Autonomous Learning Agent

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

Under the mentor of

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Submitted by

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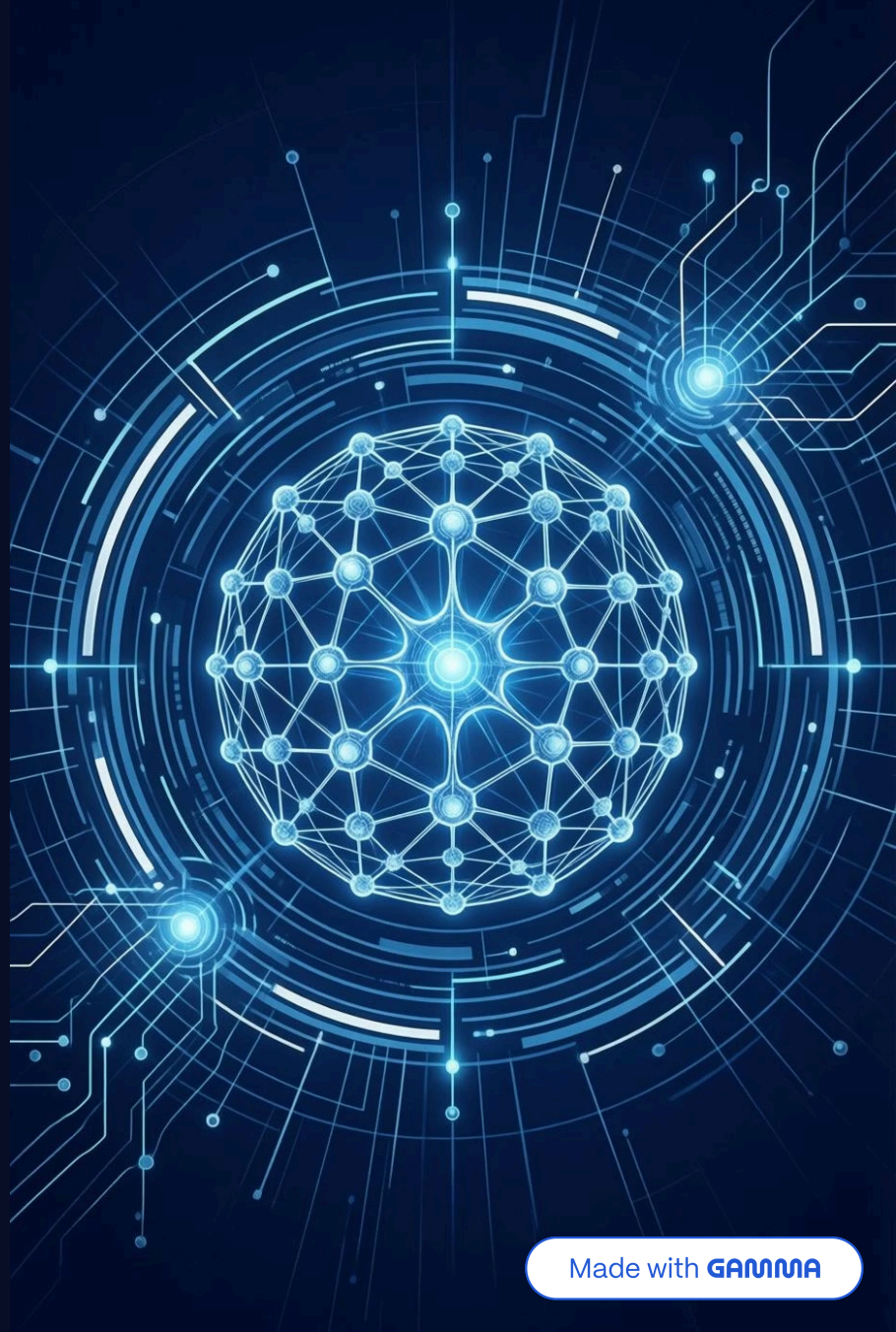
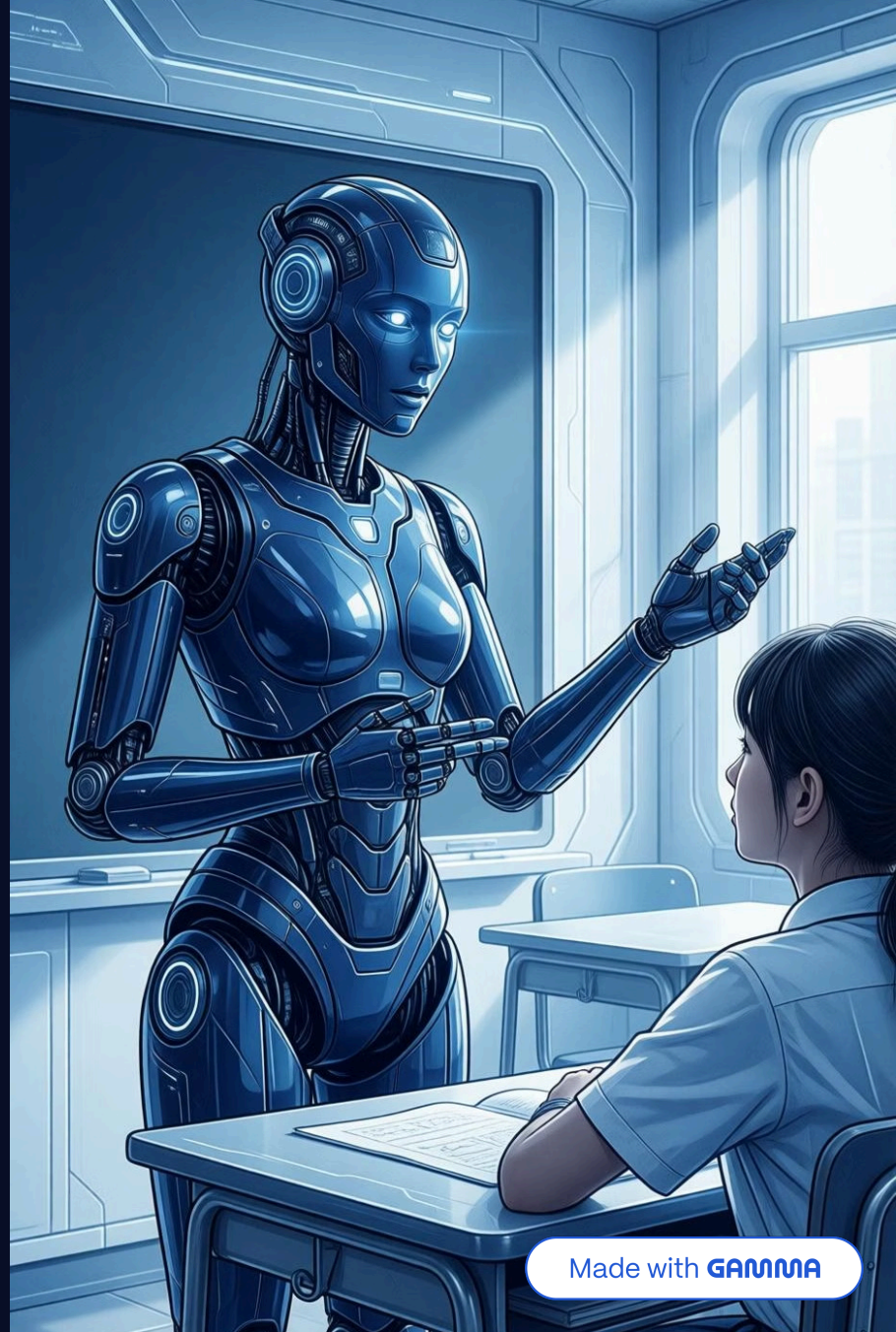


