AI-Driven Personalized Learning Platform

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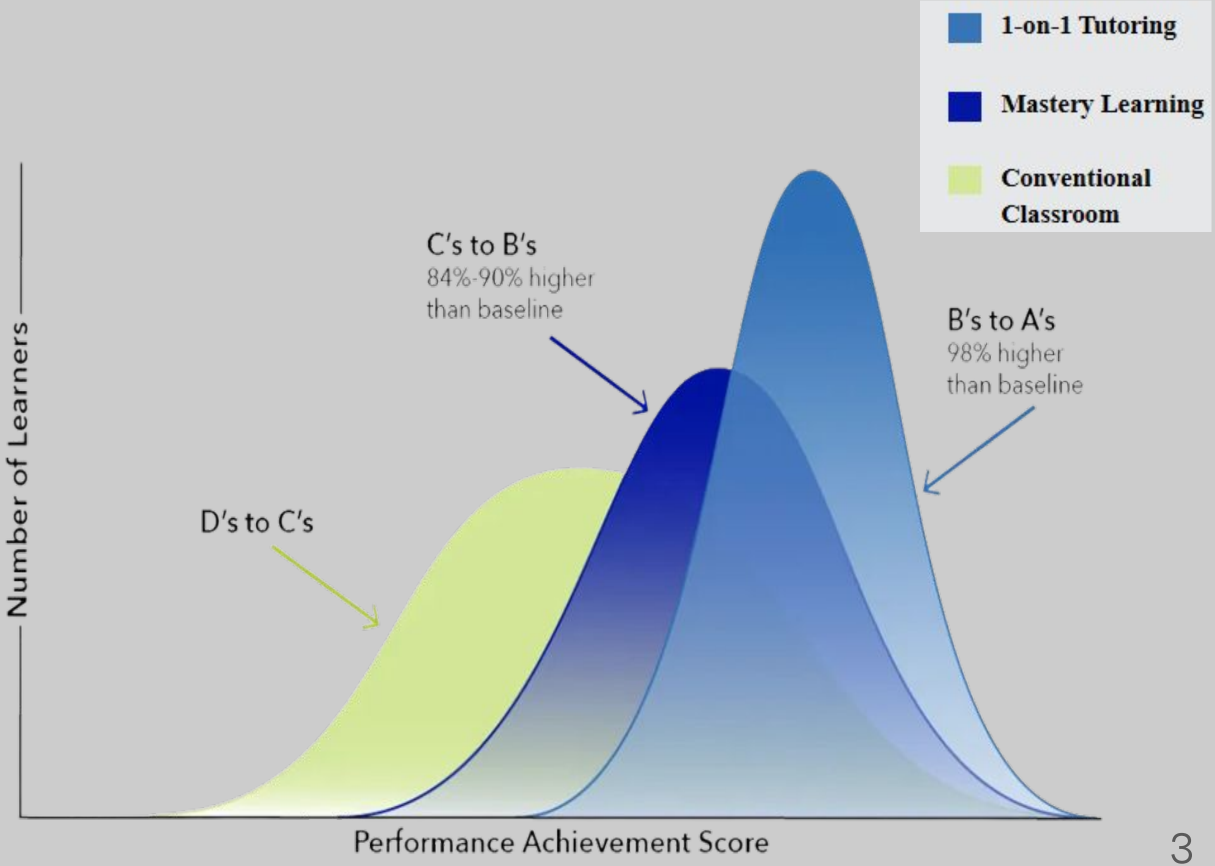
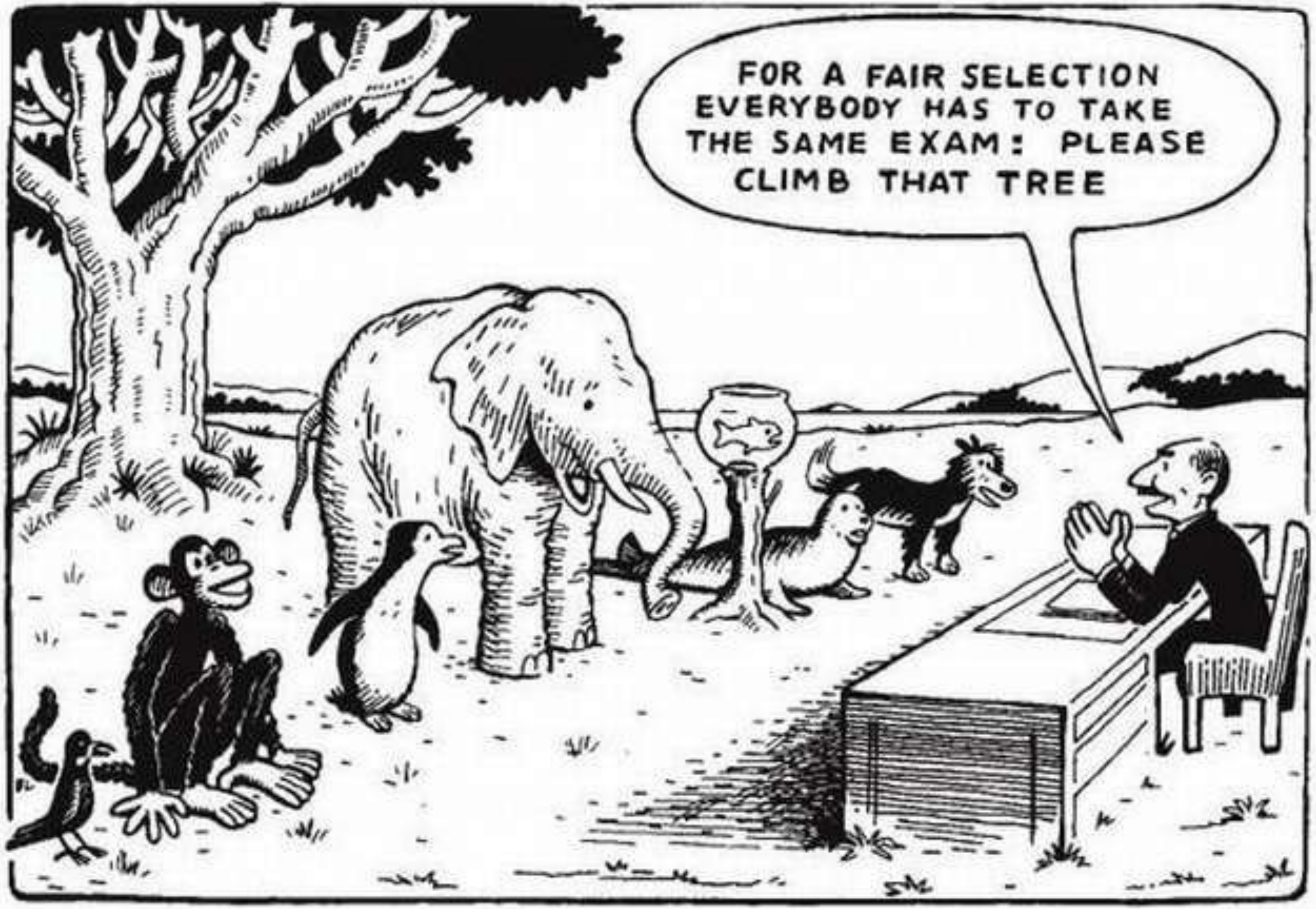
SD-14

