

# Autonomous Learning Agent

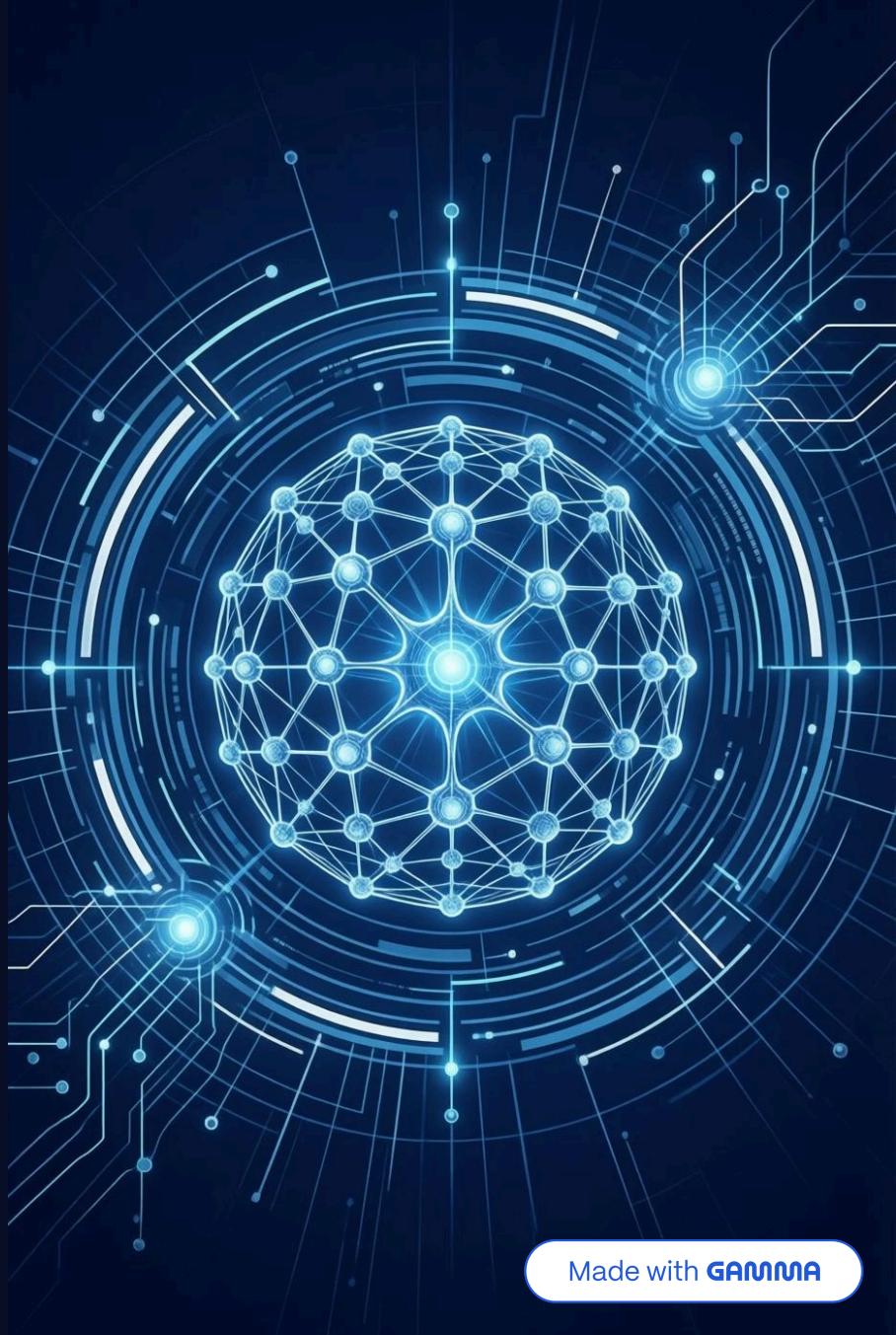
An AI-powered educational system guiding learners through structured curricula.

