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(Section 3 is incomplete in this draft due to the prototype design still being in development)

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1. Introduction

SuperU is an application that provides lifting guidance and other training information in real-time. The difference between us and our competitors is that we collect data in real time. It also creates a custom tailored workout plan from the user based on the data that is collected from the smart device/wearable. We will be using a Fitbit as our wearable and we will be using their API. By using their API we will be able to track the user data, upload it automatically, and create a routine for the user.

When training competitively in weight lifting it is best to have a trainer to be able to make sure you're performing/training at a progressive rate. It is difficult to train on your own and studies have shown that people who have a trainer usually have a higher one rep per max and those who trained on their own tend to usually plateau later in their training. Another common problem with training alone is that one might overtrain or undertrain. Figure 1 shows how a trainer can impact one's progress through a problem process flow.

Figure 1. Current Problem Process Flow
Another factor that should be taken into account when it comes to training is sleep and a plethora of people don't take this into consideration and this could increase their chances of getting hurt. This can also affect one’s recovery too if you don't get the proper amount of sleep. The CDC says that 1 out of 3 people don't get enough sleep from a day to day basis. It's also common knowledge that it's difficult to train when tired. More info will be provided in Figure 2.

![Figure 2. Further Sleep Research](image)

Research has shown that sleep deprivation can be detrimental to one's health. Some of the side effects are mood swings, loss of motor function, and reduced cognitive performance. This can overall affect one's lift and can cause plateaus in your training.
Not everyone has access to a trainer, this is where Super U comes into play. Our program will have a learning algorithm that will be tailored towards the users based on their RPE, heart-rate, and other health factors. This will make sure that our client/ user will have all the tools needed to reach their overall goals.

2. **SuperU Description**

The data that will be collected for Super U will be inputed via the user and it will also be based on the data collected from the wearable. Some static information that will be collected is height, weight, resting heart rate, and sleep patterns. The data will be collected during the routine and be updated weekly and monthly. Another important set of data that will be collected is the one rep max. This will be measured with the RPE and heart-rate during each exercise.

The wearable is a crucial aspect of the application without the data collection the app is pointless. The most important fact is that the wearable that is being used must work in tandem with the Fitbit API. This is because we will be using some important features in the API. The wearable will also have to work fluidly with our application so that it can alert the user with information during their routine such as timers, and rep and set counts.

The purpose of SuperU is to grab the data that is inputted by the user and recorded into a server. It will then generate an algorithm. It will then provide a routine for the client/user which will include pictures for each workout. The user will then be able to track their data and progress on their profile page. View our solution in Figure 3.
2.1 Key Product Features and Capabilities

The overall process of our application is very straightforward. Most of the work is already done by the wearable since it collects all the information needed from the user. A routine is then processed through an algorithm through the Fitbit API. After the data is put through that algorithm it is then put into an interpolation algorithm. With this algorithm we will be able to calculate the RPE for the user. After this the data is put into one more algorithm which will then generate the weight you want to lift, number of sets, number of reps, and RPE. This can be shown in Figure 4 and 5.
2.2 Major Components

The diagram in Figure 6 below discusses how important the API is to our program. It shows the process flow and overall shows how it works with the servers and our main application. By following the chart you are able to track the data imputed to a generated workout plan.
2.2.1 Mobile Application

Our platform will be mainly used on a mobile device via a mobile application. In the application the user will input their data and it will be stored onto a server. After this the data is put through two separate algorithms. One is for workouts and the other one is for progress prediction. The app will also allow users to compare each other's progress and predicted process.

2.2.2 Smartwatch Connection and FitBit API

The use of the wearable is important for the data collection for the app. It is important that the wearable have features such as a functional accelerometer and heart rate monitor. These are key data measurements that are taken from the wearable. The only other feature that is important when it comes to the wearable is that it can work fluidly with the Super U application. We would like to incorporate features where it makes it easier for the user to view their reps and sets during the workout without looking at their smartphone.

2.2.3 Cloud Server and Server-Side Database

The cloud server plays a pivotal role in our application because this is where we store all of the information that we can gather. Using the server is not difficult because it works directly with the Fitbit API. The user will then be able to input the data and the data is then processed into an algorithm. Through this algorithm workout routine will be generated and the user will be able to track and meet their goals in an efficient manner. View Figure 7 for more information on this.
2.2.4 Workout Creation Algorithm

SuperU mobile application will store the algorithms on a local server and locally. The algorithm will take the data points inputted by the user and provided by wearable and process the data. After the data is processed a workout plan will be generated based on the data given. The outputs that will be given are sets, reps, target RPE, and weight limit. This will help the user have a more progressive workout plan.

2.3 Identification of Case Study

The main demographic of the SuperU applications are powerlifters and weightlifters. This will give the casual/serious weightlifters to keep track of their progress without a trainer present. SuperU will use real-time data and a learning algorithm to give you the same reliable
workout routine as a trainer would. Another feature we will have is the option to have a real life trainer assigned to a given user. The trainer will be able to track the users in real time with their wearable and they can generate routines for the user as well based on the data that is provided to them. The last piece of the puzzle is the stakeholders. The gym owners are the stakeholders in this scenario. They will do this by partnering up with a gym and provide SuperU as a service. With this service trainers will be able to use this app and can easily help out a person with their workout with ease.

3. SuperU Prototype Description

Provide a top-level description of the SuperU prototypes as it relates to the end product goals.

3.1 Prototype Functional Goals and Objectives

3.1.1 Simulate real-world data

3.1.2 Produce a simulated routine based on dataset
3.2 Prototype Architecture (Hardware/Software)

How will the prototype be structured to demonstrate the key features of the product? Provide Prototype MFCD

- Describe watch data collection
- Describe how application was developed
- How is the software utilized?
- Describe how server sends and receives this data
- Describe how API detects this data
- Describe the routine creation process
- Describe how it is delivered to the user

Figures: Slides 18

3.3 Prototype and Capabilities

What does the prototype demonstrate? What is the significance in showing how the problem is solved? How have you demonstrated success? How does the prototype address project risk mitigation? Describe the functional goals and objectives.

- Monitor movement and heart rate during workout
- Compare with monitored heart rate throughout the day
- Collect data on sleep patterns
- Functional routine alerts on smartwatch device

Figures: Slides 19

3.4 Prototype Development Challenges

Not included in our Lab 1 Final Draft, our Lab 1 was created prior to our prototype design, so enough information for not gathered regarding our prototype to properly implement it in our Lab. From further research it appears that previous semester’s of the course had Lab 1 due after the prototype design.

4. Glossary

- **Rating of Perceived Exertion (RPE)** - A way of measuring physical activity intensity level based on objective parameters and the person’s experience[1].
● **One-Rep Max (1RM)** - The maximum amount of the weight you can lift for a single repetition of a given lift[1].

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

5. **References**


