



Team HAP

Michigan State University

Artificial Intelligence Training Course

Project Plan

Spring 2024

HAP Sponsors

Angela Endres

Steve Neubecker

Michigan State Capstone Team

Ashley Arciniega

Joey Morrison

Advait Paliwal

Caleb Story

Vetri Vijay

Table of Contents

<u>Executive Summary</u>	3
<u>Functional Specifications</u>	4
<u>Problem Statement</u>	4
<u>Objective</u>	4
<u>Use Cases</u>	4
<u>Functionality</u>	4
<u>Design Specifications</u>	5
<u>Overview</u>	5
<u>Dashboard</u>	5
<u>Modules</u>	6
<u>Avatar Interaction</u>	8
<u>Technical Specifications</u>	11
<u>System Architecture</u>	11
<u>System Components</u>	12
<u>Software</u>	12
<u>Development</u>	13
<u>Risk Analysis</u>	14
<u>Schedule</u>	15

Executive Summary

Health Alliance Plan (HAP) is a pioneering Michigan-based non-profit health insurance provider and subsidiary of the esteemed Henry Ford Health Systems. With a dedicated workforce of 1,100 employees serving a vast community of 430,000 insured members, HAP stands as a beacon of personalized care and customer-centric service. At HAP, the commitment goes beyond just providing insurance; it's about facilitating a seamless healthcare journey for every member. With 90% of premium revenue channeled directly into funding healthcare services, HAP sets the gold standard for utilizing resources to benefit its members. The mission is clear: to make the complex health care system easy for members to use.

HAP recognizes the imperative of remaining at the forefront of technological advancement to enhance customer value. Considering the transformative potential of AI in optimizing operational efficiencies, HAP integrates this cutting-edge technology into its workforce. In a world where AI often evokes apprehension due to misconceptions propagated by media narratives, HAP envisions a future where AI serves as a catalyst for positive change, enhancing productivity and efficiency without displacing jobs.

To actualize this vision, HAP proposes the implementation of a comprehensive AI training course tailored specifically for its workforce. This initiative bridges the gap between perception and reality, equipping employees with a nuanced understanding of AI's real-world applications. This course offers concise, user-friendly content presented through an accessible interface.

Central to the training program's effectiveness is the integration of AI chatbot technology and interactive avatars, providing a dynamic learning experience that fosters engagement and comprehension. Through hands-on interaction with AI-driven tools, employees gain practical insights into how AI can augment existing workflows, streamlining processes and enhancing decision-making Capabilities.

By championing AI literacy within its workforce, HAP not only future-proofs its operations but also cultivates a culture of innovation and adaptability. With each employee empowered to harness the potential of AI, HAP is primed to redefine the standards of excellence in healthcare provision, setting a precedent for industry-wide innovation and customer-centricity.

Functional Specifications

HAP is looking to teach managerial staff an overview of what AI is and what it can be used for. They believe that a web application is the best way to do this. This web app is a training course that takes roughly 30 minutes to complete and covers concepts such as LLM basics, vector databases, machine learning/neural network basics, AI applications, and popular LLMs. This content is at a complexity where anyone of any technical knowledge can understand it and is presented to the user through an AI-generated avatar.

This application is used to help employees at HAP understand what AI is and how it can be used by them. Many of the employees at HAP do not have a technical background, so all the content is presented in a way such that anyone of any level of technical knowledge can follow along and understand the course. This course is also intended to be short. Since we are only looking for a surface level of understanding, the entire course takes roughly 30 minutes to complete. The main objectives of this course are for users to understand AI basics at a high level, interact with an AI-generated avatar with voice, and ensure the course only takes 30 minutes.

After taking this course, the user not only is able to use AI to increase productivity but also uses it as a tool to solve everyday problems. Generative AI can be used to create documents and email templates so the user can focus on the content they want to fill it with. LLMs like ChatGPT can also be interacted with by the user to ask questions and receive more tailored feedback when compared to regular internet searches. Users can ask questions about new technologies they're learning and pick up on the context as opposed to an internet browser that takes all searches at face value.

Content is presented in many test formats as well as through an AI avatar "professor". The avatar can be interacted with by the user to ask questions about the course content and get individualized feedback. The user learns the content to answer a series of questions to test their retention of the content.