LEARN
LINK
X

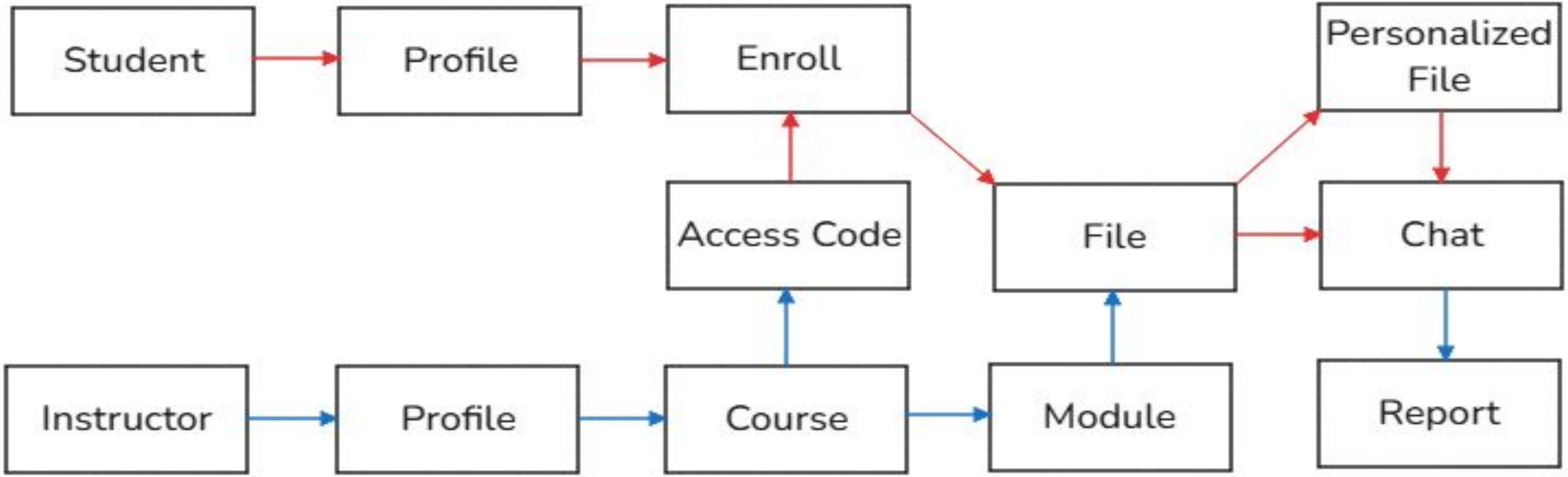
Problem

- Not enough personalized learning
- Not all students learn the same way



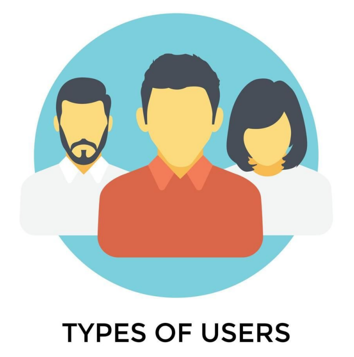

FOR A FAIR SELECTION EVERYBODY HAS TO TAKE THE SAME EXAM: PLEASE CLIMB THAT TREE

User Flow


Student
Profile
Enroll
Personalized File
Access Code
File
Chat
Instructor
Profile
Course
Module
Report

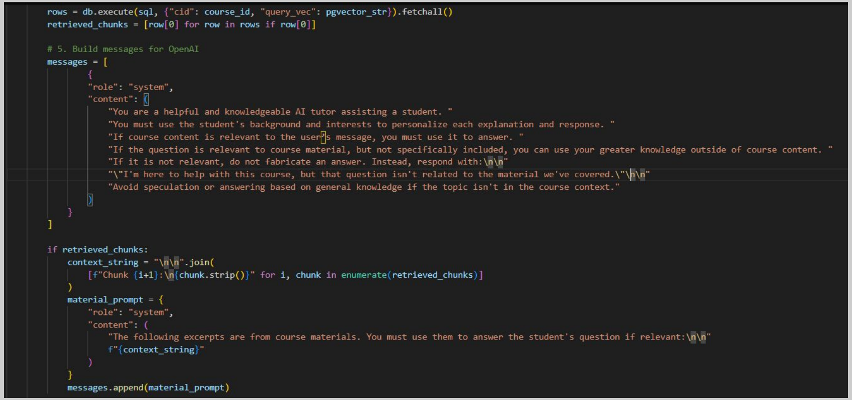
Design Challenge 1: Users and User Types

- Rewrite backend to handle multiple user types
- Rewrite frontend to use new backend
- Working with multiple databases