**Under the mentor of**

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**Submitted by**

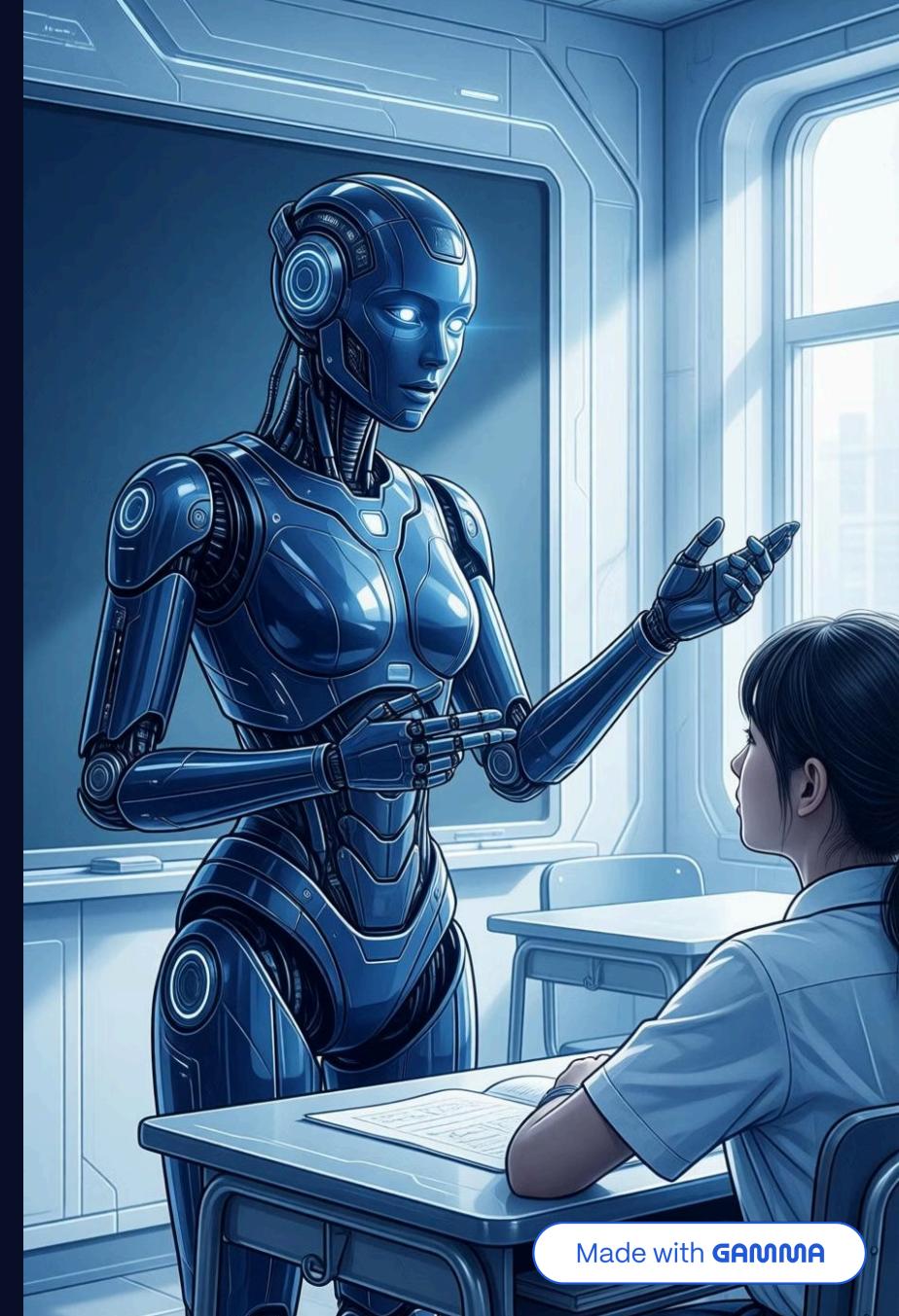
Gaurav Gaur



## Introduction

# AI-Powered Education

The Autonomous Learning Agent automatically gathers context, generates questions, evaluates answers, detects gaps of learning, and explains concepts using the **Feynman Technique**. It's interactive, adaptive, and observable.



