

PROJECT TITLE: AI Study Assistant Chatbot

SUBJECT: Generative ai chatbot

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ABSTRACT

The AI Study Assistant Chatbot is an intelligent conversational system developed using FastAPI and integrated with a Large Language Model (LLM) through the Groq API. The chatbot is designed to answer academic and study-related questions while maintaining conversation history using MongoDB.

The system stores user interactions in a database and retrieves previous conversations to generate context-aware responses. This project demonstrates how modern AI assistants maintain conversational memory and persist user data in real-world applications.

INTRODUCTION

Artificial Intelligence-powered chatbots are widely used in educational platforms to assist students in learning. However, many basic chatbots do not maintain conversational memory.

This project aims to build a Study Bot that:

- Answers academic questions
- Maintains context across conversations
- Stores user data in a database
- Provides API-based access

The system uses MongoDB for memory persistence and an LLM API for generating intelligent responses.

OBJECTIVES

The main objectives of this project are:

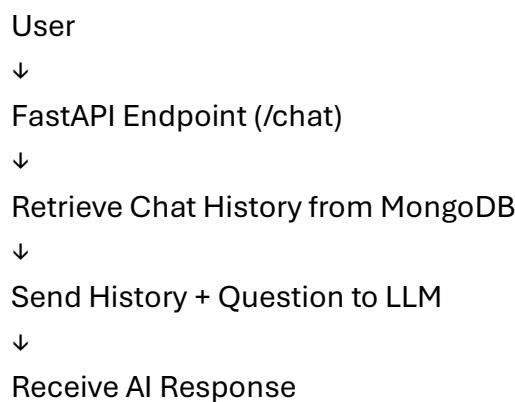
1. To build an AI-powered Study Assistant.
2. To integrate a Large Language Model (LLM) API.
3. To store chat history in MongoDB.
4. To retrieve previous conversations for contextual responses.
5. To deploy the application as a REST API.

TECHNOLOGIES USED

Technology	Purpose
Python	Backend development
FastAPI	API framework
Uvicorn	ASGI server
LangChain	LLM integration
Groq API	Language Model provider
MongoDB Atlas	Cloud database
python-dotenv	Environment variable management

SYSTEM ARCHITECTURE

System Workflow:



```
↓  
Store Conversation in MongoDB  
↓  
Return Response to User
```

This architecture ensures both intelligence and memory persistence.

MEMORY IMPLEMENTATION

Step 1: Store Conversations

Each user message and AI response is stored in MongoDB with:

- user_id
- role (human or ai)
- message
- timestamp

Example:

```
collection.insert_one({  
    "user_id": request.user_id,  
    "role": "human",  
    "message": request.question,  
    "timestamp": datetime.utcnow()  
})
```

Step 2: Retrieve Chat History

Before generating a new response, the chatbot retrieves previous messages:

```
def get_chat_history(user_id):  
    chats = collection.find({"user_id": user_id}).sort("timestamp", 1)
```

These messages are passed to the LLM as conversation history.

Step 3: Context Injection

The history is injected into the prompt template:

```
response = chain.invoke({  
    "history": history,  
    "question": request.question  
})
```

This allows the chatbot to understand previous context and respond intelligently.

This demonstrates real-world conversational memory implementation.

API ENDPOINTS

GET /

Used to check if the API is running.

Response:

AI Study Assistant API is running!

POST /chat

Used to send study-related questions.

Request Body:

```
{  
    "user_id": "student1",  
    "question": "What is Newton's First Law?"  
}
```

Response:

```
{  
    "response": "Explanation of Newton's First Law..."  
}
```

STUDY BOT LOGIC

The chatbot includes a system prompt:

"You are an AI Study Assistant. You answer academic and learning-related questions clearly and simply. Use previous conversation context when available. If the question is not study-related, politely guide the user back to academic topics."

This ensures:

- Academic focus
- Clear explanations
- Controlled responses

DEPLOYMENT

The application was deployed using Render.

Deployment Steps:

1. Upload code to GitHub.
2. Connect repository to Render.
3. Set environment variables:
 - GROQ_API_KEY
 - MONGODB_URI
4. Start command:
`unicorn app:app --host 0.0.0.0 --port 10000`

After deployment, the API is accessible via a public URL.

Hosted API link : Uvicorn running on <http://0.0.0.0:10000>

TESTING AND RESULTS

The chatbot was tested using Swagger UI.