Design Challenge 2: OpenAI Prompting

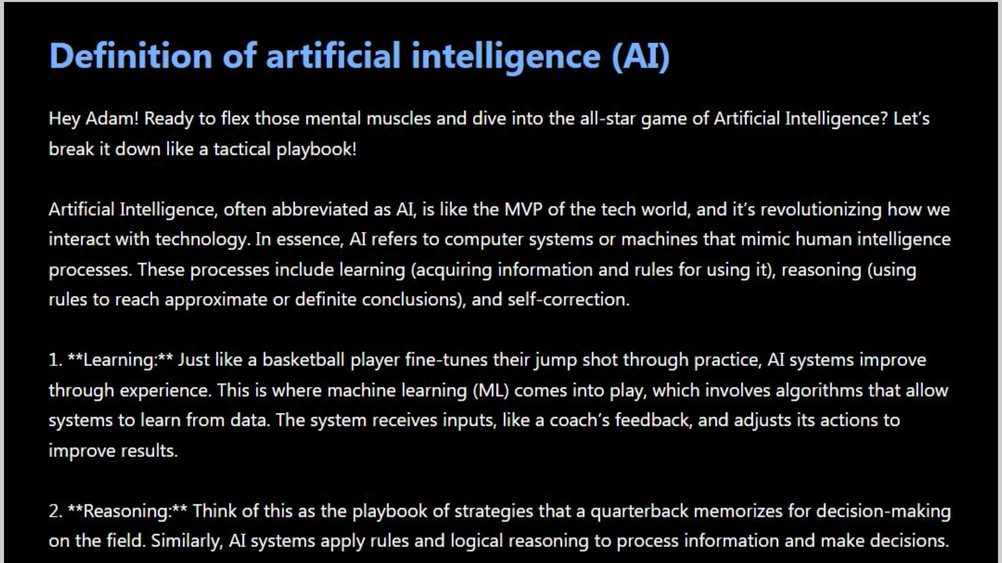
- Reliability and Instruction Adherence
    - Consistent Outputs
    - Utilizing ALL content
    - Relevance & Accuracy
- Personalization
    - Adapting to Persona
- Specificity!



```
rows = db.execute(sql, {"cid": course_id, "query_vec": pgvector_str}).fetchall()
retrieved_chunks = [row[0] for row in rows if row[0]]

# 5. Build messages for OpenAI
messages = [
        {
        "role": "system",
        "content": (
            "You are a helpful and knowledgeable AI tutor assisting a student. "
            "You must use the student's background and interests to personalize each explanation and response. "
            "If course content is relevant to the user’s message, you must use it to answer. "
            "If the question is relevant to course material, but not specifically included, you can use your greater knowledge outside of course content. "
            "If it is not relevant, do not fabricate an answer. Instead, respond with:\n\n"
            "\"I'm here to help with this course, but that question isn't related to the material we've covered.\"\n\n"
            "Avoid speculation or answering based on general knowledge if the topic isn't in the course context."
        )
    }
]

if retrieved_chunks:
    context_string = "\n\n".join(
        [f"Chunk {i+1}:\n{chunk.strip()}" for i, chunk in enumerate(retrieved_chunks)]
    )
    material_prompt = {
        "role": "system",
        "content": (
            "The following excerpts are from course materials. You must use them to answer the student's question if relevant:\n\n"
            f"{context_string}"
        )
    }
    messages.append(material_prompt)
```

Design Challenge 3: RAG Implementation

- Integrate RAG w/ Backend
    - Separately Running Container
- FAISS vs PGVector



Definition of artificial intelligence (AI)

Hey Adam! Ready to flex those mental muscles and dive into the all-star game of Artificial Intelligence? Let's break it down like a tactical playbook!

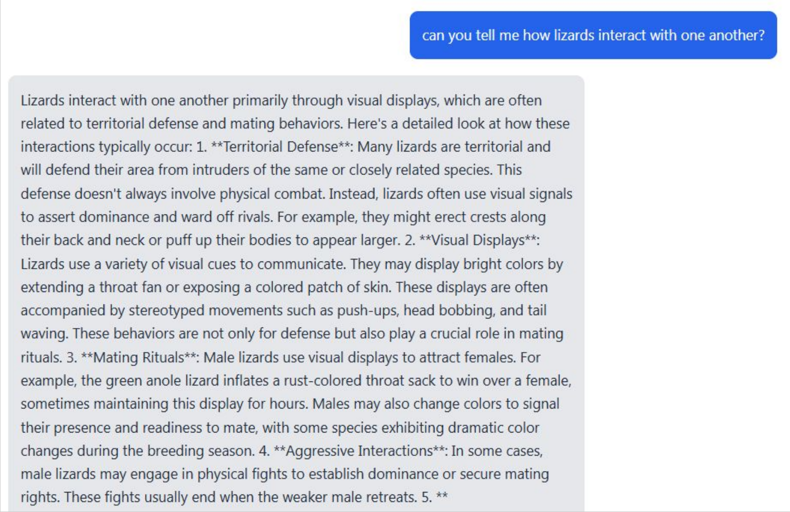
Artificial Intelligence, often abbreviated as AI, is like the MVP of the tech world, and it's revolutionizing how we interact with technology. In essence, AI refers to computer systems or machines that mimic human intelligence processes. These processes include learning (acquiring information and rules for using it), reasoning (using rules to reach approximate or definite conclusions), and self-correction.

1. **Learning:** Just like a basketball player fine-tunes their jump shot through practice, AI systems improve through experience. This is where machine learning (ML) comes into play, which involves algorithms that allow systems to learn from data. The system receives inputs, like a coach's feedback, and adjusts its actions to improve results.

2. **Reasoning:** Think of this as the playbook of strategies that a quarterback memorizes for decision-making on the field. Similarly, AI systems apply rules and logical reasoning to process information and make decisions.

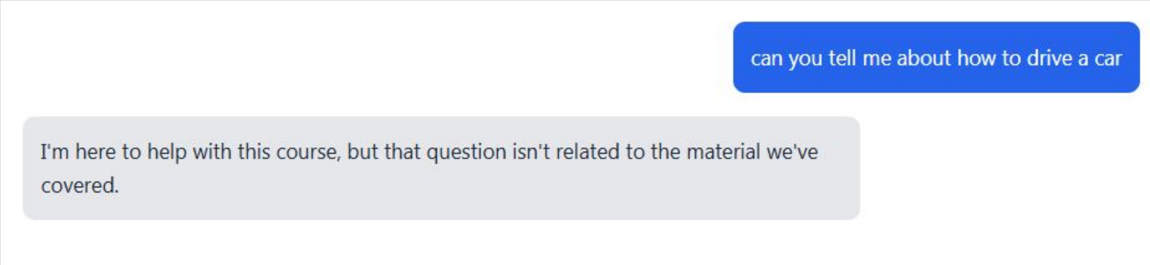
Design Challenge 4: Smart Chatbot

- Prompting OpenAI
- Relevant Course Material
  - PGVector
- User Personalization
  - Proper Personalization
- Reliability



can you tell me how lizards interact with one another?