Design Specifications

Overview

HAP's AI training course is inclusive and available to all employees. Equipped with the same comprehensive features, including a structured curriculum comprising five modules, five mini-quizzes, a conclusive final quiz, a dedicated resource page connecting to external materials, a games page, and a news page. Designed with the aim of enhancing the understanding of artificial intelligence among non-technical staff, this web-application is optimized for compatibility with computer and mobile screens.

Dashboard

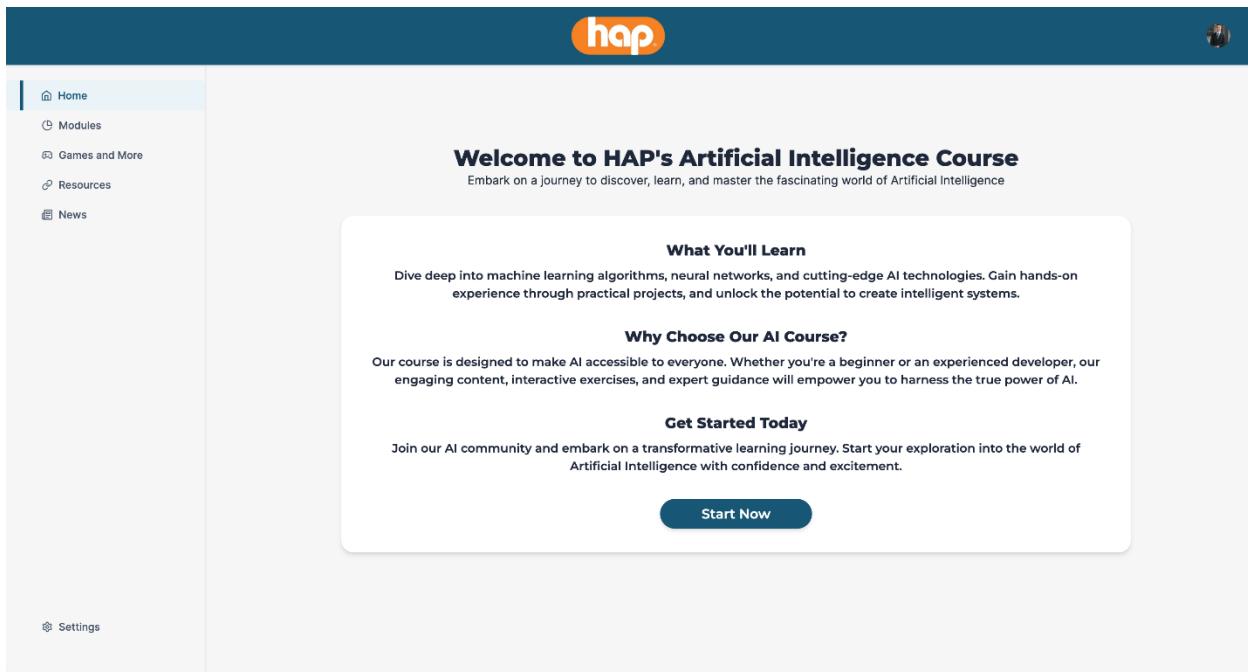


Figure 1 : Dashboard Mockup

The dashboard serves as our primary landing page, providing an overview of available modules and your progress within each. The sidebar navigation bar offers users the flexibility to access individual module descriptions, quizzes, or supplementary external resources.

Modules

Each module within HAP's AI training course is thoughtfully organized into digestible chapters, aimed at facilitating effective learning. Within each chapter, users encounter detailed information supplemented with common questions strategically placed to

reinforce understanding. Additionally, to foster engagement and support comprehension, every module incorporates a dedicated chat section where users can seek clarification or discuss concepts further. To gauge comprehension and retention, a mini quiz is included at the end of each module, providing users with an opportunity to assess their learning outcomes. This structured approach ensures that learners can progress systematically through the course content while actively engaging with the material at every stage.

The figures shown below are screen mockups for the web-application. Figure 2, shown below, shows the introductory page for Module 1.

