

# Coding Assignment

Hi,

As part of the AI Engineering Internship process, we have a simple but meaningful backend assignment for you. The goal is to understand your fundamentals in Python, API design, async programming, and how you structure logic. This is **pure backend** — no frontend required and no machine learning or RL.

Please attempt this only if you are comfortable writing clean Python and enjoy building systems.

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## Overview of the Assignment

You need to build a **small agent workflow engine**, something like a very simplified version of LangGraph. The idea is to create a system where we can define a sequence of steps (nodes), connect them, maintain a shared state, and run the workflow end-to-end via APIs.

This is not meant to be complicated. Even a small working version is totally fine — focus on correctness, clarity, and structure.

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## What You Need to Build

### 1. A Minimal Workflow / Graph Engine

This is the core part. It should support:

- **Nodes:** Each node is just a Python function that reads and modifies a shared state.
- **State:** A dictionary or Pydantic model that flows from one node to another.
- **Edges:** Define which node runs after which. A simple mapping like {"extract": "analyze"} is enough.
- **Branching:** Basic conditional routing is enough (e.g., if some value in the state is above a threshold, go to a different node).
- **Looping:** Support a simple loop (for example run a node repeatedly until a condition is met).

You do *not* need a fully dynamic graph language. A clean Python structure works.

### 2. Tool Registry (Simple Version)

Just maintain a dictionary of “tools” (Python functions) that nodes can call.

Example:

```
def detect_smells(code):  
    return {"issues": 3}
```

You can pre-register tools or allow registration via an API — both are okay.

### 3. FastAPI Endpoints

Expose these via FastAPI:

- POST /graph/create  
Input: JSON describing nodes and edges.  
Output: graph\_id.
- POST /graph/run  
Input: graph\_id + initial state.  
Output: final state + a simple execution log.
- GET /graph/state/{run\_id}  
Return the current state of an ongoing workflow.

You can choose to store graphs and runs in memory or in a small SQLite/Postgres database.

#### Optional (nice to have, not required):

- A WebSocket endpoint to stream logs step-by-step.
- Async execution of long-running steps.

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### Sample Workflow You Must Implement

To show that your engine works, implement **one example workflow**. Pick any one of the following (they are intentionally simple):

#### Option A: Code Review Mini-Agent

1. Extract functions
2. Check complexity
3. Detect basic issues

4. Suggest improvements
5. Loop until “quality\_score >= threshold”

### **Option B: Summarization + Refinement**

1. Split text into chunks
2. Generate summaries
3. Merge summaries
4. Refine final summary
5. Stop when summary length under a limit

### **Option C: Data Quality Pipeline**

1. Profile data
2. Identify anomalies
3. Generate rules
4. Apply rules
5. Loop until anomaly count is small

These can be **fully rule-based**. No ML is expected.

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### **What to Submit**

Your GitHub repo should contain:

- The FastAPI project (/app folder is ideal)
- Code for the graph engine
- Code for your example agent workflow
- A short README:
  - How to run
  - What your workflow engine supports
  - What you would improve with more time

Clean structure matters more than features.

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## How You Will Be Evaluated

We mainly look for:

- How well you structure your Python code
- Clarity of the graph/engine logic
- Clean and easy-to-understand APIs
- Ability to think in terms of state → transitions → loops
- Basic async/code hygiene

Optional extras (background tasks, logging, WebSockets, etc.) will help you stand out, but they're not required.

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If anything is unclear, feel free to ask. I encourage you to keep it simple but well-designed — that is what we look for.