Hands-on LangGraph

What is LangGraph?

This makes LangGraph especially useful for building: chatbots, multi-step reasoning pipelines, tool-using agents, multi-agent workflows, and robust control flows.

• Entry/Exit: start node (entry point) and end condition (finish point).

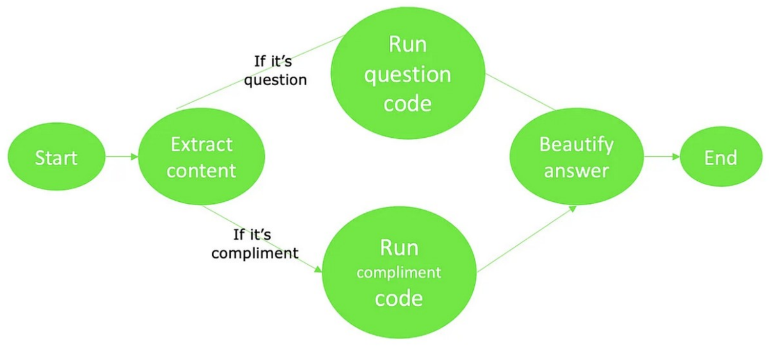
• Edges: transitions between nodes (linear or conditional).

• Nodes: Python functions that read/update the state (e.g., classify intent, call an LLM, format output).

• State: a shared dictionary/object that carries information across nodes (e.g., user question, classification label, final answer).

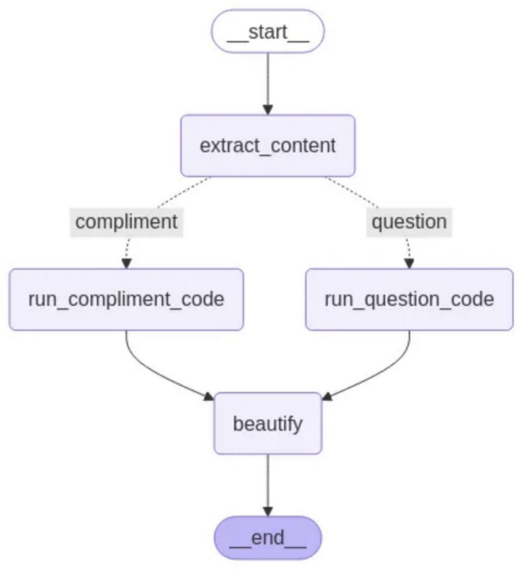
In LangGraph, your application typically consists of:

LangGraph is a graph-based framework for building LLM applications where your workflow is represented as a set of nodes (functions) and edges (transitions). Instead of writing a single linear chain, you explicitly define how data moves through the system, including loops, branching, and conditional routing.



What you will build

- A tiny graph that reads a social-media comment payload, extracts the customer remark, routes it as either a question or compliment, and then beautifies the response.
- You will run it end-to-end and optionally visualize the graph structure (Mermaid diagram).



Prerequisites

- Python 3.10+ (recommended 3.11).
- A terminal (macOS Terminal, Windows PowerShell, or Linux shell).
- Optional for graph image rendering: Jupyter / IPython, plus system tools for image display.

Step 1 – Create a project folder and virtual environment

Create a new folder and a virtual environment so installs do not affect your global Python.

macOS / Linux

```
mkdir LangGraph_Demo
cd LangGraph_Demo
python3 -m venv .venv
source .venv/bin/activate
python -m pip install --upgrade pip
```

Windows (PowerShell)

```
mkdir LangGraph_Demo
cd LangGraph_Demo
python -m venv .venv
.\.venv\Scripts\Activate.ps1
python -m pip install --upgrade pip
```

Step 2 – Install LangGraph and dependencies

Install LangGraph and LangChain (used only to talk to an LLM backend).

```
pip install -U langgraph langchain
```

If you plan to use Ollama (local LLM), install the Ollama integration:

```
pip install -U langchain-ollama
```

Step 3 – Choose and install an LLM backend

Local LLM via Ollama

Ollama runs open-source LLMs locally. This is great for hands-on labs because it avoids API keys and works offline once the model is downloaded.

Install Ollama:

- macOS: download the .dmg from the official Ollama download page and drag the app into Applications.
- Linux: use the install script from the official download page.
- Windows: download the installer from the official download page.

Verify and pull a small model (choose one that fits your machine). Example:

```
ollama --help
ollama pull llama3.2:3b
```

Quick test:

```
ollama run llama3.2:3b "Say hello in one sentence."
```

Step 4 – Create the LangGraph program

Below is a demo version where the routing decision (question vs compliment) is made by an Ollama LLM.This also uses Ollama to beautify the final response, and saves the Mermaid graph as a PNG.

1.) Open cmd (Windows) / Terminal (Mac) and execute below command. This will download and install LLM model “llama3.2:3b” locally on your system using ollama software.

ollama run llama3.2:3b

2.) Install required packages (inside your .venv): pip install -U langgraph langchain-ollama python-dotenv typing_extensions

3) Create a file named langgraph_demo.py with the code below.

```
nano langgraph_demo.py
```