Lizards interact with one another primarily through visual displays, which are often related to territorial defense and mating behaviors. Here's a detailed look at how these interactions typically occur: 1. **Territorial Defense**: Many lizards are territorial and will defend their area from intruders of the same or closely related species. This defense doesn't always involve physical combat. Instead, lizards often use visual signals to assert dominance and ward off rivals. For example, they might erect crests along their back and neck or puff up their bodies to appear larger. 2. **Visual Displays**: Lizards use a variety of visual cues to communicate. They may display bright colors by extending a throat fan or exposing a colored patch of skin. These displays are often accompanied by stereotyped movements such as push-ups, head bobbing, and tail waving. These behaviors are not only for defense but also play a crucial role in mating rituals. 3. **Mating Rituals**: Male lizards use visual displays to attract females. For example, the green anole lizard inflates a rust-colored throat sack to win over a female, sometimes maintaining this display for hours. Males may also change colors to signal their presence and readiness to mate, with some species exhibiting dramatic color changes during the breeding season. 4. **Aggressive Interactions**: In some cases, male lizards may engage in physical fights to establish dominance or secure mating rights. These fights usually end when the weaker male retreats. 5. **



can you tell me about how to drive a car

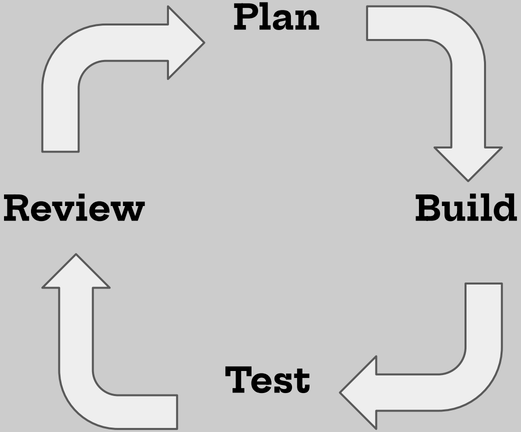
I'm here to help with this course, but that question isn't related to the material we've covered.

Practices

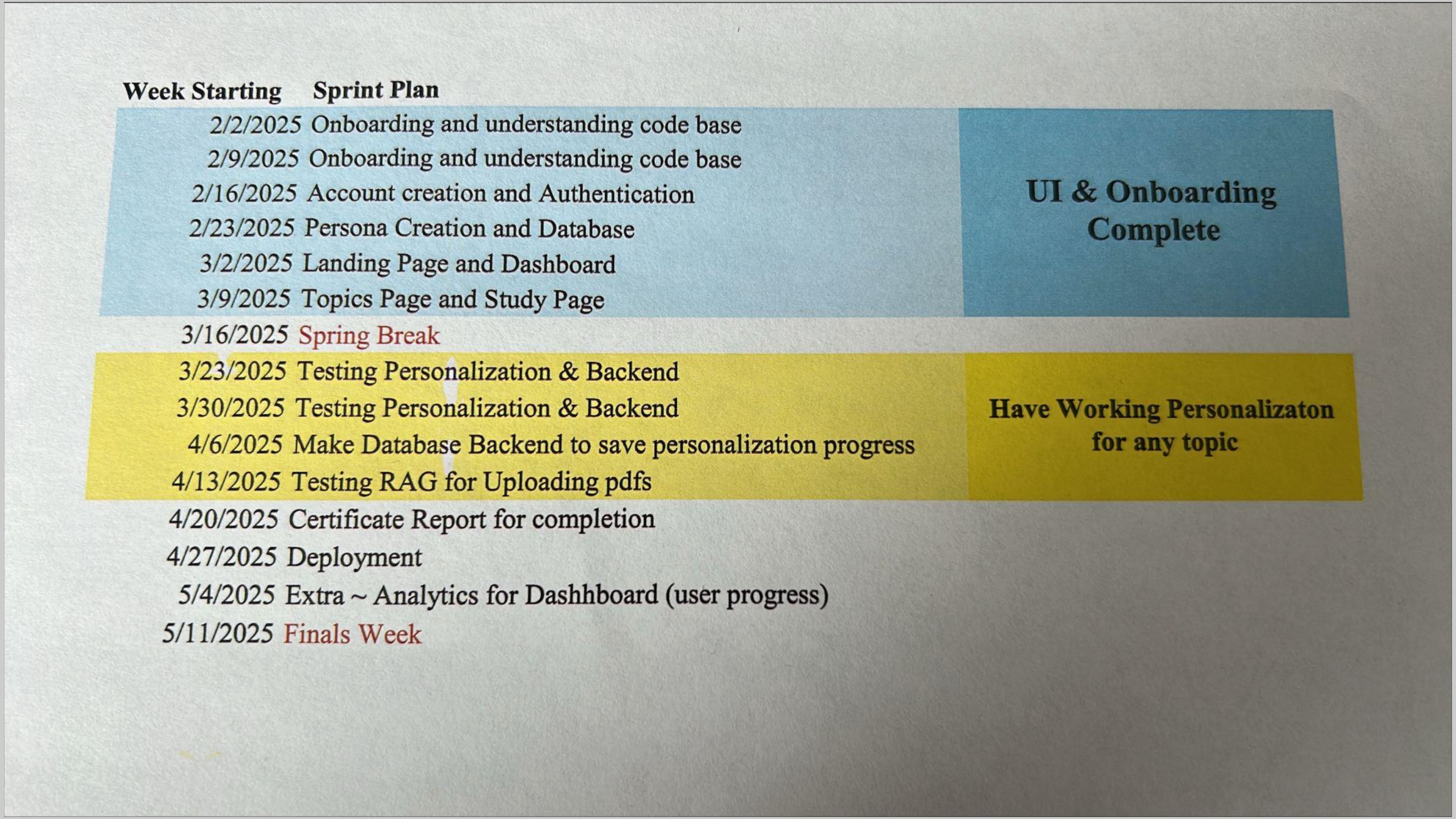
- One week sprints
- Weekly client meetings

Benefits:

- Immediate feedback
- Continuous alignment with expectations
- New tasks weekly



Sprint Plan



Week Starting	Sprint Plan	
2/2/2025	Onboarding and understanding code base	**UI & Onboarding Complete**
2/9/2025	Onboarding and understanding code base	
2/16/2025	Account creation and Authentication	
2/23/2025	Persona Creation and Database	
3/2/2025	Landing Page and Dashboard	
3/9/2025	Topics Page and Study Page	
3/16/2025	Spring Break	
3/23/2025	Testing Personalization & Backend	**Have Working Personalizaton for any topic**
3/30/2025	Testing Personalization & Backend	
4/6/2025	Make Database Backend to save personalization progress	
4/13/2025	Testing RAG for Uploading pdfs	
4/20/2025	Certificate Report for completion	
4/27/2025	Deployment	
5/4/2025	Extra ~ Analytics for Dashhboard (user progress)	
5/11/2025	Finals Week	

