

Heart Failure Chronic Illness Patient Dashboard: Recording and Tracking Health Indicators for Heart Failure with Prevention Goals and Trends.

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Abstract— Heart failure is a chronic illness affecting millions of americans. Sleep, exercise, lifestyle changes, and healthy eating habits are key in fighting heart failure before onset. A patient driven tracking software could be used for recording, monitoring, and encouraging patients to avoid developing this chronic illness.

1 PROJECT SUMMARY

The Centers for Disease Control (CDC) in 2020 state that heart failure is a chronic illness affecting approximately 6.2 million people living in the United States in 2014, and in 2018 was responsible for more than 379,133 deaths (Virani et al., 2020). The goal of this project is to leverage health analytics and visualizations as a patient dashboard to prevent this chronic disease. Since much of the problem of heart failure stems from lifestyle choices, tracking a patient's daily metrics and giving them a snapshot of their current health stats is ideal (Table 1).

Table 1—Metrics to be recorded from patients.

Name	Measures	Description
Sleep	Quality (1-5)	A required measurement, specified for the previous night's sleep.
	Duration (Hours)	
Body Weight	Mass (Pounds)	A required measurement, used with height to record BMI and track health goals related to weight.
Food	Quality (whole, processed, fast food)	A required measurement, used to track eating habits.
	Quantity (under eat, proper satiation, over eat)	
Physical Activity	Quality (1-5)	A required measurement, used to track physical activity.
	Duration (Minutes)	
Blood Pressure	Diastolic/Systolic (mm Hg)	An optional measurement, for those who own blood pressure monitoring equipment.

2 TOOLS AND TECHNOLOGY

2.1 The technology list

The following technologies would be used to generate the android application::

- Java 11
- Android SDK
- Spring Boot
- PostgreSQL
- JDBC
- Amazon AWS
- Amazon RDS
- ReST
- IntelliJ IDEA
- Github

2.2 Data sources

There will be no data sources provided, all content will be generated from users of the application and platform.

2.3 Diagrams

The application will consist of a front end using Android, with a backend composed of Spring and PostgreSQL on the AWS cloud platform. See Figure 1 for overview of the application and the general structure.

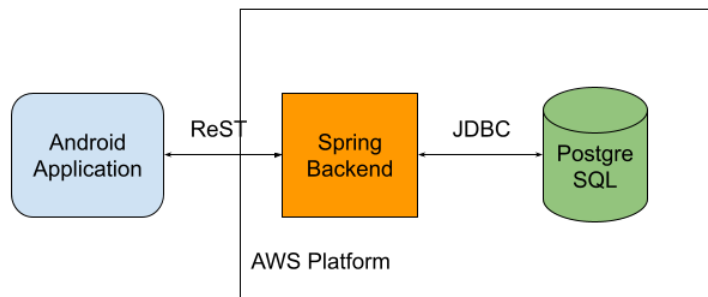


Figure 1—Overview Diagram of the application and services.

The android application will comprise four screens: a login, the dashboard, a submission form for the patients health metrics, and a profile page. See Figure 2 for a diagram.

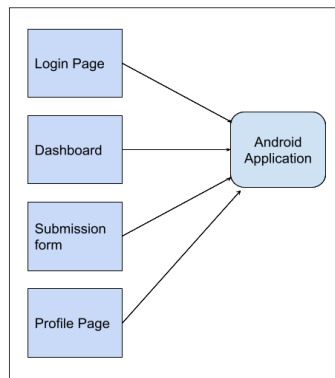


Figure 2—Diagram of Android application content.

The backend application will expose ReST endpoints for account creation and maintenance, as well as submission of health metrics data. The tables this data would be stored in would be USER and METRICS. See Figure 3 for the content of these database tables.

USER	METRICS
user_id email password height weight age	sleep_duration Sleep_quality food_quantity food_quality activity_duration activity_quality blood_pressure_diastolic blood_pressure_systolic

Figure 3—Diagram of Android application content.

2.4 Screen mockups

With the entry form providing patient health input, a dashboard will be calculated demonstrating where the patient is in their goal of achieving a healthy lifestyle that would be ideal in preventing the development of heart failure. Patients would see their trend as well as their current status, and ideal goals based on their current information. See Figure 4a and 4b for examples of the screens listed in the diagram of Figure 2.

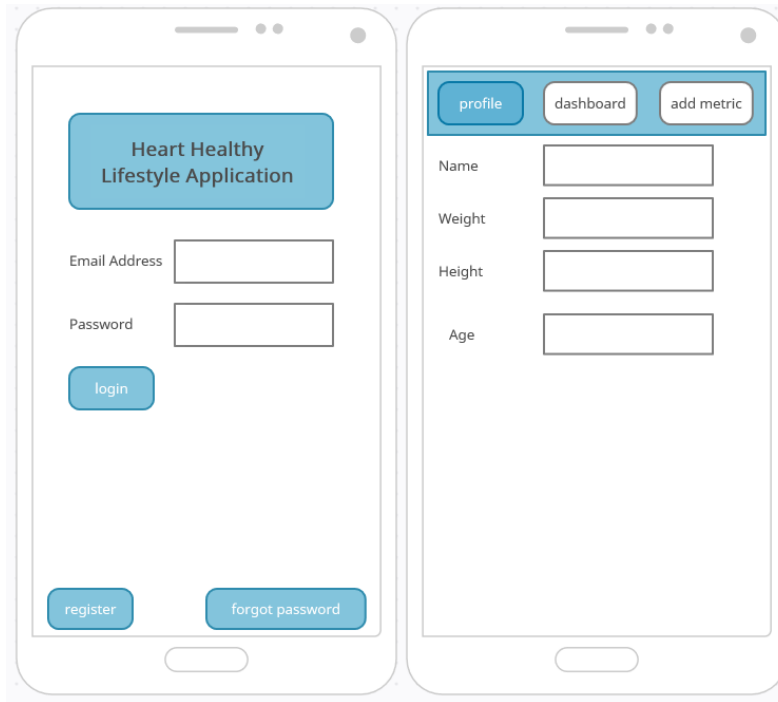


Figure 4a—Application login and profile page mockups.