# Core Objectives

1

## Structured Learning

Checkpoint-based progression.

2

## Automatic Assessment

Evaluates understanding.

3

## Gap Detection

Identifies weak areas.

4

## Feynman Explanations

Simplifies complex concepts.

5

## Progress Tracking

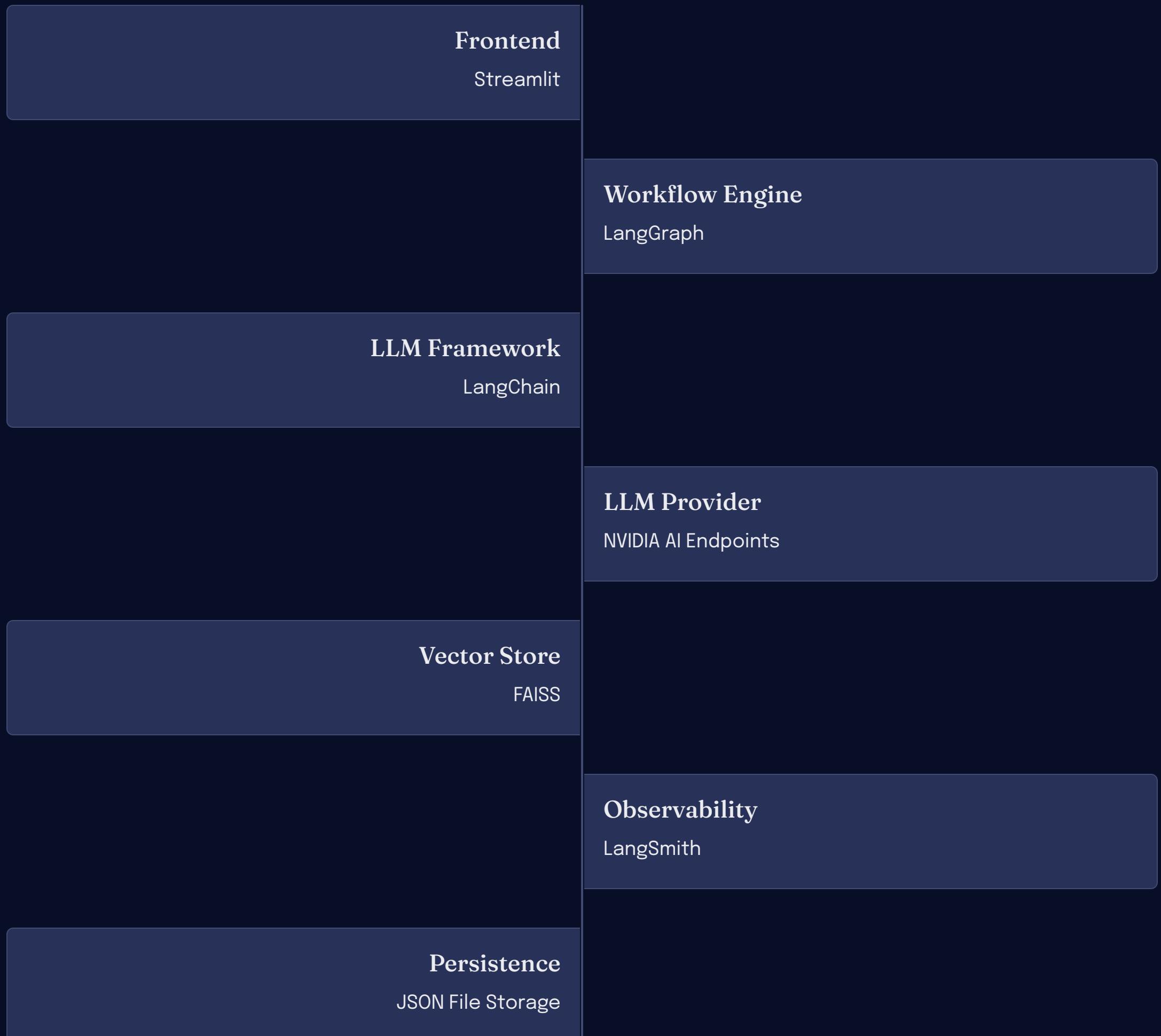
Persistent learner data.