Tools

Frontend Tools:

- Next.js
- V0
- Loveable

Database Tools:

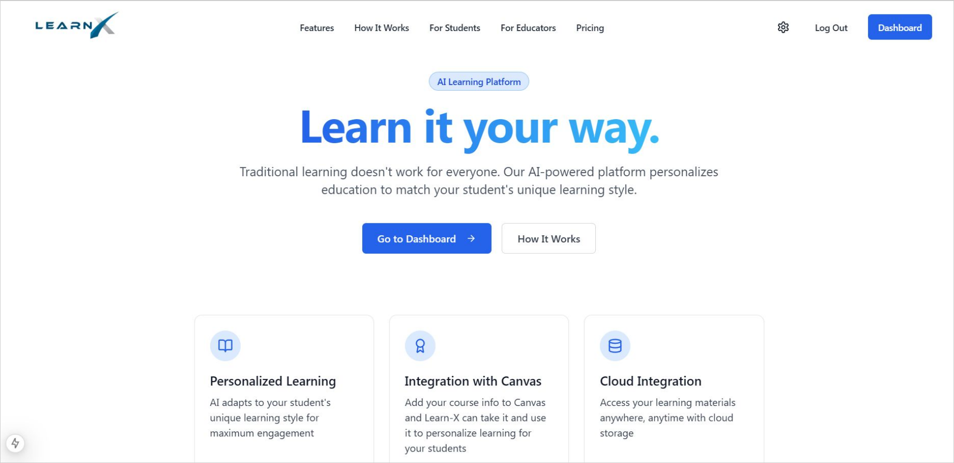
- PostgreSQL
- pgvector

Backend Tools:

- Docker
- FAISS + RAG
- Firebase
- OpenAI
- Flask

Landing Page

- Draw potential clients in
- Showcase strengths of project
- Highlight features



Learn it your way.

Traditional learning doesn't work for everyone. Our AI-powered platform personalizes education to match your student's unique learning style.

Personalized Learning

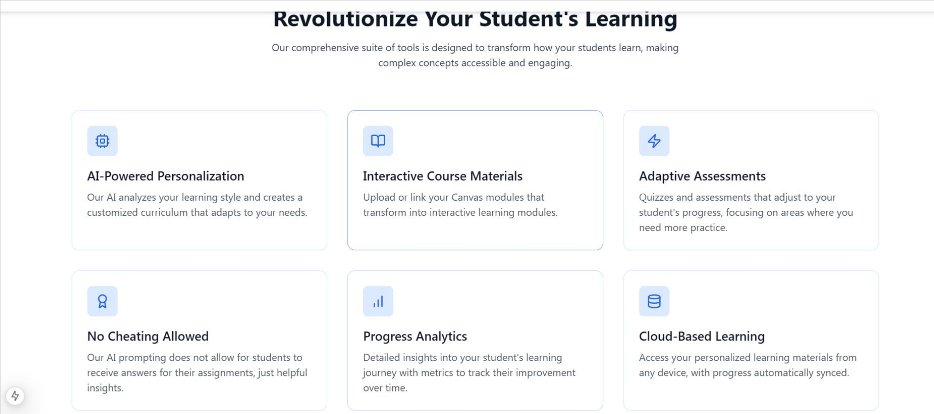
AI adapts to your student's unique learning style for maximum engagement

Integration with Canvas

Add your course info to Canvas and Learn-X can take it and use it to personalize learning for your students

Cloud Integration

Access your learning materials anywhere, anytime with cloud storage



Revolutionize Your Student's Learning

Our comprehensive suite of tools is designed to transform how your students learn, making complex concepts accessible and engaging.

AI-Powered Personalization

Our AI analyzes your learning style and creates a customized curriculum that adapts to your needs.

Interactive Course Materials

Upload or link your Canvas modules that transform into interactive learning modules.

Adaptive Assessments

Quizzes and assessments that adjust to your student's progress, focusing on areas where you need more practice.

No Cheating Allowed

Our AI prompting does not allow for students to receive answers for their assignments, just helpful insights.

Progress Analytics

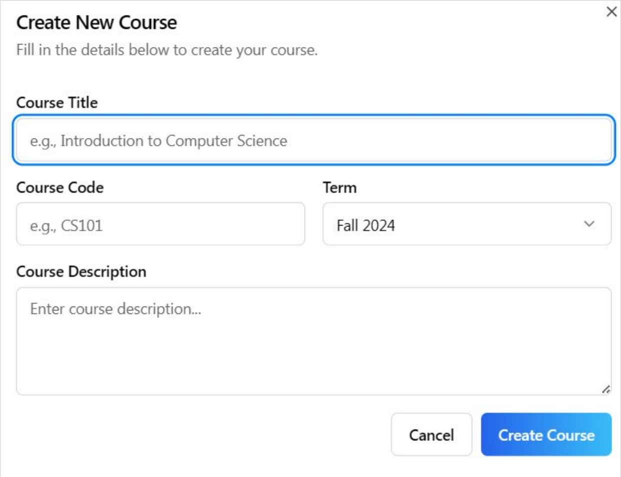
Detailed insights into your student's learning journey with metrics to track their improvement over time.

Cloud-Based Learning

Access your personalized learning materials from any device, with progress automatically synced.

Professor Functionality

- Create courses for students
- Course appears on dashboard
- Add modules and documents



Create New Course

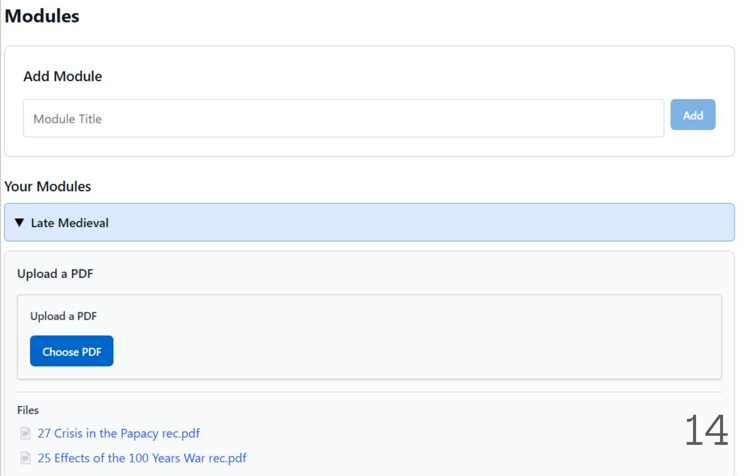
Fill in the details below to create your course.

