

```
!pip install langgraph --quiet
```

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!pip install sentence-transformers --quiet
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!pip install langgraph
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Requirement already satisfied: langgraph in /usr/local/lib/python3.11/dist-packages (0.4.7)
Requirement already satisfied: langchain-core>=0.1 in /usr/local/lib/python3.11/dist-packages (from langgraph) (0.3.60)
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Requirement already satisfied: sniffio>=1.1 in /usr/local/lib/python3.11/dist-packages (from anyio->httpx>=0.25.2->langgraph) (1.3.1)

```

```
!pip install -U langchain langchain-community
```

```

Requirement already satisfied: langchain in /usr/local/lib/python3.11/dist-packages (0.3.25)
Collecting langchain-community
  Downloading langchain_community-0.3.24-py3-none-any.whl.metadata (2.5 kB)
Requirement already satisfied: langchain-core<1.0.0,>=0.3.58 in /usr/local/lib/python3.11/dist-packages (from langchain) (0.3.58)
Requirement already satisfied: langchain-text-splitters<1.0.0,>=0.3.8 in /usr/local/lib/python3.11/dist-packages (from langchain) (0.3.8)
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Requirement already satisfied: aiohttp<4.0.0,>=3.8.3 in /usr/local/lib/python3.11/dist-packages (from langchain-community) (4.0.0)
Requirement already satisfied: tenacity!=8.4.0,<10,>=8.1.0 in /usr/local/lib/python3.11/dist-packages (from langchain-community) (8.1.0)
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Requirement already satisfied: numpy>=1.26.2 in /usr/local/lib/python3.11/dist-packages (from langchain-community) (2.0.2)
Requirement already satisfied: aiohappyeyeballs>=2.3.0 in /usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3) (2.3.0)

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Requirement already satisfied: aiohttp<4.0.0,>=3.8.3->lang
Requirement already satisfied: attrs>=17.3.0 in /usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3->langcha
Requirement already satisfied: frozenlist>=1.1.1 in /usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3->lan
Requirement already satisfied: multidict<7.0,>=4.5 in /usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3->l
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Requirement already satisfied: greenlet>=1 in /usr/local/lib/python3.11/dist-packages (from SQLAlchemy<3,>=1.4->langchain) (
Requirement already satisfied: anyio in /usr/local/lib/python3.11/dist-packages (from httpx<1,>=0.23.0->langsmith<0.4,>=0.1.
Requirement already satisfied: httpcore==1.* in /usr/local/lib/python3.11/dist-packages (from httpx<1,>=0.23.0->langsmith<0.
Requirement already satisfied: h11>=0.16 in /usr/local/lib/python3.11/dist-packages (from httpcore==1.*->httpx<1,>=0.23.0->l
Requirement already satisfied: jsonpointer>=1.9 in /usr/local/lib/python3.11/dist-packages (from jsonpatch<2.0,>=1.33->langc
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Requirement already satisfied: sniffio>=1.1 in /usr/local/lib/python3.11/dist-packages (from anyio->httpx<1,>=0.23.0->langsm
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2.5/2.5 MB 30.7 MB/s eta 0:00:00
Downloading dataclasses_json-0.6.7-py3-none-any.whl (28 kB)

```

```
!pip install faiss-cpu --quiet
```

```
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```

```

from langchain_community.vectorstores import FAISS
from langchain_community.embeddings import HuggingFaceEmbeddings
from langchain_core.documents import Document
from langchain.text_splitter import CharacterTextSplitter

```

```

# Your symbolic KB
kb_facts = """\
animal(dog).
animal(cat).
animal(eagle).
animal(sparrow).
flies(eagle).
flies(sparrow).
has_tail(dog).
has_tail(cat).
"""

```

```

kb_rules = """\
bird(X) :- animal(X), flies(X).
mammal(X) :- animal(X), has_tail(X).
"""

```

```

# Convert to LangChain Documents
docs = [
    Document(page_content=kb_facts, metadata={"source": "facts"}),
    Document(page_content=kb_rules, metadata={"source": "rules"})
]

```

```

# Split and embed
splitter = CharacterTextSplitter(chunk_size=100, chunk_overlap=0)
kb_chunks = splitter.split_documents(docs)
embedding = HuggingFaceEmbeddings()
vectorstore = FAISS.from_documents(kb_chunks, embedding)
retriever = vectorstore.as_retriever()

