
EE/CprE/SE 491

Iowa State A.I. Schedule Companion

Weekly Report #2

Wednesday, February 7 - Tuesday, February 13

Group number: ssdec24-08

Client: Koby Fowler

Faculty Advisor: Abraham Aldaco

Team Members:

Koby Fowler - Overall Application Leader

Chandrashekar Tirunagiri - Frontend Design Leader

Raghuram Guddati - Backend Design Leader

Jacob Paustian - Artificial Intelligence Research Leader

Christian Deam - Meeting Manager

Anna Huggins - Team Manager/Communicator

Weekly Summary

As the previous week was meant for us to get situated with our roles and come to terms with what our responsibilities are, this week was about the cementation of that fact via action. Each of us began to perform the bare necessities regarding our tasks, a key detail being that the front-end and back-end of our project were beginning to form, with the back-end having a slight head start and full contact with our advisor and proposed meetings at least once a month. We have also changed the name of our project to "Iowa State A.I. Schedule Companion" instead of "A.I. Schedule Companion." This formal change allows us to consistently talk about the project in full name without confusion, as there is now only one name.

Past Week Accomplishments

Front-end Meeting - Koby Fowler & Chandrashekar Tirunagiri

- Topic: front-end web page designs
 - Discussed homepage design changes based on current Figma designs & abstracting the login and sign-up pages in fech-login branch (GitHub)

Infrastructure Set Up & Hosting - Koby Fowler

- **Infrastructure Set Up**
 - Met with Raghu to explain how the infrastructure works and how to use it
 - Set up the RDS PostgreSQL database
 - Created AWS user groups
 - Created EC2 instance
 - Initialized Terraform
- **Hosting**
 - Completed hosting our site with Amplify

Structure Adaptation, Page Development - Chandrashekar Tirunagiri

- **Project Structure Adaptation:**

Went through Next.js 14.1 documentation for the new features and file structure in the new version of Next.js 14.1
- **Development of Login and Sign-Up Pages:**

Utilization of Material-UI: Leveraged Material-UI (now MUI) components for the design and layout of the Login and Sign-Up pages. This involved using `@mui/material` for UI components like text fields, buttons, and layout controls, and `@mui/icons-material` for adding intuitive icons to the user interface.

Form Implementation: Integrated forms on the Login and Sign-Up pages to collect user information. Ensured the forms are user-friendly and responsive, employing MUI components for form fields, validation, and submission handling.

Styling and Responsiveness: Applied custom styles using MUI's theming capabilities to ensure the pages are visually appealing and maintain consistency with the overall design system. Also, ensured that the Login and Sign-Up pages are responsive and provide a seamless experience across different devices and screen sizes.
- **Home Page Template Development:**

Layout Design: I began crafting the Home page template but must design more based on the OpenAI. Either prompts or text fields or have a simple welcome page.

- **Learning:**

In addition to my frontend responsibilities, I developed my technical expertise by engaging with Terraform, a leading Infrastructure as Code (IaC) tool. My learning journey was facilitated through an in-depth tutorial provided by HashiCorp, focusing on provisioning AWS EC2 instances. To gain practical experience and better understand the nuances of infrastructure automation, I utilized my own AWS account to experiment with Terraform.

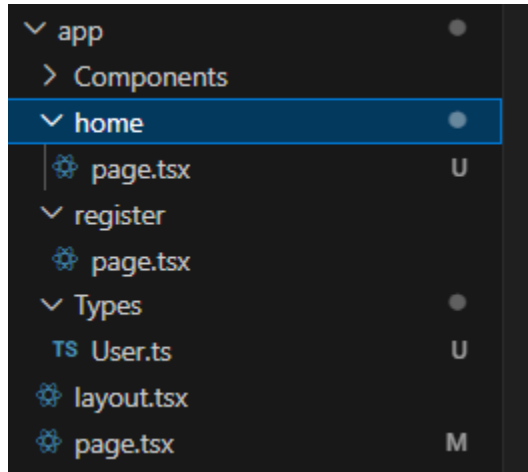


Figure 1: File structure.