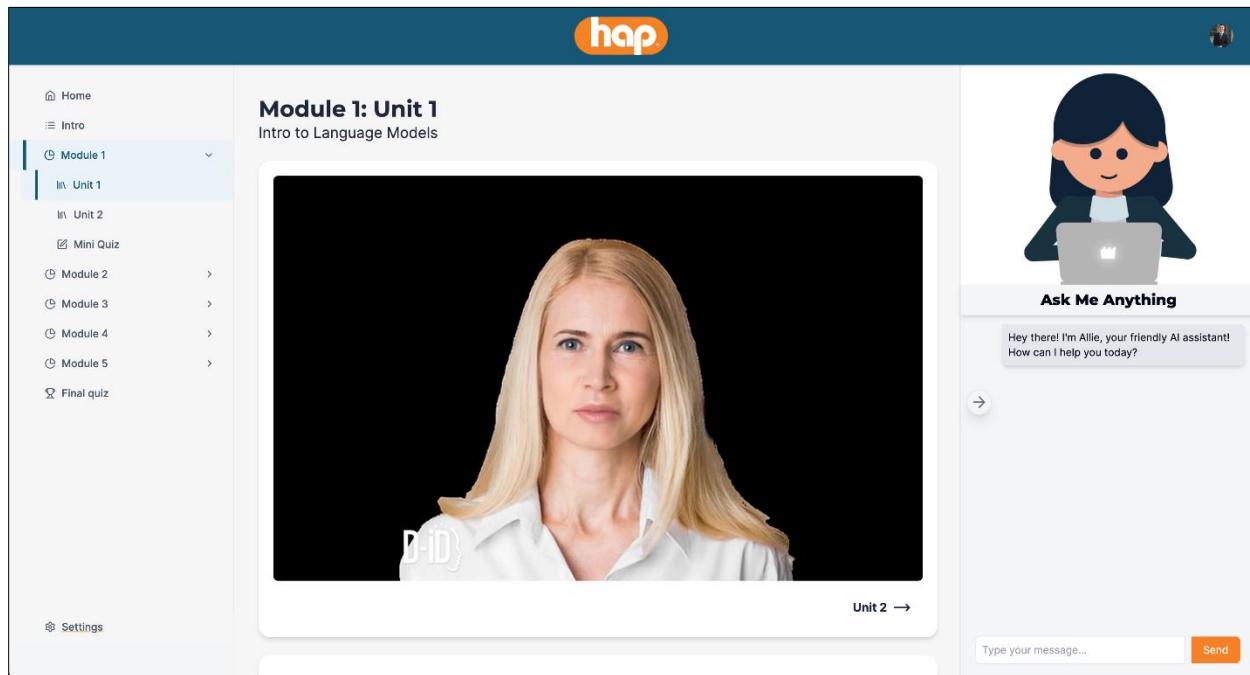


Figure 2 : Module

Figure 3, shown below, shows an example of what a chapter looks like. Lastly, figure 4, also shown below, shows an example of what a module quiz looks like. The module mini quizzes are comprehensive consists of ten questions focusing on just the module it is on. The final quiz is cumulative, focusing on the entire course.

Introducing Language Models

What are Language Models?

Language models are like smart friends for computers—they help them understand and predict human language. You know when your phone suggests the next word as you type? That's a simple version of what a language model does. It's like a helper that guesses what words might come next in a sentence, making it easier for computers to understand what you're saying.

Applications of Language Models

Language models are used in lots of everyday things, like texting, searching the internet, or talking to virtual assistants. They make our lives easier by predicting what we're trying to say or helping us find information faster. Whether it's completing your sentences or translating languages, language models are the behind-the-scenes helpers making it all happen.

How Language Models Predict Text

Ever wondered how your phone knows what word to suggest next? Language models use clever tricks to figure it out. They analyze lots of examples of text to understand patterns and relationships between words. By doing this, they can make educated guesses about what word might come next in a sentence, making them sound more like a human.

Language Models in Everyday Life

You might not realize it, but language models are all around us, making our digital lives smoother and more efficient. From auto-complete suggestions on your phone to voice commands with virtual assistants like Siri or Alexa, these models help us communicate with technology in a way that feels natural and intuitive.

The Inner Workings of Language Models

Learning from Textual Data

Language models learn from text data, just like students learn from textbooks. But instead of memorizing facts, they analyze patterns in sentences to understand how words fit together. By studying lots of examples, they get better at predicting the next word in a sentence or understanding the meaning behind what's being said.