Introduction

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

Frontend
Streamlit

Workflow Engine
LangGraph

LLM Framework
LangChain

LLM Provider
NVIDIA AI Endpoints

Vector Store
FAISS

Observability
LangSmith

Persistence
JSON File Storage

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

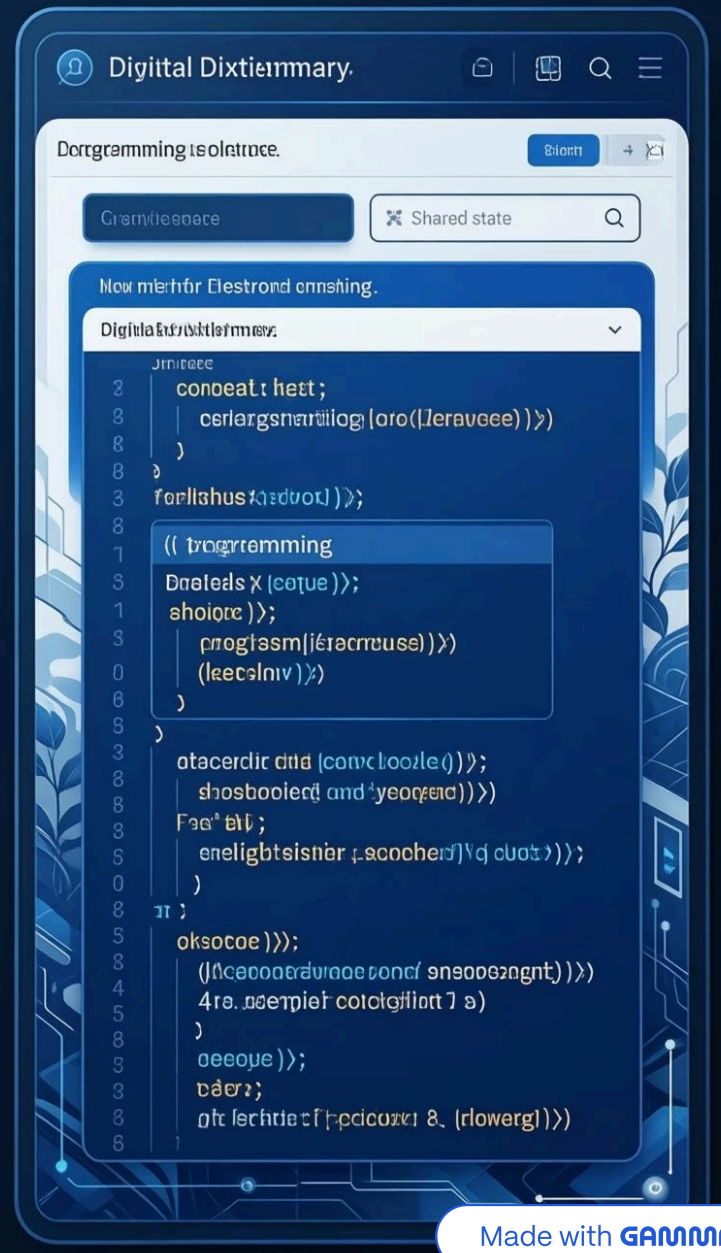
Feynam teaching learning by explaining a concept in the simplest possible words until you fully understand it.

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
- score_percentage
- passed
- gaps
- feynman_explanation



Pass / Fail Logic

Pass Criteria

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

Fail Criteria

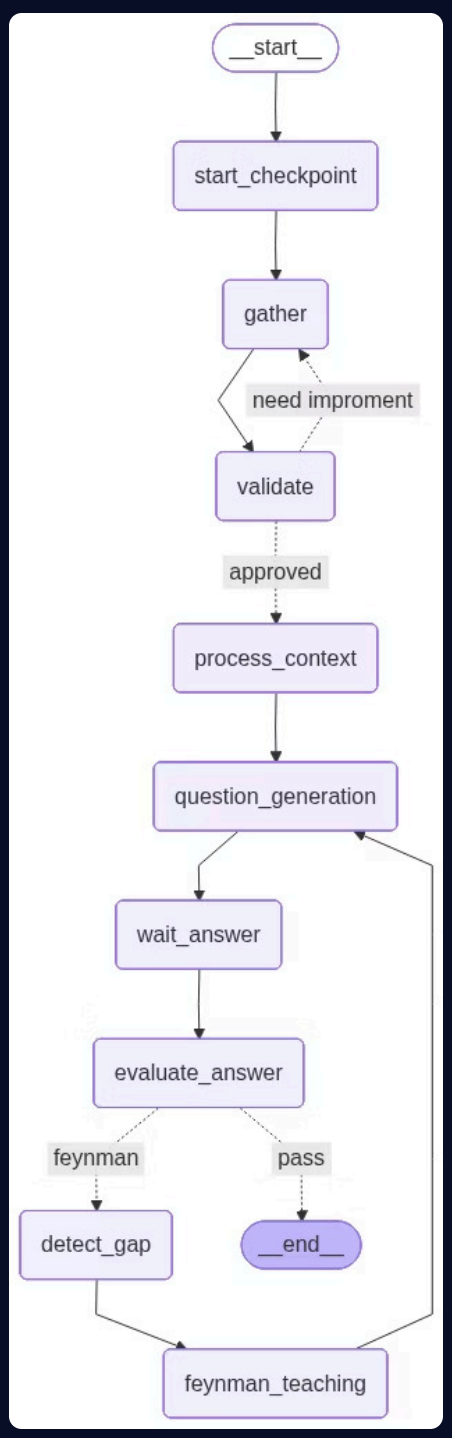
- Average score $< 70\%$
- Feynman explanation shown
- User retries same checkpoint