6

## Full Observability

Via LangSmith.

# Technology Stack



# High-Level Architecture



The architecture ensures a seamless flow from user interaction to AI-driven learning processes.

# Learning Workflow: Step-by-Step

01

## Load Progress

Retrieve learner's current status.

02

## Display Checkpoint

Present current learning module.

03

## Accept Notes

User provides PDF/Text notes.

04

## Gather Context

Collect relevant learning material.

05

## Validate Context

Ensure relevance of gathered info.

06

## Generate Questions

Create assessment questions.

07

## Collect Answers

Receive learner's responses.

08

## Evaluate Answers

Score responses.

09

## Route Based on Score

Pass/Fail logic determines next step.

10

## Feynman Teaching

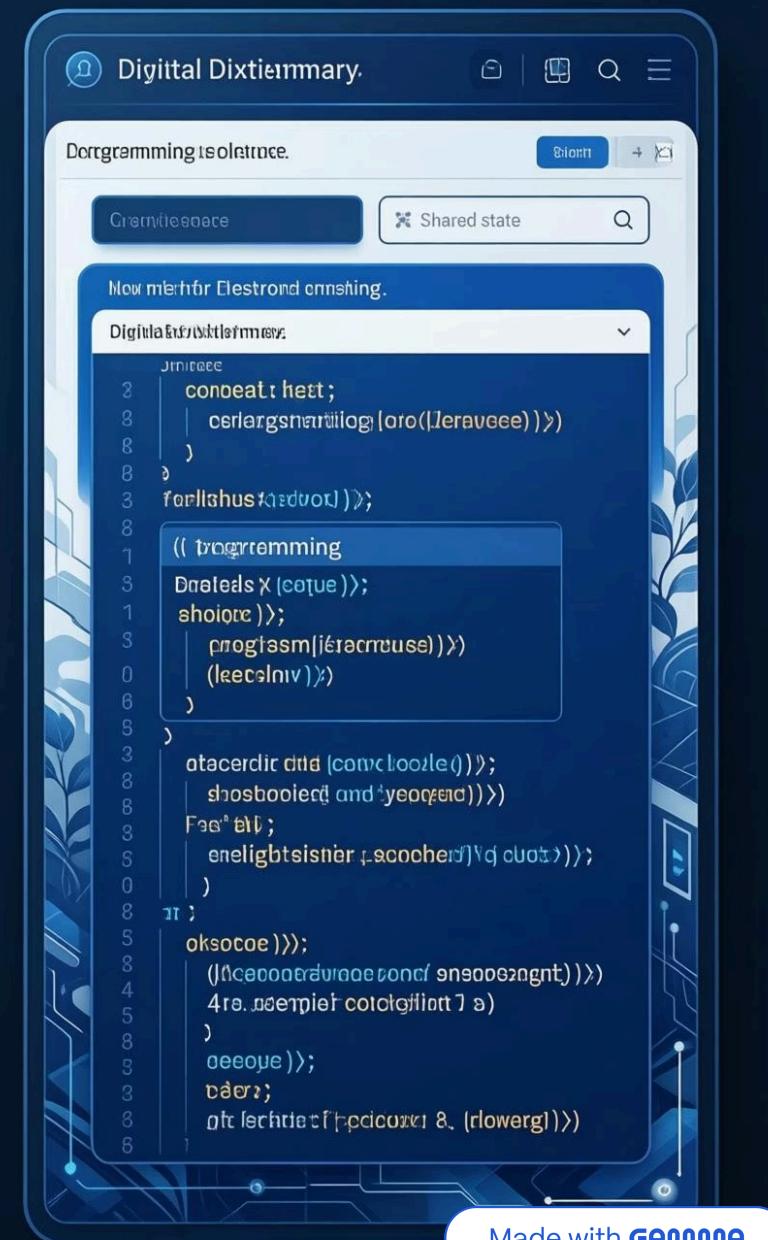
Feynman teaching learning by explaining a concept in the simplest possible words until you fully understand it.