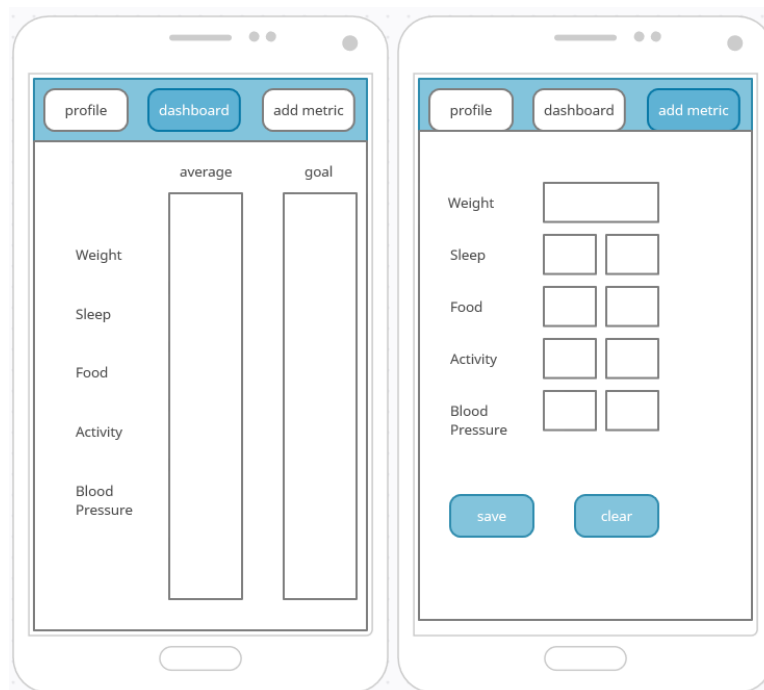


Figure 4b—Application dashboard and add metric page mockups.

3 IMPLEMENTATION PLAN

3.1 Project tasks

The following list demonstrates the overall product development tasks needed to complete launch of version 1.0 of the “Heart Healthy Lifestyle Application.”

Heart healthy lifestyle application production tasks and goals:

1. Setup AWS Educate account, Github account, Android SDK, IntelliJ IDEA & Spring Boot project.
2. Create an Android application with forms and buttons created.
3. Create a spring boot service with ReST endpoints exposed.
4. Place backend application on Amazon AWS with PostgreSQL for storage.
5. Bring everything together and test.

3.2 Project timeline

The project will take six weeks to complete, and will dedicate four weeks to development of the android application and the backend service. One week will be dedicated strictly to setting up the accounts, development environments, and the local copies of the frameworks, thus allowing for smooth development during the development phases. The final week will be for hosting and testing. See Figure 5 for a Gantt chart style layout of the project timeline.

It is possible that setup might proceed relatively quickly allowing for development to occur earlier. However, it is often noted that setup, especially of frameworks and software development kits can take longer than anticipated, hence an entire week is focused on such tasks.

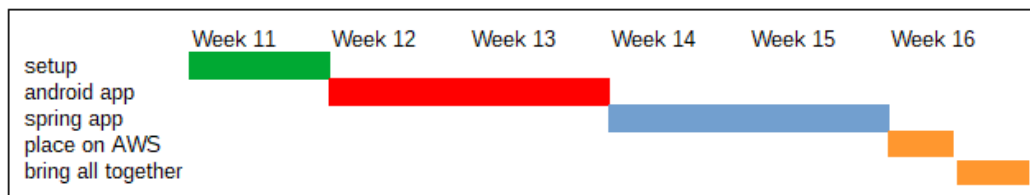


Figure 5—Project timeline Gantt chart.

3.3 Needs and Risks

3.3.1 Setup

The needs and risks associated with the setup will be to avoid taking too long to setup accounts and the frameworks within IntelliJ IDEA. The major risk is that setup may take longer than a week and consume valuable development time.

3.3.2 Develop android application

The needs of this phase of development will be around education during development as the Android SDK has not been used before development. The risk would be that an application would not be developed with appropriate security to protect private medical data during entry, use, and storage on the host phone.

3.3.3 Develop spring boot service

The needs of this phase of development will be creating a lean service to effectively communicate with the frontend securely. Communication with android applications was not tested before the design phase. The risk would be that an application would not be developed with appropriate security to protect private medical data during communication with the android application or with the database.

3.3.4 Place backend service on AWS

This setup phase would require learning how AWS deployment works, placing a service on AWS and getting it running while also using Amazon RDS. Risk could be posed to user data as the service is hosted online and that service has not been utilized previously for this specific task.

3.3.5 Bring it all together and test

Testing phase is making sure the application and backend service all function as normal and expected for final submission. The needs of this phase regard timing the project so there is enough time to test and correct problems that are found. There is no risk associated with this phase.

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