```

```

<ipython-input-7-b1395c4d9a88>:32: LangChainDeprecationWarning: The class `HuggingFaceEmbeddings` was deprecated in LangChain
embedding = HuggingFaceEmbeddings()
<ipython-input-7-b1395c4d9a88>:32: LangChainDeprecationWarning: Default values for HuggingFaceEmbeddings.model_name were dep
embedding = HuggingFaceEmbeddings()
/usr/local/lib/python3.11/dist-packages/huggingface_hub/utils/_auth.py:94: UserWarning:
The secret `HF_TOKEN` does not exist in your Colab secrets.
To authenticate with the Hugging Face Hub, create a token in your settings tab (https://huggingface.co/settings/tokens), set
You will be able to reuse this secret in all of your notebooks.
Please note that authentication is recommended but still optional to access public models or datasets.
warnings.warn(
modules.json: 100% 349/349 [00:00<00:00, 21.0kB/s]
config_sentence_transformers.json: 100% 116/116 [00:00<00:00, 9.50kB/s]
README.md: 100% 10.4k/10.4k [00:00<00:00, 557kB/s]
sentence_bert_config.json: 100% 53.0/53.0 [00:00<00:00, 3.14kB/s]
config.json: 100% 571/571 [00:00<00:00, 42.9kB/s]
Xet Storage is enabled for this repo, but the 'hf_xet' package is not installed. Falling back to regular HTTP download. For
WARNING:huggingface_hub.file_download:Xet Storage is enabled for this repo, but the 'hf_xet' package is not installed. Falli
model.safetensors: 100% 438M/438M [00:02<00:00, 164MB/s]
tokenizer_config.json: 100% 363/363 [00:00<00:00, 23.8kB/s]
vocab.txt: 100% 232k/232k [00:00<00:00, 2.96MB/s]
tokenizer.json: 100% 466k/466k [00:00<00:00, 5.40MB/s]
special_tokens_map.json: 100% 239/239 [00:00<00:00, 10.0kB/s]
config.json: 100% 190/190 [00:00<00:00, 13.5kB/s]

```

```

# Step 4: Define schema and construct the LangGraph
from langgraph.graph import StateGraph
from typing import TypedDict

```

```

# Define the graph schema
class GraphState(TypedDict):
    query: str
    context: str

```

```

# Define the retrieve node
def retrieve_node(state: GraphState) -> GraphState:
    docs = retriever.invoke(state["query"])
    context = "\n".join([doc.page_content for doc in docs])
    return {"query": state["query"], "context": context}

```

```

# Define the judge node (placeholder for CoT/refinement logic)

```

```

# def judge_node(state: GraphState) -> GraphState:
#     print("Final context retrieved for query:")
#     print(state["context"])
#     return state

```

```

def judge_node(state: GraphState) -> GraphState:
    query = state["query"]
    context = state["context"]

    # Simulate Chain of Thought by evaluating the relevance
    print("\n Chain of Thought Reasoning:")
    print(f"Query: {query}")
    print("Step 1: Examine retrieved context...")
    print(context)

```

```

# Very simple reasoning example (could be replaced with LLM later)
if "sparrow" in query.lower() and "flies(sparrow)." in context:
    print("→ Reasoning: The fact 'flies(sparrow)' exists, so yes, it can fly.")
elif "dog" in query.lower() and "flies(dog)." not in context:
    print("→ Reasoning: No evidence found that dogs fly, so probably not.")
else:
    print("→ Reasoning: Not enough information to answer definitively.")

```

```

return state

```

```

# Build the graph
graph = StateGraph(GraphState)

```

```

graph = StateGraph(State)
graph.add_node("retrieve", retrieve_node)
graph.add_node("judge", judge_node)

graph.set_entry_point("retrieve")
graph.add_edge("retrieve", "judge")
graph.set_finish_point("judge")

# Compile the graph
runnable = graph.compile()

```

```
output = runnable.invoke({"query": "Can a sparrow fly?"})
```



Chain of Thought Reasoning:  
 Query: Can a sparrow fly?  
 Step 1: Examine retrieved context...

```

animal(dog).
animal(cat).
animal(eagle).
animal(sparrow).
flies(eagle).
flies(sparrow).
has_tail(dog).
has_tail(cat).
bird(X) :- animal(X), flies(X).
mammal(X) :- animal(X), has_tail(X).
→ Reasoning: The fact 'flies(sparrow)' exists, so yes, it can fly.

```