# LearningState: State Management

**LearningState** is a shared dictionary flowing through LangGraph nodes, ensuring all components access consistent data.

## Key Fields

- checkpoint
  - user\_Notes
  - answers
  - questions
  - passed
  - gaps
  - feynman\_explanation



# Pass / Fail Logic

## Pass Criteria

- Average score  $\geq 70\%$
- User clicks "Next Checkpoint"



## Fail Criteria

- Average score  $< 70\%$
- Feynman explanation shown
- User retries same checkpoint

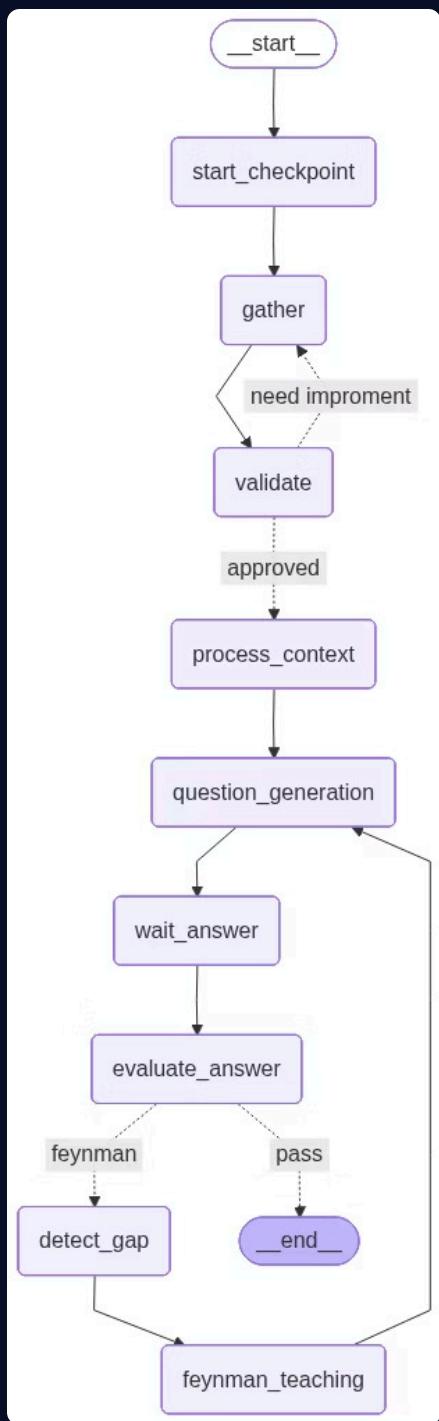


No automatic advancement; learner controls progression.

# LangGraph Workflow & Observability

## Workflow Nodes

- start\_checkpoint
- gather\_context
- evaluation\_context
- process\_context
- question\_generation
- evaluate\_answer
- detect\_gap
- feynman\_teaching



## LangSmith Observability

Provides full tracing of:

- LangGraph nodes
- Routing decisions
- LLM prompts & responses
- Latency & errors