Predictive Algorithms and Processes

Imagine trying to guess the next word in a sentence based on what came before. That's what predictive algorithms in language models do—they analyze the words you've already typed and make educated guesses about what might come next. These algorithms use fancy math and statistics to figure out the most likely next word, helping the model sound more like a human.

Adaptation and Feedback Mechanisms

Just like how humans learn from their mistakes, language models improve by receiving feedback. When you correct a typo or choose a different word from the model's suggestion, it learns from that feedback and gets better over time. This adaptability is crucial for improving the model's accuracy and making it more useful in real-world situations.

Enhancing User Experience through Continuous Learning

Figure 3: Chapter

Module 1

Language Models

Earn an 80% or higher on this quiz to move on.

Mini Quiz

Welcome to your first mini quiz on language models! Here are a few questions to test your knowledge so far:

Q1: What is the main function of a language model?
 To predict the weather
 To understand and predict human language
 To solve mathematical equations
 To play video games

Q2: How do language models learn from text data?
 By memorizing every word in the dictionary
 By analyzing patterns and relationships in sentences
 By guessing randomly
 By ignoring text data completely

Q3: What role does feedback play in improving language models?
 It helps models learn from their mistakes and adjust predictions
 It teaches models to speak different languages
 It confuses models and makes them less accurate
 It has no impact on language models

Q4: What is the main challenge associated with building and using large language models?
 Finding enough computational resources
 Finding enough data to train them
 Making them understand slang and informal language
 Keeping them from becoming too smart

Q5: How do self-attention mechanisms in Transformers work?

Ask Me Anything

Artificial Intelligence (AI) is a fascinating field of computer science where machines simulate human intelligence processes, such as learning, reasoning, problem-solving, perception, and understanding natural language. AI encompasses various technologies like machine learning, deep learning, neural networks, and more to enable machines to perform tasks that typically require human intelligence. In simpler terms, AI is like having intelligent machines that can think, learn, and make decisions similar to humans. These AI systems can analyze data, recognize patterns, make predictions, and automate tasks, leading to advancements in various fields such as healthcare, finance, transportation, and many others. AI is transforming the way we live and work, improving efficiency, accuracy, and decision-making processes across industries.

Type your message... Send

Figure 4: Quiz

Chat Integration

The chat feature is intended to give users hands-on experience of what it's like interacting with artificial intelligence. Here, you can interact with our AI bot Allie. She can answer any of your questions on artificial intelligence. Figure 5, shown below, shows the text chat feature.