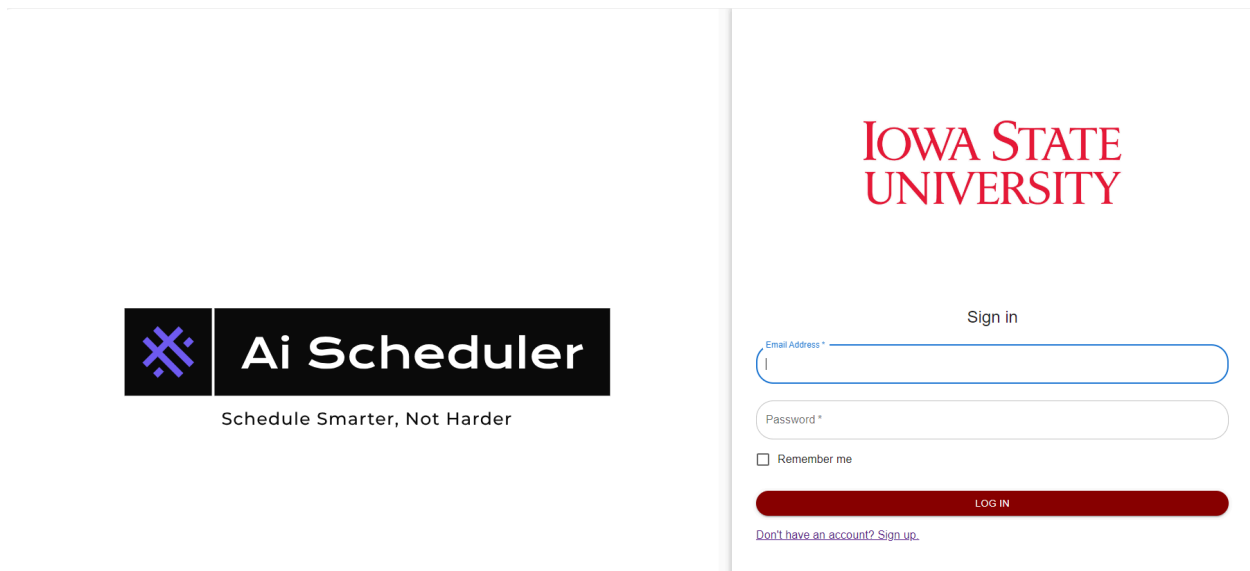


Figure 2: Login page.

IOWA STATE
UNIVERSITY

Sign up

[Don't have an account? Sign up.](#)

Figure 3: Sign-up page.

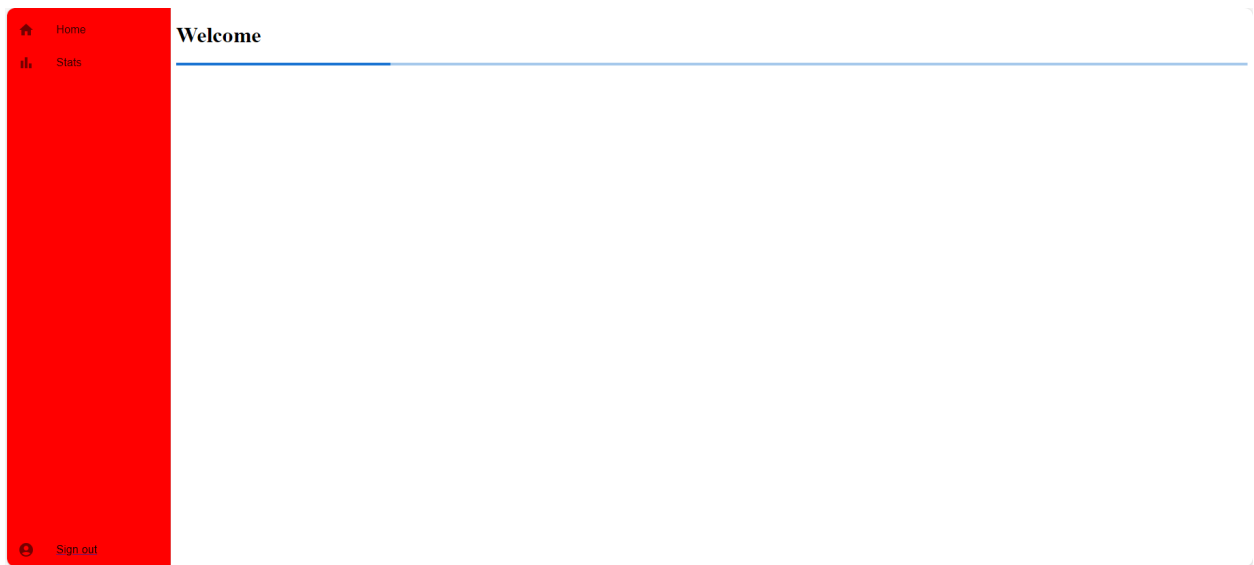


Figure 4: Basic home page template.

Learning Infrastructure - Raghuram Guddati

- I spent some time this week getting used to Terraform and learning more about PostgreSQL.
- I met with our team leader about planning the steps needed to build backend databases using PostgreSQL and Terraform.
- I learned more about AWS, especially how Amazon S3 works. To do this, they had to learn how to create buckets and post files quickly. I also learned how to start an EC2 instance and how to connect to it using SSH or RDP.

- **Overview of What I learned:**

- **Terraform:** I found out that Terraform makes managing infrastructure easier by letting you define infrastructure as code. This makes it possible to automatically set up resources and handle them similarly on all cloud platforms.