Tests performed:

- ✓ Study-related question
- ✓ Follow-up question (memory test)
- ✓ MongoDB data verification
- ✓ API response validation

The chatbot successfully:

- Generated intelligent answers
- Retrieved previous context
- Stored chat history correctly

SCREENSHOTS

The screenshot shows the AI Study Assistant - Swagger UI interface. The URL in the browser is `127.0.0.1:8000/docs#/default/chat.chat_post`. The main area displays the `POST /chat` endpoint. The `Parameters` section indicates "No parameters". The `Request body` section is marked as required and has a schema defined:

```
{
  "user_id": "student",
  "question": "What is Newton's First Law?"
}
```

Below the schema is a large input field for the request body. At the bottom, there are "Execute" and "Clear" buttons.

The screenshot shows the AI Study Assistant - Swagger UI interface with the same URL as the previous screenshot. The main area displays the `Responses` section for the `POST /chat` endpoint. It includes a `Curl` command and a `Request URL` field set to `http://127.0.0.1:8000/chat`. The `Server response` section shows a `200` status code with a `Response body` containing JSON data:

```
{
  "response": "Newton's First Law (Law of Inertia)\n\nAn object will stay at rest or keep moving in a straight line at constant speed unless an external force acts on it.\nIn other words, a body does not change its state of motion on its own; it needs a net external force to accelerate, decelerate, or change direction."
}
```

The `Response headers` section shows:

```
access-control-allow-credentials: true
access-control-allow-origin: *
content-length: 334
content-type: application/json
date: Sun, 22 Feb 2026 17:45:59 GMT
server: uvicorn
```

The `Responses` section at the bottom shows a `200 Successful Response` entry with a `Media type` dropdown set to `application/json`.

Example Value | Schema

```
"string"
```

422 Validation Error

Media type

application/json

No links

Example Value | Schema

```
{
  "detail": [
    {
      "loc": [
        "string",
        0
      ],
      "msg": "string",
      "type": "string"
    },
    {
      "input": "string",
      "ctx": {}
    }
  ]
}
```

Schemas

ChatRequest > Expand all object

HTTPValidationError > Expand all object

ValidationError > Expand all object

```
nloads/chatbot project/venv/Scripts/Activate.ps1
● (venv) PS C:\Users\ASSUS\Downloads\chatbot project> python -m uvicorn app:app --reload
INFO:     Will watch for changes in these directories: ['C:\\Users\\ASSUS\\Downloads\\chatbot project']
INFO:     Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO:     Started reloader process [31636] using StatReload
INFO:     Started server process [15732]
INFO:     Waiting for application startup.
INFO:     Application startup complete.
INFO:     127.0.0.1:49932 - "GET / HTTP/1.1" 200 OK
INFO:     127.0.0.1:49932 - "GET /favicon.ico HTTP/1.1" 404 Not Found
INFO:     127.0.0.1:54476 - "POST /chat HTTP/1.1" 200 OK
```

The screenshot shows the MongoDB Atlas Data Explorer interface. The top navigation bar displays 'ORGANIZATION speed's Org - 2026-0...' and 'PROJECT chatbot'. The left sidebar includes sections for 'Data Explorer', 'My Queries', 'Data Modeling', and 'CLUSTERS (1)'. Under 'CLUSTERS (1)', 'Cluster0' is selected, showing sub-clusters 'admin', 'local', and 'study_bot'. The 'chat_history' collection is currently selected. The main workspace displays the 'chat_history' collection with 4 documents. A search bar at the top says 'Type a query: { field: 'value' } or Generate query'. Below it are buttons for 'ADD DATA', 'UPDATE', 'DELETE', and 'EXPORT CODE'. The first document in the list is:

```
_id: ObjectId('699b40db8809ff47fbf62fc6')
user_id: "student1"
role: "ai"
message : "★Newton's First Law (Law of Inertia)★
> *An object will stay at rest or in motion unless acted upon by an external force.*"
timestamp : 2026-02-22T17:46:00.234+00:00
```

The second document is:

```
_id: ObjectId('699b4c49e50db89b6f45637c')
user_id: "student1"
role: "human"
message : "What is Newton's Second Law?"
timestamp : 2026-02-22T18:34:49.252+00:00
```

The third document is:

```
_id: ObjectId('699b4c49e50db89b6f45637d')
user_id: "student1"
role: "ai"
```

At the bottom of the interface, there are links for 'System Status: All Good', '©2026 MongoDB, Inc.', and 'Status Terms Privacy Atlas Blog Contact Sales'.

CONCLUSION

The AI Study Assistant Chatbot successfully demonstrates how AI systems can integrate LLMs with database-backed memory to provide contextual responses. The project showcases real-world AI assistant architecture, including backend API development, cloud database storage, and deployment.

I WASN'T ABLE TO ADD THE MongoDB Atlas collection showing stored messages DUES TIME LIMIT OF UPLOAD