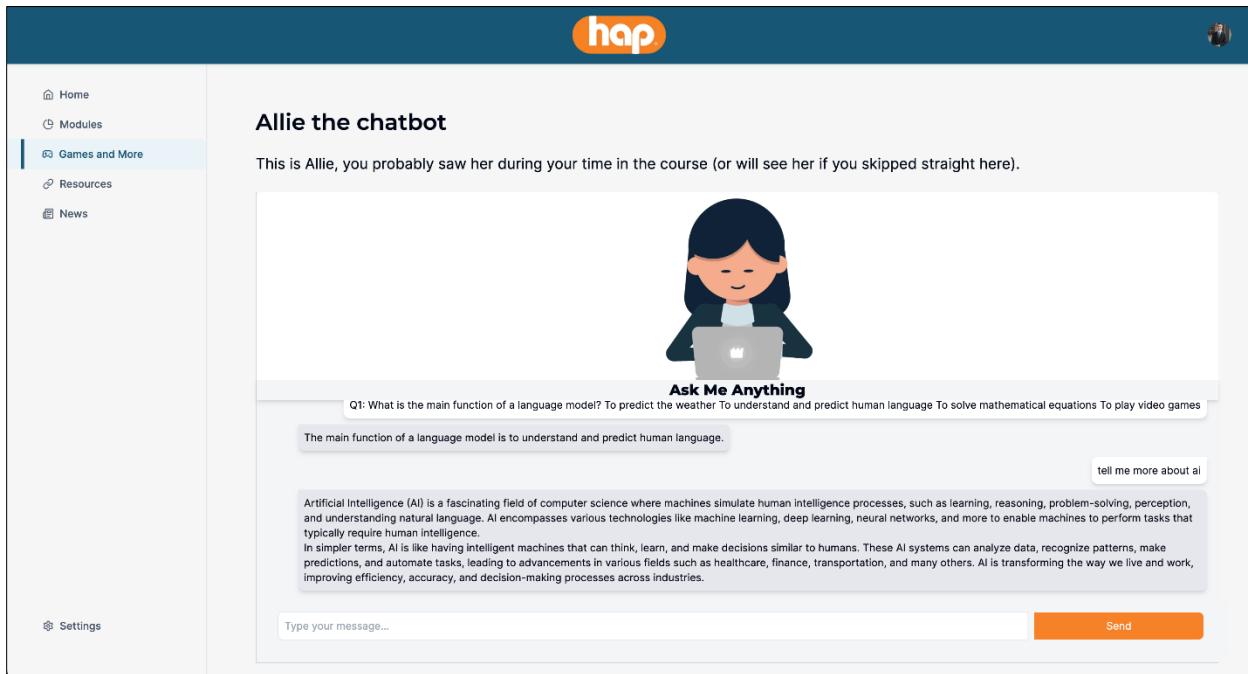


Figure 5: Chat

Interactive Sections

In addition to the core learning course, there are some interactive sections that can be used by the employees. One of which is the Games and More. This section allows for the user to further gain an understanding of AI through games and activities. The user has the choice of playing a game of Hangman or Memory with AI related terms, taking an interactive tutorial of the AI chatbot, and using an object detection model on the user's uploaded images as shown in Figure 6.

Another section that we have in addition to the learning course is AI news. In this section, the user is able to see all the most recent news relating to artificial intelligence. The user is able to search for specific terms to further filter the responses. Figure 7 shows the news page

Games

- Hangman**
Average Time: 2 min.
Difficulty: Easy
- Memory**
Average Time: 3 min.
Difficulty: Medium
- Allie the Chatbot**
Average Time: 3 min.
Difficulty: N/A
- Object Detection**
Average Time: 5 min
Difficulty: N/A

[Photo Credits](#)

Figure 6: Games

Latest AI News

Search for news...

Meta is so desperate for data sources to train its AI it weighed risking copyright lawsuits: report
Business Insider on MSN.com ~ 4/6/2024
MSN is a Microsoft-owned web portal that offers a variety of internet services such as news, entertainment, and communication tools.

9 hot AI jobs you can get without knowing how to code
Business Insider on MSN.com ~ 4/6/2024
MSN is a Microsoft-owned web portal that offers a variety of internet services such as news, entertainment, and communication tools.

Can AI Show Cognitive Empathy via Acoustics?
Psychology Today ~ 4/6/2024
The article discusses the potential for AI to demonstrate cognitive empathy through acoustics and provides resources for finding therapists and information on mental health, addiction, personality, personal growth, relationships, and family life. A recent study shows that AI can accurately recognize emotions from audio clips, highlighting its potential in psychology. The study also explores the use of various features in analyzing audio recordings. The article also mentions the potential of AI in other fields such as drug production and offers information on the writer and the website, Psychology Today. The website offers resources for mental health and allows users to find therapists and treatment centers. The article also covers the topic of low sexual desire and provides resources for seeking help. The magazine section focuses on emotional intelligence and its impact on relationships and society.