Code (langgraph_demo.py):

```
from __future__ import annotations
```

```
import json
from typing_extensions import TypedDict, Literal
from dotenv import load_dotenv
load_dotenv()

from langgraph.graph import StateGraph, START, END
from langchain_ollama import ChatOllama

Route = Literal["question", "compliment"]

class State(TypedDict, total=False):
    payload: list[dict]
    text: str
    route: Route
    answer: str

# --- Node 1: extract text from payload ---
def extract_content(state: State) -> dict:
    return {"text": state["payload"][0]["customer_remark"]}

# --- Node 1.5: LLM router (decide question vs compliment) ---
def llm_route(state: State) -> dict:
    """
    Uses an LLM (Ollama) to classify the customer remark into:
    - "question"
    - "compliment"

    Returns: {"route": "..."}
    """
    llm = ChatOllama(model="llama3.2:3b", temperature=0)
    system = (
        "You are a strict text classifier.\n"
        "Return ONLY valid JSON with exactly one key: \"route\".\n"
        "The value must be either \"question\" or \"compliment\".\n"
        "No extra keys, no explanation, no markdown."
    )
    user = (
        f'Text: "{state["text"]}"\n\n'
        "Classify the text as either:\n"
        "- \"question\": asks for information, includes inquiries, confusion,
requests.\n"
        "- \"compliment\": praise, appreciation, positive feedback.\n\n"
        "Return JSON now."
    )

    raw = llm.invoke([("system", system), ("user", user)]).content.strip()

    # Robust parsing: try JSON first; fallback to substring detection.
    try:
        obj = json.loads(raw)
        route = obj.get("route", "").strip().lower()
    except Exception:
        route = raw.lower()

    if "question" in route:
        return {"route": "question"}
    if "compliment" in route:
        return {"route": "compliment"}
    # Default fallback if model output is unexpected
    return {"route": "question"}


# --- Router: returns the route string for conditional edges ---
def route_from_state(state: State) -> Route:
    return state["route"]


# --- Node 2a: handle compliment ---
def run_compliment_code(state: State) -> dict:
    return {"answer": "Thanks for the compliment."}


# --- Node 2b: handle question ---
def run_question_code(state: State) -> dict:
    return {"answer": "Thanks for your question. We will look into it."}


# --- Node 3: beautify using LLM (Ollama) ---
def beautify_llm(state: State) -> dict:
    llm = ChatOllama(model="llama3.2:3b", temperature=0)


    prompt = (
        "Rewrite the following customer-service reply politely in ONE short 
sentence.\n"
        "Do not add new facts.\n\n"
        f"Reply: {state['answer']}"
    )


    pretty = llm.invoke(prompt).content.strip()
    return {"answer": pretty}
```

```python
def build_graph():
    graph_builder = StateGraph(State)


    graph_builder.add_node("extract_content", extract_content)
    graph_builder.add_node("llm_route", llm_route)
    graph_builder.add_node("run_question_code", run_question_code)
    graph_builder.add_node("run_compliment_code", run_compliment_code)
    graph_builder.add_node("beautify_llm", beautify_llm)


    graph_builder.add_edge(START, "extract_content")
    graph_builder.add_edge("extract_content", "llm_route")


    graph_builder.add_conditional_edges(
        "llm_route",
        route_from_state,
        {
            "compliment": "run_compliment_code",
            "question": "run_question_code",
        },
    )


    graph_builder.add_edge("run_question_code", "beautify_llm")
    graph_builder.add_edge("run_compliment_code", "beautify_llm")
    graph_builder.add_edge("beautify_llm", END)


    return graph_builder.compile()


if __name__ == "__main__":
    graph = build_graph()
```

```
# --- Save diagram as PNG (terminal-friendly) ---
png_bytes = graph.get_graph().draw_mermaid_png()
with open("langgraph_demo2_diagram.png", "wb") as f:
    f.write(png_bytes)
print("Diagram saved as: langgraph_demo2_diagram.png")


# --- Example payloads ---
payload_question = [
    {
        "time_of_comment": "2025-01-20",
        "customer_remark": "Why has the packaging changed?",
        "social_media_channel": "facebook",
        "number_of_likes": 100,
    }
]


payload_compliment = [
    {
        "time_of_comment": "2025-01-21",
        "customer_remark": "I love your product—great job!",
        "social_media_channel": "instagram",
        "number_of_likes": 42,
    }
]


print("\n=== RUN: QUESTION ===")
result = graph.invoke({"payload": payload_question})
print("FINAL RESULT:\n", result)


print("\nSTREAM:\n")
```

```
    for step in graph.stream({"payload": payload_question}):
        print(step)


    print("\n=== RUN: COMPLIMENT ===")
    result = graph.invoke({"payload": payload_compliment})
    print("FINAL RESULT:\n", result)


    print("\nSTREAM:\n")
    for step in graph.stream({"payload": payload_compliment}):
        print(step)
```

Step 5 – Run it

From the same folder (with your virtual environment activated):

```
python3 langgraph_demo.py
```

You should see a final state dictionary (including text, answer, and the original payload), plus step-by-step node outputs from stream().

Optional – Visualize the graph (Mermaid diagram)

If you are in a Jupyter notebook:

pip install jupyter jupyterlab notebook jupyter_core ipykernel (to install jupyter notebook)

python3 -m notebook (open’s juypter notebook on browser)

you can render a diagram:

```
from IPython.display import Image, display

graph = build_graph()

display(Image(graph.get_graph().draw_mermaid_png()))
```

Troubleshooting

- ImportError for ChatOllama: ensure you installed langchain-ollama.

- Ollama command not found: confirm Ollama is installed and the CLI is on your PATH; restart the terminal after installation.
- Model not found in Ollama: run "ollama pull <model>" first.
- Python version issues: LangGraph docs recommend Python 3.10+.

References

1) Dr. Varshita Sher. Gentle Introduction to LangGraph: A Step-by-Step Tutorial. Level Up Coding (Medium), Mar 20, 2025. https://levelup.gitconnected.com/gentle-introduction-to-langgraph-a-step-by-step-tutorial-2b314c967d3c

2) LangChain Docs (OSS). Install LangGraph. https://docs.langchain.com/oss/python/langgraph/install

3) Ollama Docs. Download / Install. https://ollama.com/download

4) LangChain Docs (OSS). ChatOllama integration. https://docs.langchain.com/oss/python/integrations/chat/ollama