Lab 1 - SuperU Overview

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1. Introduction

SuperU is a fitness application that is currently in development to fulfill and promote to people that have an interest in weight training, trainers and gyms. This application will help lifters overcome strength plateaus and become stronger by using AI or an option trainer.

1.2 Societal Problem

Nearly half of the world lifers face service plateaus from over or under training. Research suggests that supervised training has been shown to result in better progress. A study with 20 men lifters separated in a supervised group and unsupervised group for a period of 12 weeks. The final result load showed that supervised group squat and bench press one rep max were greater than unsupervised learning. Another important factor that lifters don't consider is sleep. The CDC found that \( \frac{1}{3} \) people do not get enough sleep on a day to day basis. Something vital to weight training properly. Also, according to the US library medicine. The study found mounting evidence showing that, due to a variety of reasons such as demanding training schedules. These actions may lead to sleep deprivation that can hinder athletes performance. In order, to avoid these common lifters issues is to.
Figure 1: Further Sleep Research

Lifters and trainers should be informed about the important factors that may impact performance. Lifters and trainers must have an easy and simple way to track and visualize important training data. Lifters need a customized plan that is generated for them to overcome and improve 1RM most effectively. SuperU will provide a solution to these common issues. The application will provide a simple but powerful way to track and visualize lifter performance overtime. With the help with machine learning and AI algorithms to fully customized workout plans based on cutting-edge research. SuperU will highlight critical factors required to improve 1RM most effectively. The fitbit watch or smartwatch critical data.
1.3 SuperU Product Description

SuperU will provide trainers and lifters able to track performance and progress. The smartwatch or fitbit wearable with track sleep, heart rate, RPE. Create strongly effective workout plans for the lifters, which can be edited by the trainer. The lifter training data is collected into an individual user profile. SuperU will be a mobile application. Lifters will promote an entry questionnaire for what lifts they want to increase. Every week a base-lined for a week in order to build a data profile. After that data is provided, the workout plan generated the algorithm to have sufficient data for making decisions. The device that is recording this data are smartwatches (fitbit). The main critical data record will be the track of sleep, heart rate, RPE. After the main data is collected from the lifter, the application will format a workout plan. SuperU will be available as a mobile application.
1.4 Solution - SuperU

The main goals and objectives are to allow the user to visualize stored data to track progress. The use of smartwatches to increase the amount of the relevant data that could be used to make decisions. The only hardware we are using is accelerometer/motion detection, heart rate monitor. This data will process proper routine algorithms.

Current Solution Process Flow

Figure 3: Current Solution Process Flow

2.1 Key Product Features and Capabilities

Going to discuss the mobile client application from two main viewpoints: lifter and trainer. Let's start with lifters, the data from workout history will be visualized. Custom tailored workout plans and schedules. RPE will be generated from the algorithm using tracked parameters such as sleep, previous RPE, soreness, Previous 1RM.
Figure 4: Generating Workout plan
Daily workout will be generated the output will be type of exercise, number of sets, number reps per set, and rest time between sets). On a weekly schedule, date and time selection are used to track parameters such as sleep, previous RPE soreness, previous 1 rep max. The trainer client side will track client progress and data history, Modify generated custom client workout plans and schedules. A very flexible UI interface to adjust plans for given clients.

2.1.2. Cloud Architecture

![Database Scheme](image)

*Figure 6: Database Scheme*

Fire base will be our main cloud architecture, user profiles such as basic information, such as name, date of birth email user ID. Our cloud architecture will store even more critical information, weekly information which are start date and end date for a workout, average sleep score, average body weight and average body fat ratio. Also
will be storing exercise set information which are, reps, RPE, sets and weight. On a daily basis we are going in store from the trainer, active day information such as date and body weight, body fat ratio and sleep score. User ID and clients are also stored. The cloud code (Firebase). Any data from the fitbit will go directly into Firestore using Firebase functions. All data will be backup and free up if necessary within the database. Firebase provides an In App Messing, to deliver user notifications.