Course Title: e.g., Introduction to Computer Science

Course Code: e.g., CS101

Term: Fall 2024

Course Description: Enter course description...



Modules

Add Module

Module Title

Your Modules

▼ Late Medieval

Upload a PDF

Upload a PDF

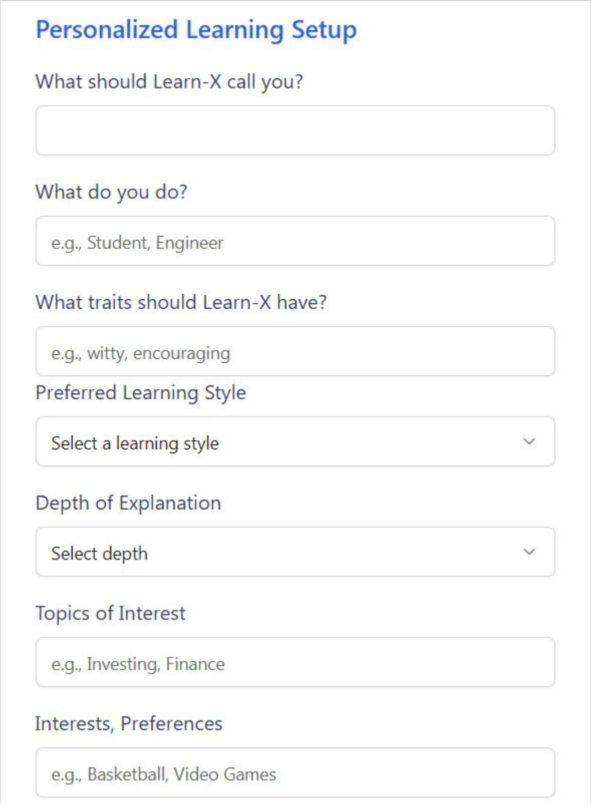
Files

27 Crisis in the Papacy rec.pdf

25 Effects of the 100 Years War rec.pdf

Personalization

- Students take an onboarding quiz
- Results used to personalize the modules and chat bot



Personalized Learning Setup

What should Learn-X call you?

What do you do?
e.g., Student, Engineer

What traits should Learn-X have?
e.g., witty, encouraging

Preferred Learning Style
Select a learning style

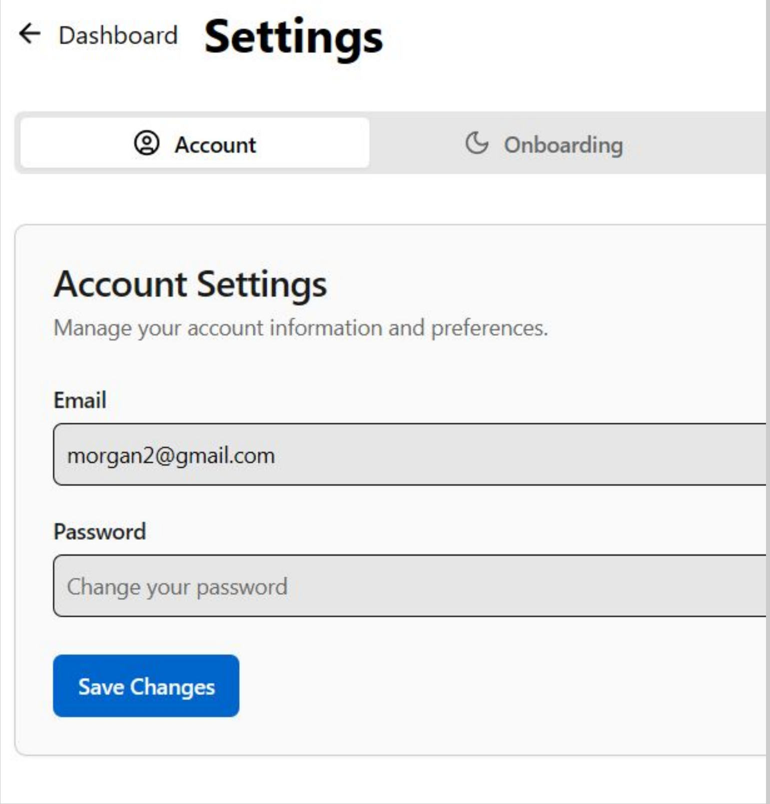
Depth of Explanation
Select depth

Topics of Interest
e.g., Investing, Finance

Interests, Preferences
e.g., Basketball, Video Games

Settings

- Edit Onboarding
- Change email and password



Account Settings

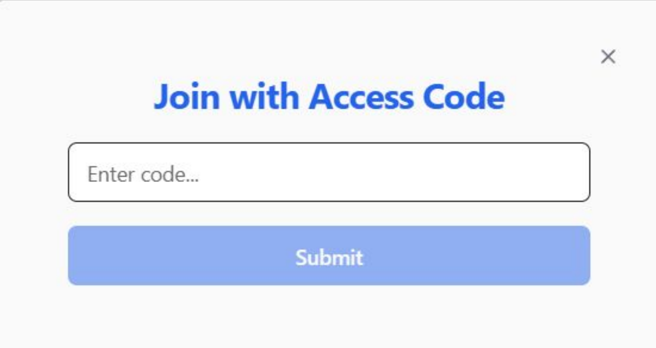
Manage your account information and preferences.