Example:

```
provider "aws" {  
  region = "us-west-2"  
}
```

```
resource "aws_instance" "example" {  
  ami      = "ami-0c55b159cbfafa1f0"  
  instance_type = "t2.micro"  
}
```

When we run this Terraform configuration, it will create an EC2 instance in the specified AWS region using the specified AMI and instance type.

- **PostgreSQL:** One important thing I learned about PostgreSQL is that it strictly follows ACID rules, which protect the security and dependability of data. I also thought it was great how easily it could be expanded with different add-ons, which added advanced features like full-text search and JSON support.

GPT API Research & Proof-of-Concept - Jacob Paustian

- This week, I:
 - Aimed to conduct more research with the GPT API.
 - Developed a small proof-of-concept making use of GPT and LangChain.

High-Level Overview of what I learned:

1. Text Generation Models are trained to understand natural language, code, and images.
2. These models are referred to as "Completions."
3. The Completions API requires two fields per request: a message and a model.

4. Completions return JSON containing choices, misc identifiers, and usage stats.

Messages JSON:

- Contains two required fields
 - role: Can be one of the following roles:
 - user - The role of the user talking to GPT.
 - assistant - The role of GPT responding to the user.
 - system - The role of an intermediary user, such as an administrator, can internally give instructions to an assistant.
 - content
- Upon calling `openai.chat.completions.create()`, a Promise object is returned.

Completion JSON:

- The response to a Message.
- Contains the following:
 - choices. choices are a feature I still need to understand. ChatGPT uses these when you are given two options and are asked to pick which one answers your question better.
 - Identifiers such as id, model, and object.
 - Usage stats. These entail:
 - `completion_tokens`: the number of tokens spent on the response
 - `prompt_tokens`: the number of tokens spent on the question
 - The number of tokens is determined internally, but roughly can be evaluated as the number of syllables.
 - For example: "ChatGPT is great!" uses the following: ["Chat", "G", "P", "T", "is", "great"]
 - There exists a tool called "tiktoken" that I would like to look into that is used to help developers monitor and count tokens.

With all this said, I have learned something new: OpenAI's API in no way, shape, or form remembers previous questions/responses. It is up to the developer to ensure that information persists into new requests. This can be done in multiple ways, but the framework I have seen people mention is called LangChain. LangChain is a massive new API all on its own, but one of its introductory features is Context-Awareness, where the developer can connect a language mode (like GPT) to sources of "context." For brevity's sake, I could follow their documentation enough to assemble a rudimentary chatbot. Below is a screenshot of me playing 20 questions with it to prove I have a working "memory!" To make this app, I also learned about Next.js, the frontend framework we have chosen to use. I was unfamiliar with it at the time, and frankly still am, but I have done just enough to have something fully functional!

Yes! Submit

```
main-app.js?v=1707872930571:94
Download the React DevTools for a better development experience: https://reactjs.org/link/react-devtools
You: Let's play 20 questions. page.tsx:15
Chatbot: Sure, I'll start. Is it an animal? page.tsx:18
You: Nope. page.tsx:15
Chatbot: Is it a man-made object? page.tsx:18
You: Yes. page.tsx:15
Chatbot: Is it something that is commonly found in households? page.tsx:18
You: Yes. page.tsx:15
Chatbot: Is it smaller than a breadbox? page.tsx:18
You: I don't think I know how big a bread box is? page.tsx:15
Chatbot: A breadbox is typically used to store bread and is usually around 16-18 inches long. So, is the object you're thinking of smaller than that? page.tsx:18
You: Oh yeah should be. page.tsx:15
Chatbot: Is it used for entertainment purposes? page.tsx:18
You: Could be page.tsx:15
Chatbot: Is it electronic? page.tsx:18
You: Yes page.tsx:15
Chatbot: Is it a television? page.tsx:18
You: No page.tsx:15
Chatbot: Is it a video game console? page.tsx:18
You: Yes page.tsx:15
Chatbot: Is it a PlayStation? page.tsx:18
You: Yes! page.tsx:15
Chatbot: Great! I guessed it correctly. That was fun! Do you want to play another round or is there something else I can assist you with? page.tsx:18
```

Figure 5: Open API Screenshot.