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

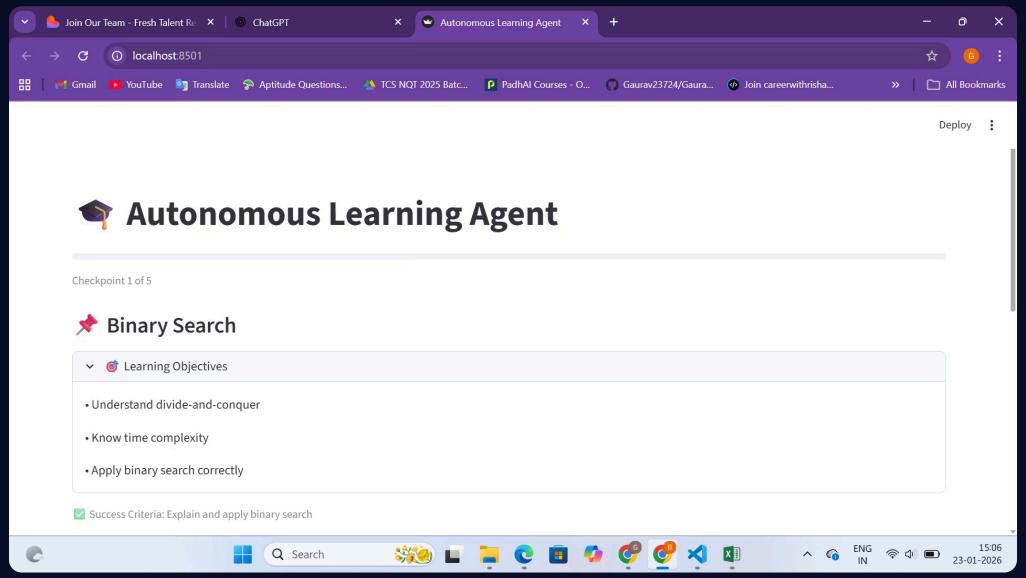


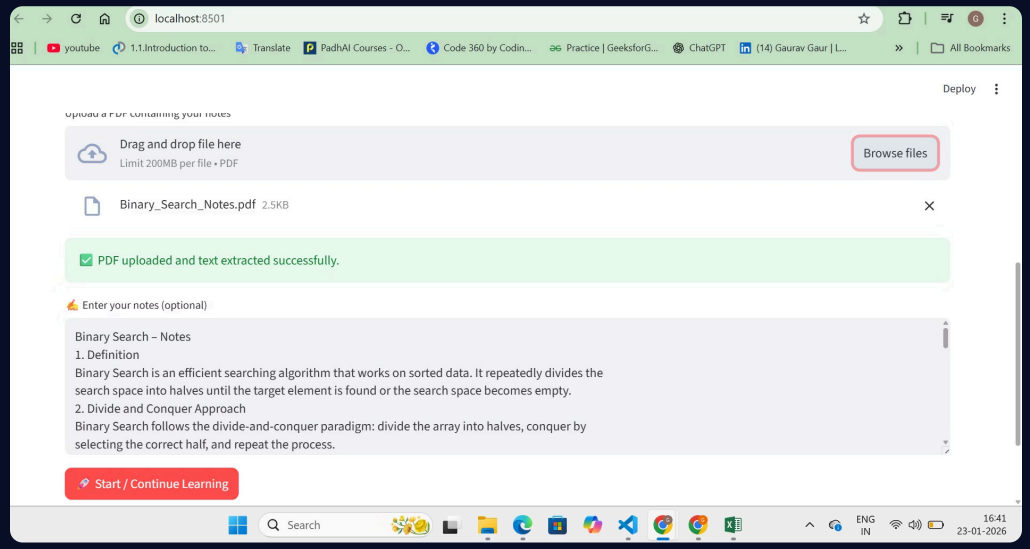
LangSmith Observability

Provides full tracing of:

