OMS CS6440: Introduction to Health Informatics

Sprint #2 - Project Planning

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1 PROJECT TOPIC - SLEEP PATTERN ANALYSIS APP (SPAA)

1.1 Background

Sleep is one of the fundamental needs of the human body. It directly affects our physical and mental health. It's not only important to have the required amount of hours of sleep but it's also important to have quality sleep. While some people thrive on having a long 8-hour sleep session, others function better when taking naps during the day and a shorter 6-hour sleep session at night. The sleep needs of each individual differ according to their body. It is only by tracking and analyzing the sleep data, we can come to know if these needs are fulfilled properly. The main aim of the Sleep Pattern Analysis App (SPAA) is to make the user aware of which sleeping pattern works best for them.

1.2 Justification

While there are a lot of tools on the market that track and report sleep data (Android Apps, Smartwatches, Fitness Trackers, etc), very few of them provide some analysis of the sleep data. They inform the user on how long they have slept and in which stage (REM, deep, etc), but they don't provide information regarding the quality of the sleep, recovery, sleep debt, etc. A lot of the apps also gatekeep information behind paywalls.

1.3 Solution

The Sleep Pattern Analysis App (SPAA) empowers users by providing them with a detailed analysis of their sleeping patterns to help them make informed decisions. It allows users to import their weekly/monthly data in JSON format,

clean and visualize the data, and provide the user with a calculated sleep score along with some recommendations (continue sleep pattern, recovery hours, etc.)

2 TECHNICAL DESIGN

2.1 Tools and Technology

The technology stack that will be used for the project includes:

- React.js
- JavaScript
- HTML/CSS
- Python
- fhir.resources library
- GitHub Pages (for deployment)

2.2 Datasets and Data Sources

We will use the user's weekly or monthly sleep data for analysis. This data can include values of date, minutes to fall asleep, minutes asleep, level of sleep, etc. We will perform some level of data cleaning (e.g. data discrepancies like sleep for less than 5 min or greater than 18 hours should not be counted) and processing before analyzing it.

The data will be provided/imported by the user in JSON format and the application will perform real-time analysis on it. If time permits we will also provide the option for CSV import. For testing, I will be using my sleep data that is collected from my Fitbit. I've been using it for the last 6 years so it has a lot of data + variations (good and bad sleep, short naps, etc).

2.3 Architecture Diagram

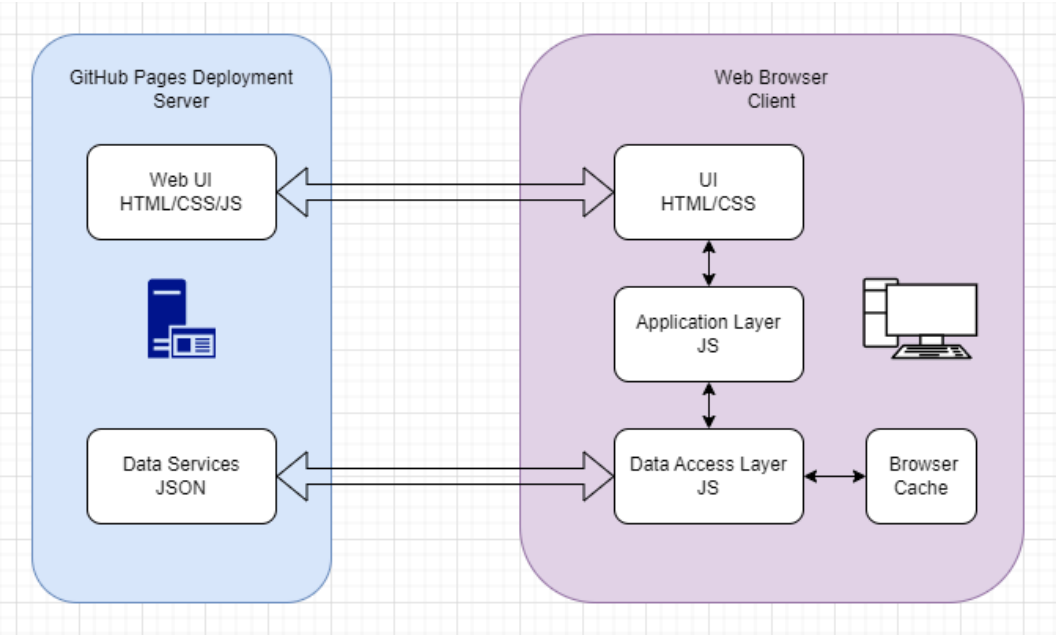

Figure 1— Rudimentary architecture diagram of the Sleep Pattern Analysis App (SPAA) made using draw.io