# Screenshot

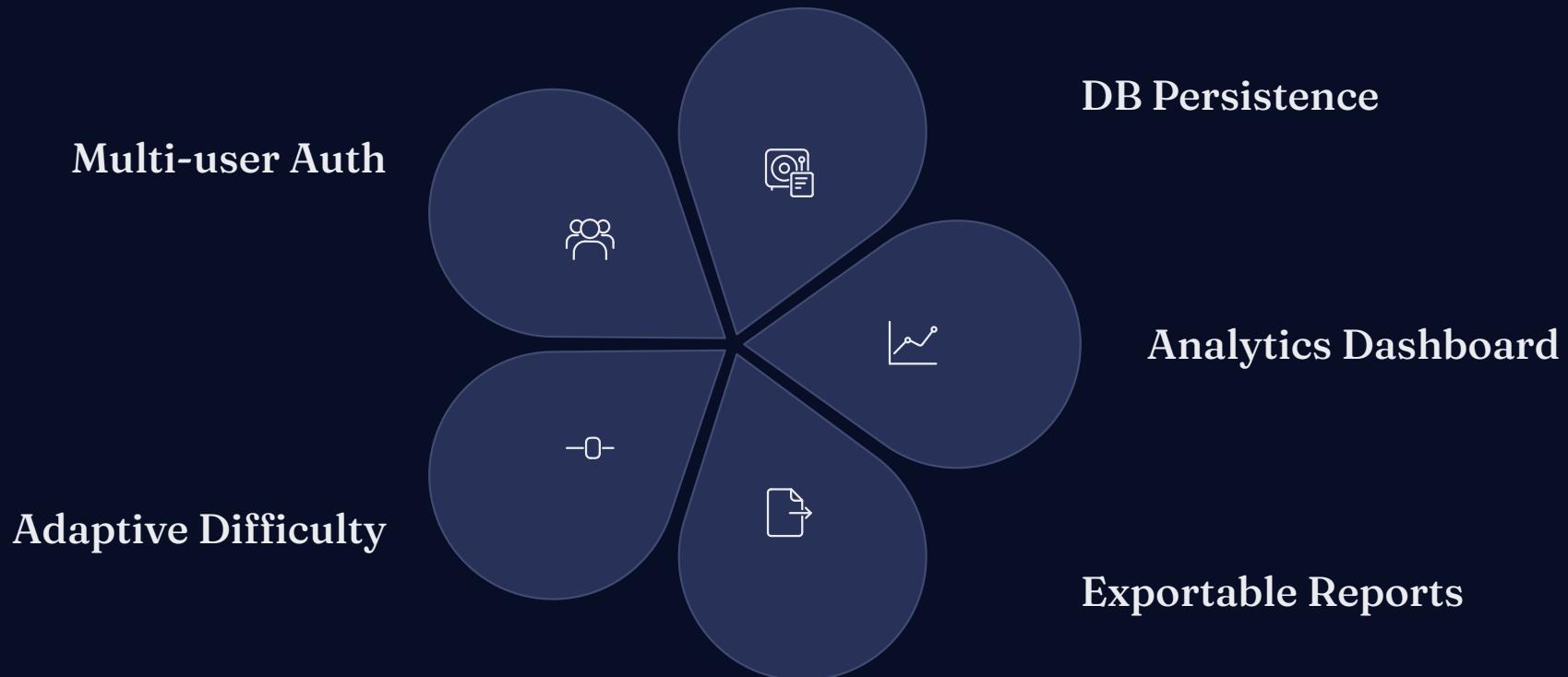
The screenshot shows a web browser window titled "Autonomous Learning Agent". The main content area displays a section titled "Binary Search" with a graduation cap icon. Below the title, it says "Checkpoint 1 of 5". Under the heading "Binary Search", there is a sub-section "Learning Objectives" with the following bullet points:

- Understand divide-and-conquer
- Know time complexity
- Apply binary search correctly

At the bottom of the page, there is a checkbox labeled "Success Criteria: Explain and apply binary search". The browser's address bar shows "localhost:8501". The taskbar at the bottom of the screen includes icons for various applications like File Explorer, Task View, and Control Panel.

The screenshot shows a web browser window titled "localhost:8501". The main content area has a header "Upload a file containing your notes" with a "Drag and drop file here" button and a "Browse files" button. A file named "Binary\_Search\_Notes.pdf" (2.5KB) is listed. Below this, a green message box indicates "PDF uploaded and text extracted successfully." There is a section titled "Enter your notes (optional)" with a "Start / Continue Learning" button. The browser's address bar shows "localhost:8501". The taskbar at the bottom of the screen includes icons for various applications like File Explorer, Task View, and Control Panel.

# Future Enhancements & Conclusion



The Autonomous Learning Agent is a scalable, observable, and adaptive system, combining strong control flow and automated evaluation for an effective AI tutor.

# Thank You