Apple licenses millions of Shutterstock images to train its AI models

Figure 7: News

Technical Specifications

System Architecture

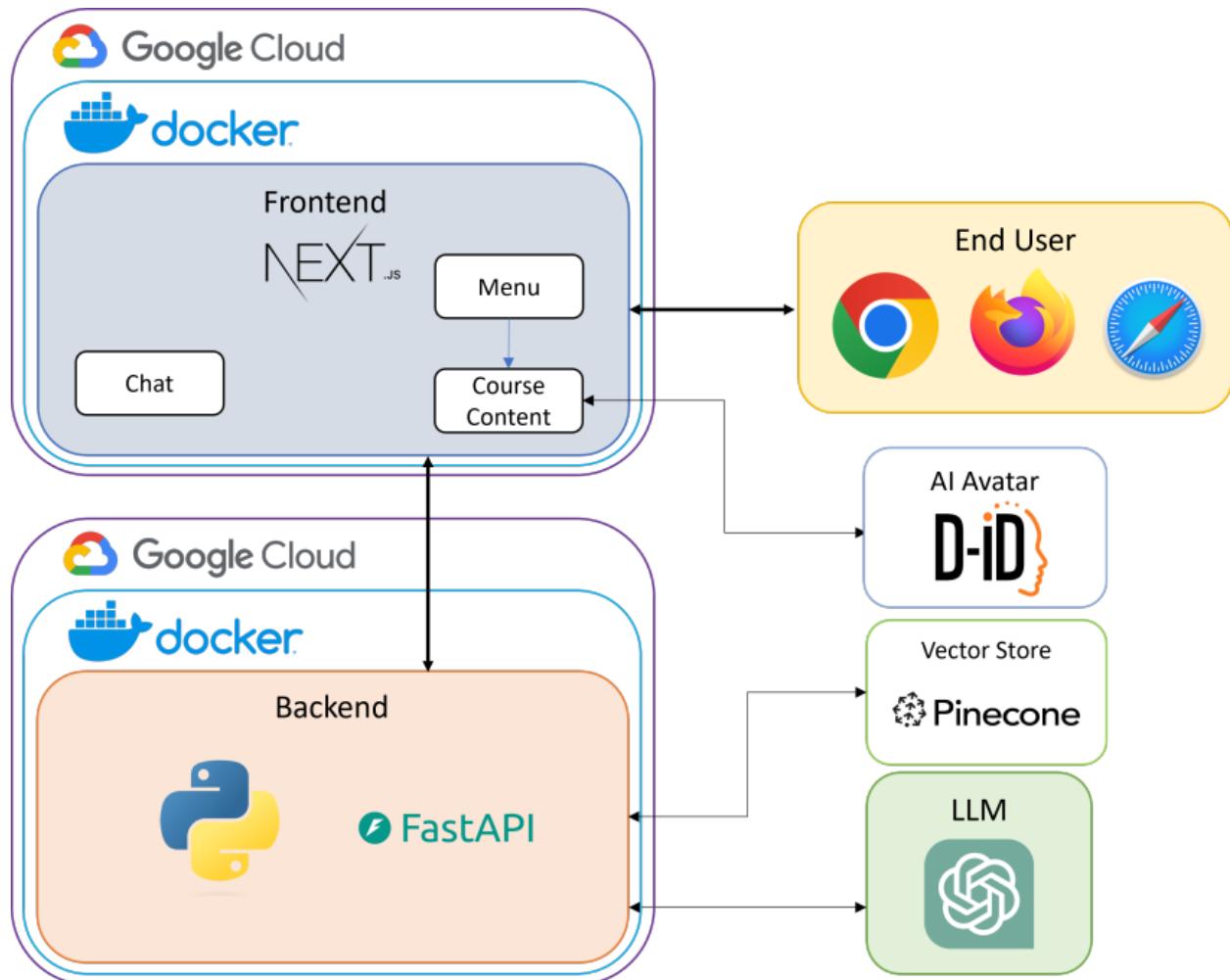


Figure 7: System Architecture

System Components

Software

Docker

- Containerization: Used for packaging the application and its dependencies into containers. Ensures consistency across multiple development, testing, and production environments, facilitating easy deployment and scaling.

FastAPI

- API Interface: Utilized to create a high-performance, asynchronous API interface. Enables the development of RESTful APIs with automatic interactive documentation, validation, and serialization, enhancing the efficiency and reliability of the system's backend services.

Google Cloud Platform

- Cloud Run: Serves as the primary compute platform for the HAP project, offering fully managed, serverless, and event-driven capabilities. It enables the deployment of containerized applications, ensuring scalability and seamless integration with other GCP services.
- Secrets Manager: Used to securely store and manage sensitive information such as API keys, ensuring that these secrets are encrypted, access-controlled, and auditable.

MongoDB

- Database: Serves as the primary database for the project, offering a flexible and scalable NoSQL database solution. It is used to store and manage structured and unstructured data efficiently.

Next.JS

- Web Framework: Employed as the web framework for the project, providing a robust platform for building server-rendered React applications. Ensures fast page loads, automatic code splitting, and streamlined data fetching, enhancing the user experience of the web application.