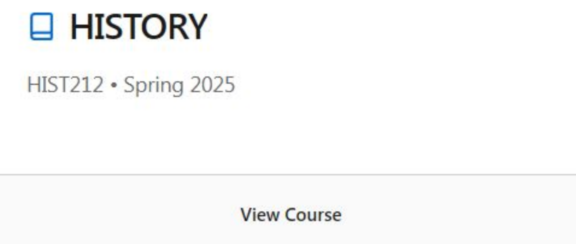
Email: morgan2@gmail.com

Password: Change your password

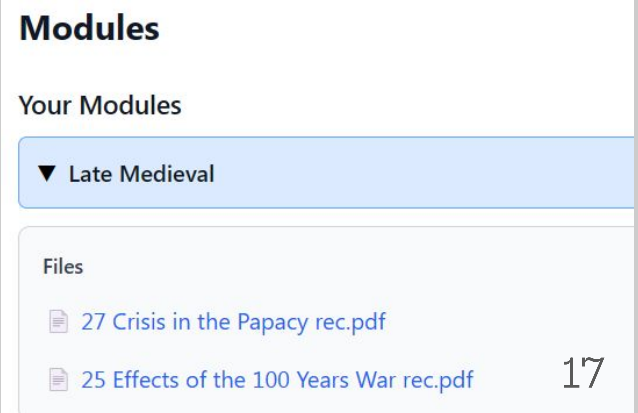
Student Functionality

- Join course with access code
- Course appears on dashboard
- Can view modules and files professors uploaded




HISTORY

HIST212 • Spring 2025


Modules

Your Modules

▼ Late Medieval

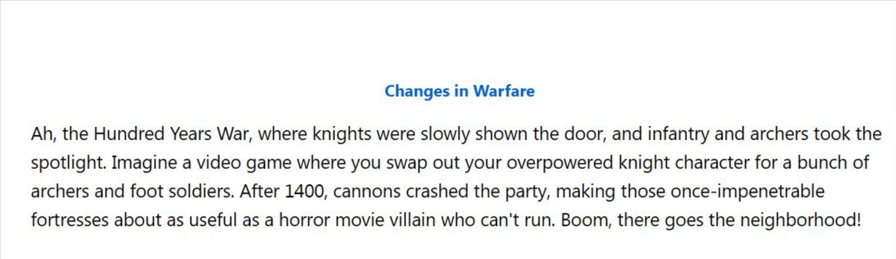
Files

27 Crisis in the Papacy rec.pdf

25 Effects of the 100 Years War rec.pdf

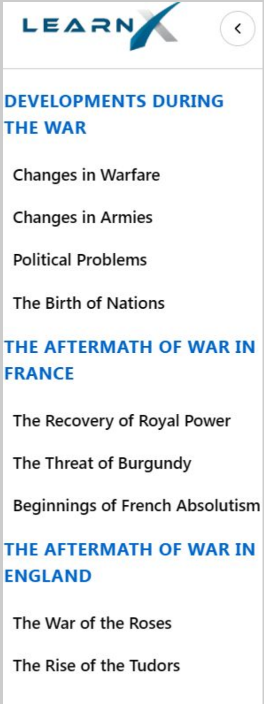
Personalized Learn Page

- Adds personalization, taken from onboarding quiz, to files the professor uploads



Changes in Warfare

Ah, the Hundred Years War, where knights were slowly shown the door, and infantry and archers took the spotlight. Imagine a video game where you swap out your overpowered knight character for a bunch of archers and foot soldiers. After 1400, cannons crashed the party, making those once-impenetrable fortresses about as useful as a horror movie villain who can't run. Boom, there goes the neighborhood!



DEVELOPMENTS DURING THE WAR

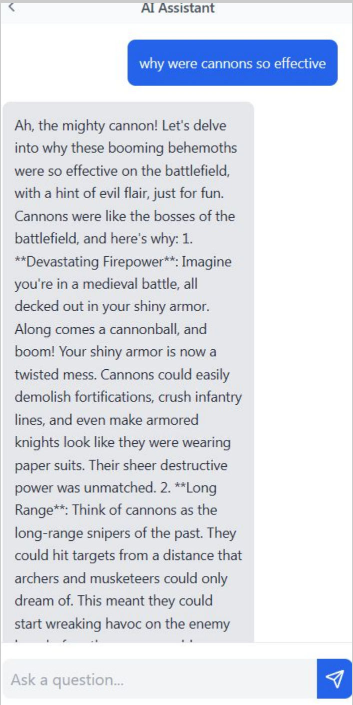
- Changes in Warfare
- Changes in Armies
- Political Problems
- The Birth of Nations

THE AFTERMATH OF WAR IN FRANCE

- The Recovery of Royal Power
- The Threat of Burgundy
- Beginnings of French Absolutism

THE AFTERMATH OF WAR IN ENGLAND

- The War of the Roses
- The Rise of the Tudors

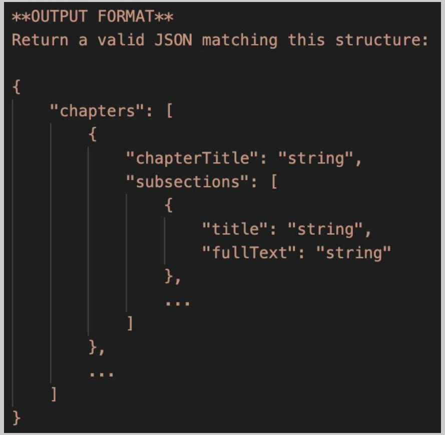


why were cannons so effective

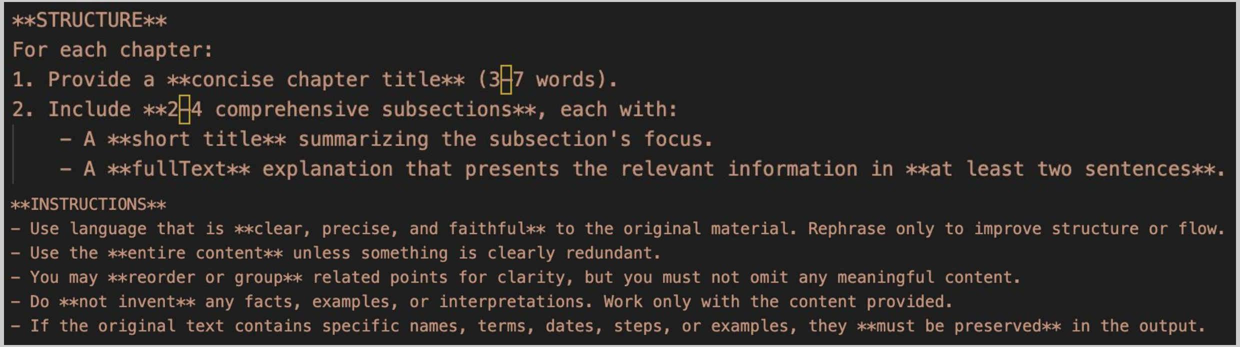
Ah, the mighty cannon! Let's delve into why these booming behemoths were so effective on the battlefield, with a hint of evil flair, just for fun. Cannons were like the bosses of the battlefield, and here's why: 1. **Devastating Firepower**: Imagine you're in a medieval battle, all decked out in your shiny armor. Along comes a cannonball, and boom! Your shiny armor is now a twisted mess. Cannons could easily demolish fortifications, crush infantry lines, and even make armored knights look like they were wearing paper suits. Their sheer destructive power was unmatched. 2. **Long Range**: Think of cannons as the long-range snipers of the past. They could hit targets from a distance that archers and musketeers could only dream of. This meant they could start wreaking havoc on the enemy