Additional Assignment & Summary - Christian Deam

- Formally assigned to aid in the backend
- Made the weekly summary

Submitted Project Requests, Revised Team Contract - Anna Huggins

- **Submitted Project Request to OARDE**
 - Building on the previous Google Forms draft of our student survey (See Figures 2.1 and 2.2 of Report 1), I reached out to the Office of Assessment, Research, and Divisional Effectiveness about conducting a student survey
 - Status: I was contacted by Matt Pistilli to clarify the scope of our survey and our project. After emailing him back, I await future contact regarding our next steps.
- **Requested funding from ETG for AWS, ChatGPT-4.0, and Domain Names**
 - Emailed ETG regarding funding for:
 - Amazon Web Services
 - ChatGPT-4.0
 - Researched which version of the ChatGPT API we will need for this project

- Approximated pricing of desired API for funding request
 - Domain names (2 needed)
 - Desired domain name: “isu-companion”
- **Revised Team Contract**
 - Based on TA feedback, re-formatted and organized the entire team contract to emphasize professionalism
 - Submitted updated document
- **Updated Report Template**
 - Based on some changes I made using similar formatting in the Team Contract, I went back and updated the Report Template I created last week
 - No major changes were made, just slight formatting updates, and some minor typos were corrected

Individual Contribution Tracker

Name	Individual Contributions	Hours this Week	Hours Cumulative
Raghuram Guddati	<ul style="list-style-type: none"> - Had a discussion with my team leader on the code infrastructure and discussed the creation and structuring of the backend DB using PostgreSQL - I also did a little bit of learning on Terraform to create Databases in PostgreSQL 	6.0	12.0
Christian Deam	<ul style="list-style-type: none"> - Made the weekly summary 	1.0	3.5
Jake Paustian	<ul style="list-style-type: none"> - Performed research on OpenAI's API - Performed research on LangChain's API - Built a demo app that allows users to interact with an introductory chatbot capable of using context and memory 	6.0	9.5
Anna Huggins	<ul style="list-style-type: none"> - Contacted Assessment, Research, and Divisional Effectiveness about conducting a student survey - Revised & re-submitted Team Contract - Contacted ETG regarding funding for AWS and ChatGPT API - Updated Report 2 template formatting - Scheduled front-end design meeting with Chan 	5.0	9.0
Chandrashekar Tirunagiri	<ul style="list-style-type: none"> - Attended front-end meeting to discuss login page design - Designed the login, sign up page and simple home page template - Learned terraform - Scheduled front-end design meeting with Anna 	8.0	9.0
Koby Fowler	<ul style="list-style-type: none"> - Attended front-end meeting to discuss login page design - Completed hosting with Amplify - Set up RDS PostgreSQL database - Created EC2 instance 	12.0	22.0

	- Initialized Terraform - Taught Raghu infrastructure		
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Pending Issues

Issue #1 - Confirming Funding for ChatGPT API and Amazon Web Services (AWS)

- **Anna Huggins**

- Contacted Electronic and Technology Group (ETG) regarding funding for ChatGPT API, domain names, and Amazon Web Service (AWS)
- Status: Still awaiting a response; until we receive funding, we will be temporarily operating with a free, limited version of AWS and are limited in testing capabilities for our A.I.

Plans for the Upcoming Week

Koby Fowler

- Finish initial front-end page visuals of front-end
- Finish infrastructure setup

Chandrashekar Tirunagiri

- I plan to abstract my login and sign up part of my code. And started working more on the home page with Anna and plan to decide how to make login/sign up and add the homepage look better.
- I also plan to understand the backend part of the code with Raghuram to have a clear understanding of the application and technologies being used in the backend so I can offer help when needed in the backend part.
- I would also like to collaborate to learn about training the data and methodology being used in GPT so that I can have a clear overall understanding of the application.

Raghuram Guddati

- I'm focusing on delving deeper into Terraform for the upcoming week. Additionally, I'm gearing up to initiate the creation of backend databases with the help of Christian, using PostgreSQL, kicking off with the development of Terraform scripts tailored for this purpose.
- I also plan to enhance my understanding of AWS, mainly focusing on diving deeper into S3 services.
- I also plan on setting up a small meeting with Christian to plan on our backend databases and structuring them. We will be using Terraform to write scripts to make tables in PostgreSQL.

Jacob Paustian

- For the next week, I plan to learn about how to train GPT. I do not know how much time it will take to know, as training the A.I. is *supposedly* the most significant challenge with AI. In addition, I would like to learn more about Next.js and some of the other technologies we will be using. I need to familiarize myself with AWS or Terraform, for example. At some point, research will begin to peter off in favor of the actual development of the app, so when that time comes, I would like to pitch in as much as possible.

Christian Deam

- Host another meeting on Monday (hopefully this time at the allotted time of around 4) and now that I truly know I am helping with the backend, familiarize myself with it and help Raghuram with it in whatever way I can. I expect a spike in contribution hours following this week.

Anna Huggins

- Conduct in-depth research on our front-end design tools before meeting with Chan
- For this week, I scheduled a meeting with Chan to help work on front-end responsibilities
 - *Meeting Date:* In-person on Thursday, Feb. 15th @4:30pm
 - Help Chan re-work frontend homepage and login designs
- Continue communication with ETG regarding funding and follow up on any further information they may need
- Coordinate with OARDE regarding the design and distribution of our survey