2.4 Screen Mock-ups

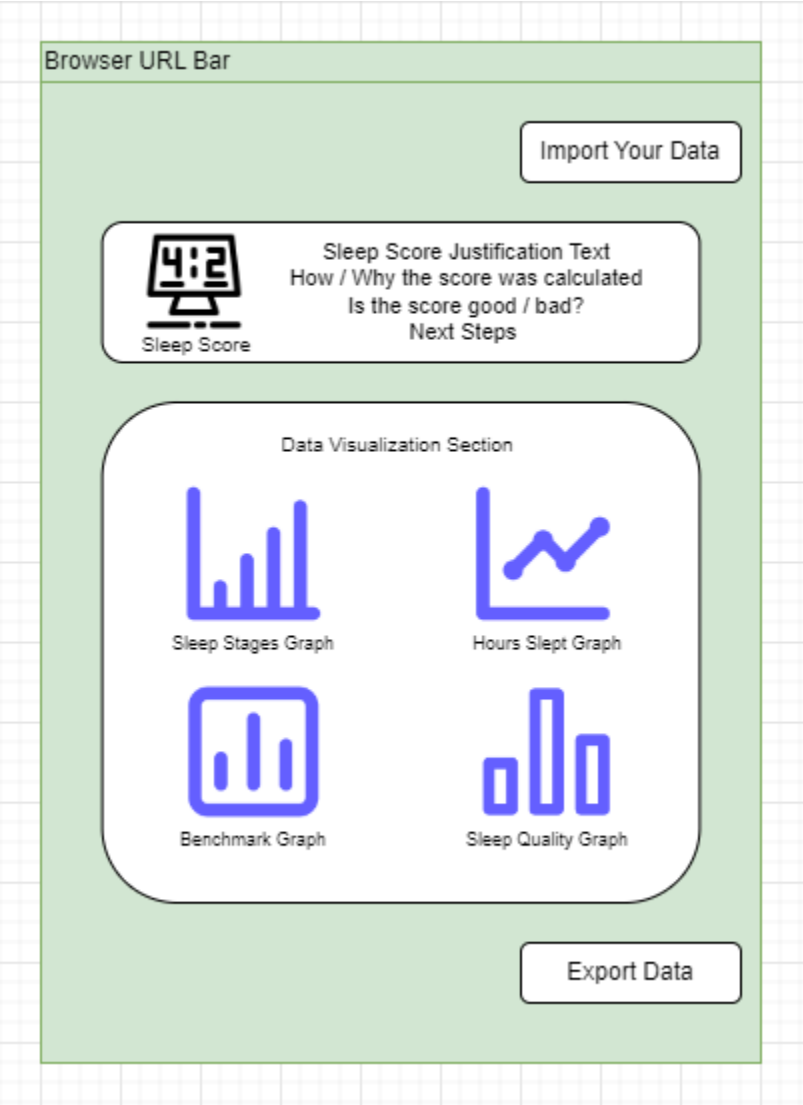

Figure 2— Rudimentary screen mockup of the Sleep Pattern Analysis App (SPAA) made using draw.io

3 IMPLEMENTATION PLAN

3.1 Project Tasks

The project can be divided into these high-level tasks:

1. Project setup - Creating a GitHub repo, local setup, etc.
2. Setting up the import feature for JSON data and data cleaning (removing redundant or out of place data)
3. Data processing - Like calculating sleep stages from minute data
4. Data visualizations - Plotting the data to relevant graphs for better user understanding.
5. Sleep score engine - Calculating how good was the sleep session
6. Export feature - fhir.resources compatible JSON output
7. Additional features (if time permits) - Compatibility for CSV imports.

3.2 Project Timeline

Sprint	Week	Start Date	End Date	Tasks
1	1-6	22nd Jan	1st Feb	Team Formation and Kickoff
2	7	2nd Feb	25th Feb	Project Planning and Design
3	8	26th Feb	3rd Mar	Project Setup
	9	4th Mar	10th Mar	Import Feature
	10	11th Mar	17th Mar	Data Cleaning + Processing
4	11	18th Mar	24th Mar	Data Visualizations
	12	25th Mar	31st Mar	Sleep Score Engine
5	13	1st Apr	7th Apr	Sleep Score Engine
	14	8th Apr	14th Apr	Export Feature + Testing
6	15	15th Apr	21st Apr	Cleanup + Testing + Final Submission

3.3 Needs/Risks

Overall in the project the only potential major risk is the sleep score engine I plan to code. It is a risk as it requires deep research into sleep science - understanding the sleep stages, average benchmarks, requirements unique for each person, etc. Once the research is done, it will also require a few iterative sessions (based on how it behaves) to get it to be as accurate as possible.

Some other minor risks include - exploring and understanding the data visualization/plotting libraries and parsing the analyzed data in the form of FHIR resources for export.