dict(orient="records")
```

Formatting the examples

```python
from langchain_core.prompts import FewShotPromptTemplate, PromptTemplate

example_prompt = PromptTemplate.from_template("Question: {question}\n{answer}")
```

```python
prompt = example_prompt.invoke({"question": "What is the capital of Italy?"
                                "answer": "Rome"})
print(prompt.text)
```

```
Question: What is the capital of Italy?
Rome
```

FewShotPromptTemplate

```
prompt_template = FewShotPromptTemplate(
    examples=examples,
    example_prompt=example_prompt,
    suffix="Question: {input}",
    input_variables=["input"]
)
```

- `examples` : the list of dicts
- `example_prompt` : formatted template
- `suffix` : suffix to add to the input
- `input_variables`

Invoking the few-shot prompt template

```python
prompt = prompt_template.invoke({"input": "What is the name of Henry Campbell's dog?"})
print(prompt.text)
```

```
Question: Does Henry Campbell have any pets?
Henry Campbell has a dog called Pluto.
...

Question: What is the name of Henry Campbell's dog?
```

Integration with a chain

```python
llm = ChatOpenAI(model="gpt-4o-mini", api_key="...")

llm_chain = prompt_template | llm
response = llm_chain.invoke({"input": "What is the name of Henry Campbell's dog?"})
print(response.content)
```

```
The name of Henry Campbell's dog is Pluto.
```

Let's practice!