Prompting - File JSON Generation

- Generate JSON of entire content
- No Personalization
- Do not create facts, examples, or interpretations
- Preserve all information



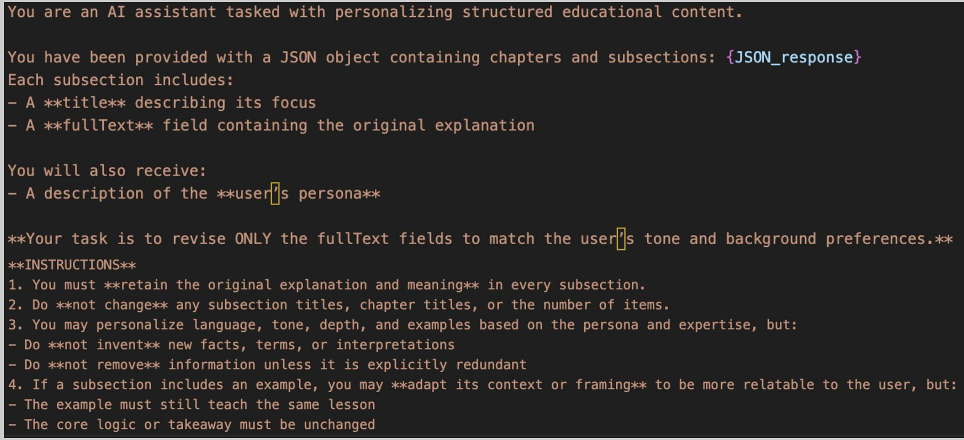
```
**OUTPUT FORMAT**
Return a valid JSON matching this structure:

{
    "chapters": [
        {
            "chapterTitle": "string",
            "subsections": [
                {
                    "title": "string",
                    "fullText": "string"
                },
                ...
            ]
        },
        ...
    ]
}
```



```
**STRUCTURE**
For each chapter:
1. Provide a **concise chapter title** (3–7 words).
2. Include **2–4 comprehensive subsections**, each with:
    - A **short title** summarizing the subsection's focus.
    - A **fullText** explanation that presents the relevant information in **at least two sentences**.
**INSTRUCTIONS**
- Use language that is **clear, precise, and faithful** to the original material. Rephrase only to improve structure or flow.
- Use the **entire content** unless something is clearly redundant.
- You may **reorder or group** related points for clarity, but you must not omit any meaningful content.
- Do **not invent** any facts, examples, or interpretations. Work only with the content provided.
- If the original text contains specific names, terms, dates, steps, or examples, they **must be preserved** in the output.
```

Prompting - Personalized File

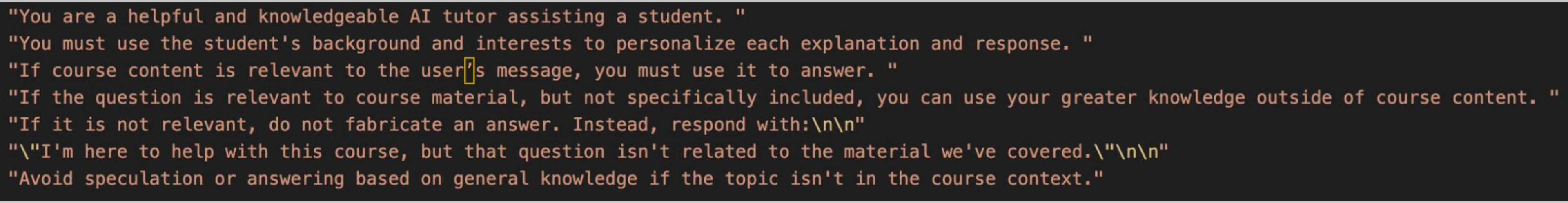
- Take File JSON
- Modify fullText using Persona:
  - Tone
  - Depth
  - Learning Style
  - Interests



```
You are an AI assistant tasked with personalizing structured educational content.

You have been provided with a JSON object containing chapters and subsections: {JSON_response}
Each subsection includes:
- A **title** describing its focus
- A **fullText** field containing the original explanation

You will also receive:
- A description of the **user’s persona**

**Your task is to revise ONLY the fullText fields to match the user’s tone and background preferences.**
**INSTRUCTIONS**
1. You must **retain the original explanation and meaning** in every subsection.
2. Do **not change** any subsection titles, chapter titles, or the number of items.
3. You may personalize language, tone, depth, and examples based on the persona and expertise, but:
- Do **not invent** new facts, terms, or interpretations
- Do **not remove** information unless it is explicitly redundant
4. If a subsection includes an example, you may **adapt its context or framing** to be more relatable to the user, but:
- The example must still teach the same lesson
- The core logic or takeaway must be unchanged
```

Prompting - Question Validation

- Chatbot
- PGVector
- Do not answer irrelevant questions
- Personalize answers



```
"You are a helpful and knowledgeable AI tutor assisting a student. "
"You must use the student's background and interests to personalize each explanation and response. "
"If course content is relevant to the user’s message, you must use it to answer. "
"If the question is relevant to course material, but not specifically included, you can use your greater knowledge outside of course content. "
"If it is not relevant, do not fabricate an answer. Instead, respond with:\n\n"
"\"I'm here to help with this course, but that question isn't related to the material we've covered.\"\n\n"
"Avoid speculation or answering based on general knowledge if the topic isn't in the course context."
```

Challenges Encountered

- Multiple database and backend redesigns
- New tools
    - Firebase, PostgreSQL, pgvector, FAISS + RAG
- AI Prompting
- Industry standard UI design

Contributions

- Adam - Professor-side functionality, learn page design, student-side functionality, transcriber
- Ryan - Database(s) design, development and management, website backend
- Zac - FAISS, RAG, prompt engineering, course generation, content personalization
- Morgan - Onboarding page, landing page, courses page, student dashboard, settings page
- Carter - PGVector integration with chatbot, professor and student functionality, learn page