OpenAI

- GPT API: Integrated to provide advanced natural language processing capabilities. Enables the system to understand, generate, and interact with human-like text, forming the core of the HAP's conversational AI.

Pinecone

- Vector Store: Acts as the vector store for the project, providing a scalable and efficient solution for storing and querying large-scale vector embeddings. This is crucial for maintaining the memory and context of GPT interactions, enhancing the overall performance and relevance of the responses.

shadcn/ui

- UI Components: An open-source UI component library integrated to accelerate the development of the user interface. Provides a consistent and modern look and feel across the application, improving user engagement and satisfaction.

Development Environments

GitLab

- Version Control: Serves as the version control system for the project, offering a single application for the entire DevOps lifecycle. Facilitates collaborative coding, continuous integration/continuous deployment (CI/CD), issue tracking, and code review, ensuring efficient and high-quality software development.

Trello

- Task Management: Serves as a web-based project management tool that uses a card-based system for organizing tasks and projects. It's designed to visually represent workflows, facilitating the ability to manage tasks, collaborate, and track progress.

Visual Studio Code

- Prototyping: Serves as a collaborative interface design tool used for creating user interfaces, web pages, and app prototypes. It operates entirely in the browser, allowing multiple users to work on the same design simultaneously, fostering real-time collaboration and feedback.

Risk Analysis

Avatar Cost

Difficulty: Medium

Description: The potential lack of a dedicated budget for the avatar is a significant concern due to the high costs usually associated with avatar services.

Mitigation: Interaction during Q&A sessions primarily utilize chat responses instead of more resource-intensive avatar responses.

Technical Limitations of AI and LLMs

Difficulty: High

Description: Large Language Models (LLMs) might not always produce accurate or contextually appropriate responses, a crucial factor for the integrity of the service.

Mitigation: Continuous updates and training with pertinent data is implemented to enhance the AI model's accuracy and contextual relevance.

Latency of Product

Difficulty: Medium

Description: Latency in response generation could adversely affect user experience, as swift and seamless interaction is anticipated in dynamic AI-driven interfaces.

Mitigation: Caching of the course content and the avatar is implemented to improve response times and overall user interaction.

Content Relevance

Difficulty: High

Description: The rapid advancement in the field of AI presents a risk of course content becoming quickly outdated, with ongoing project involvement for updates potentially unfeasible.

Mitigation: Scheduled updates and the utilization of AI's adaptability in course material development is employed to maintain content relevancy and timeliness.

Schedule

Week 1 – 4: Jan 8 – Jan 29

- Develop front end and back end skeleton
- Choose Avatar and begin development
- Create rough draft of UI design

Week 4: Jan 29 - Feb 2

- Connect all of the individual pieces (frontend, backend, cloud, and avatar)
- Have all the course content finalized and approved
- Finish fully functional prototype on Figma

Week 5: Feb 5 - Feb 9

- Debug until the individual parts of the project communicate effectively.
- Develop the dashboard page
- Begin avatar integration

Week 6: Feb 12 - Feb 16

- Make the backend call the OpenAI API and display on frontend
- Develop course modules
- Continue avatar integration

Week 7: Feb 19 - Feb 23

- Link the avatar to the course content
- Begin the chat functionality

Week 8: Feb 26 - Mar 1

- Finish the chat functionality
- Develop the final quiz site
- Add extra materials to resource page

Week 9: Mar 4 - Mar 8

- Ensure that the UI/UX is smooth and consistent for the user
- Ensure all content is accurate and all quizzes are functional
- Begin games page

Week 10: Mar 11 - Mar 15

- Finish the avatar's functionality with the frontend and course content
- Make sure that all aspects of the course are linked and communicate together.
- Add more games

Week 11: Mar 18 - Mar 22

- Add final features to the avatar, chatbot, and course content.
- Polish the UX
- Create news page

- Improve games page

Week 12: Mar 25 - Mar 29

- Continue debugging
- Wrap up stretch goals
- Improve news page, add scheduler

Week 13: Apr 1 - Apr 5

- Beta Presentation
- Bug fixes
- Finalize stretch goals

Week 13: Apr 8 - Apr 12

- Bug fixes

Week 14: Apr 15 - Apr 19

- Bug fixes