2.1.3. FitBit/SmartWatch API

The FitBit / SmartWatch API will connect with smartphones then through SuperU clients. The lifter data such as heartbeat, accelerometer will be recorded and shown. Most of the user data will be recorded with respect to training.

2.1.4. Administrator Roles

The Administrator will have permission to add or remove users manually. Any Database maintenance and repair will have permission. Data migration and System management task and performance analysis permission will be granted.

2.2 Major Components (Hardware/Software)
The major components are hardware or software. On the hardside are the smartwatch / FitBit type fitness watches and Smartphones or tablets are compatible. The software we are going to use is Java/android studio, Swift IOS, FitBit API, Firebase Authentication. When running tests, JUni and XCTest will be the main testing.

Database will be using Firebase cloud Firestore and SQLite.

3. Identification of Case Study

3.1 Who is this product for?

→ Weightlifters

→ Powerlifters

→ Bodybuilders
People who want to become stronger

Personal trainers

SuperU will be used to increase One rep max for a given selected set of exercise. Helping achieve fitness goes per individual. Trainer can also benefit from their client data to analyze. Can help gyms owners improve equipment for gyms from the feedback from lifters. SuperU used for heavy weight trainers achieve maximized performance as sy and effectively as possible. Escaping annoying lifting plateaus and increasing the amount of weight they can lift.

3.3 Who else might this benefit?

- Non-athletes who are meeting job strength requirements
- Athletes for other sports who might benefit from strength training
- Trainers who want to track and visualize client data
- Data could by fitness industry to make calculated business decisions

4. SuperU Product Prototype Description

The proof of concept for SuperU will include a fully functional android mobile application, which would allow lifters and trainers to register for the applications. The application will allow pairing with smartwatch or FitBit only with the user's permission. The data from the smartwatch will help generate a workout plan and can be used for analysis and statistics. All this data will be collected real time before being stored on the database. Once login, the home screen will be prompted saying workout plans and progress viewer.
Workout plans (plans developed by the app based on the user’s collected data)

Progress Viewer (shows a lifter the progress and expected position for 1RM if they continue to receive guidance from the app)

SuperU will also have a trainer interface. The trainer is supposed to look over list lifter clients to help analyze or possibly edit workout. List below are the components in the interface is displayed

List of clients/Lifters (Trainer can select a user and access the corresponding workout plan and progress for that selected user)

Workout Plans (plans on a per client/lifter basis where the trainer will also be given the ability to modify such plans)

Progress Viewer (progress on a per client/lifter basis, where the trainer will be able to track and visualize the clients progress)

4.1 Prototype Architecture (Hardware/Software)

Hardware that is will be use with SuperU are:

Smartphone/Tablet

FitBit/SmartWatch

Important software components SuperU will use are:

Firebase Authentication

Firebase Firestore Firebase Cloud Functions Firebase In-App-Messaging

SuperU Client .APK android application

4.2 Prototype Features and Capabilities

Monitor heart-rate and movement mid routine
→ Monitor average heart-rate throughout day for comparison
→ Collect sleep patterns
→ Functional routine alerts on smartphone and wearable
→ A Functional Notification system for lifters and trainers
→ Allow lifters data to be visualized and analysed

4.3 Prototype Development Challenges

SuperU has sensitive data tracking and a variety of development difficult challenges that will be addressed.

→ Different body types for effective workouts
→ Testing the predicted workout plan
→ More intensive research in sleep
→ Collecting data to test

5. Glossary

a. Rating of Perceived Exertion (RPE) - A way of measuring physical activity intensity level based on objective parameters and the person’s experience[1].

b. One-Rep Max (1RM) - The maximum amount of the weight you can lift for a single repetition of a given lift[1].

c. Weightlifter - One who lifts heavy weights for exercise, muscle strengthening, or athletic competition.

d. Plateau - State where a lifter fails to improve their 1RM for a long period of time.

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