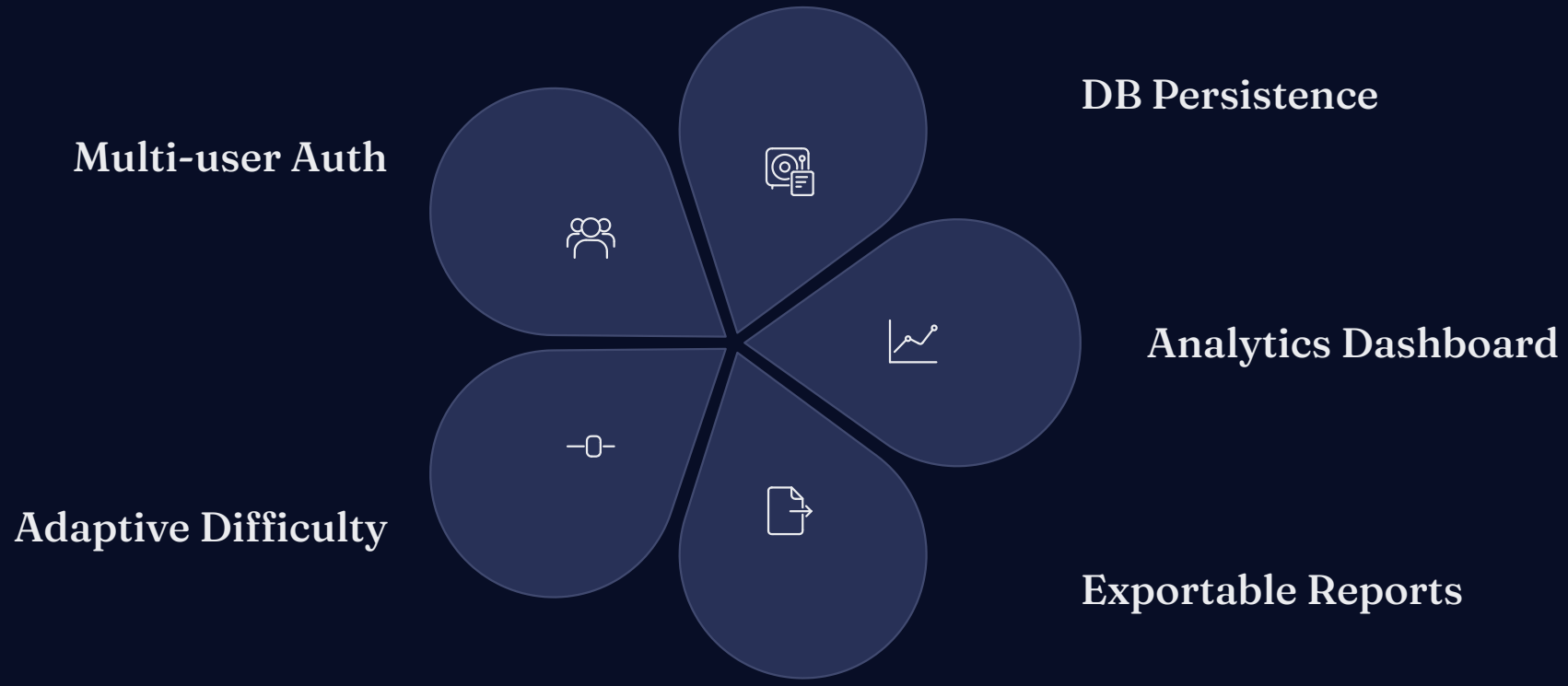
- LangGraph nodes
- Routing decisions
- LLM prompts & responses
- Latency & errors

Screenshot





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