Virtual Personal Trainer

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Abstract

We have developed an application which delivers an exercise regimen curtailed to the individual user. The app acquires the user's fitness data through Fitbit devices such as smartwatches and digital scales and their corresponding embedded software. Extrapolated data is fed into an AI (Artificial Intelligence) algorithmic component which produces a workout plan and meal recommendations to help the user achieve a higher level of fitness. This trainer is auto-configured to the user's personal and health parameters some of which are specified during user registration to the system. These parameters include underlying health conditions and physical characteristics and are updated at regular intervals. The user reaps the benefits of the application by gaining awareness of the positive impact that a healthier lifestyle can have on his or her physical and mental capacity. The data collection and exporting process involves an understanding of data structures stored in JSON form by the manufacturer of the smart devices. This is followed by the development of a generalized workout plan based on well-established health parameters that can be fine-tuned to reach targeted levels of fitness. Device-generated values currently include average heart rates and Body to Mass Indices (BMI). A functioning prototype that tests the system has been developed using HTML, CSS, and JavaScript. This work is continued in the direction of enhanced Graphical User Interfaces and an expanded AI component for more detailed workouts through the use of additional user characteristics and hardware features. Smart devices that provide additional features such as heart pulse rates are explored.

Technology Used

Hardware:
- Fitbit Inspire 2 Smartwatch
- Fitbit Aria Air Smart scale

Software & Languages:
Fitbit API, JavaScript, JSON, HTML 5, CSS, SQL, PHP

Data Collection

Our first priority was getting a sizeable amount of data in order to test our virtual personal trainer's capability to personalize workouts. After making individual Fitbit accounts, we each spent two weeks wearing the Fitbit smartwatch for the whole day as well as weighing ourselves on the smart scale once a day. These devices collected daily instances and averages of many statistics related to our physical fitness. All these statistics are then passed through a Bluetooth connection into our Fitbit phone application and subsequently saved onto our Fitbit profiles.

Next, we wrote JavaScript code to utilize the Fitbit API, using an XMLHTTP Request, to recover our data from out profiles and implement this data into our AI algorithm. The prototype of our Virtual Personal Trainer uses the following daily statistics: resting heart rate, steps taken, body mass index (BMI), and number of calories burned. To reap the full benefits of the Virtual Personal Trainer, any new users should have a Fitbit account and use the associated smart devices.

Registration and Output

First, the user must register with our webapp. In the registration page the user will have to indicate their Dietary Preferences, Preexisting Conditions and their Fitness Goal. This will help the Virtual Personal Trainer determine which meals it will recommend for the user. After registering, the user will be redirected to the dashboard page where the user may login to Fitbit using the button provided on screen. After a successful login to Fitbit the user's data is retrieved and put through our personal trainer artificial intelligence (AI) algorithm. The algorithm then outputs one of three recommended workouts: cardio-focused, strength building, or general fitness. The workout recommended by the AI depends on the individual user's fitness data. Like a human personal trainer, the workout is personalized to focus on the area in most need of improvement. Finally, the recommended meals and workout is available through the click of a button on the user's dashboard through our modern and easy-to-use interface.
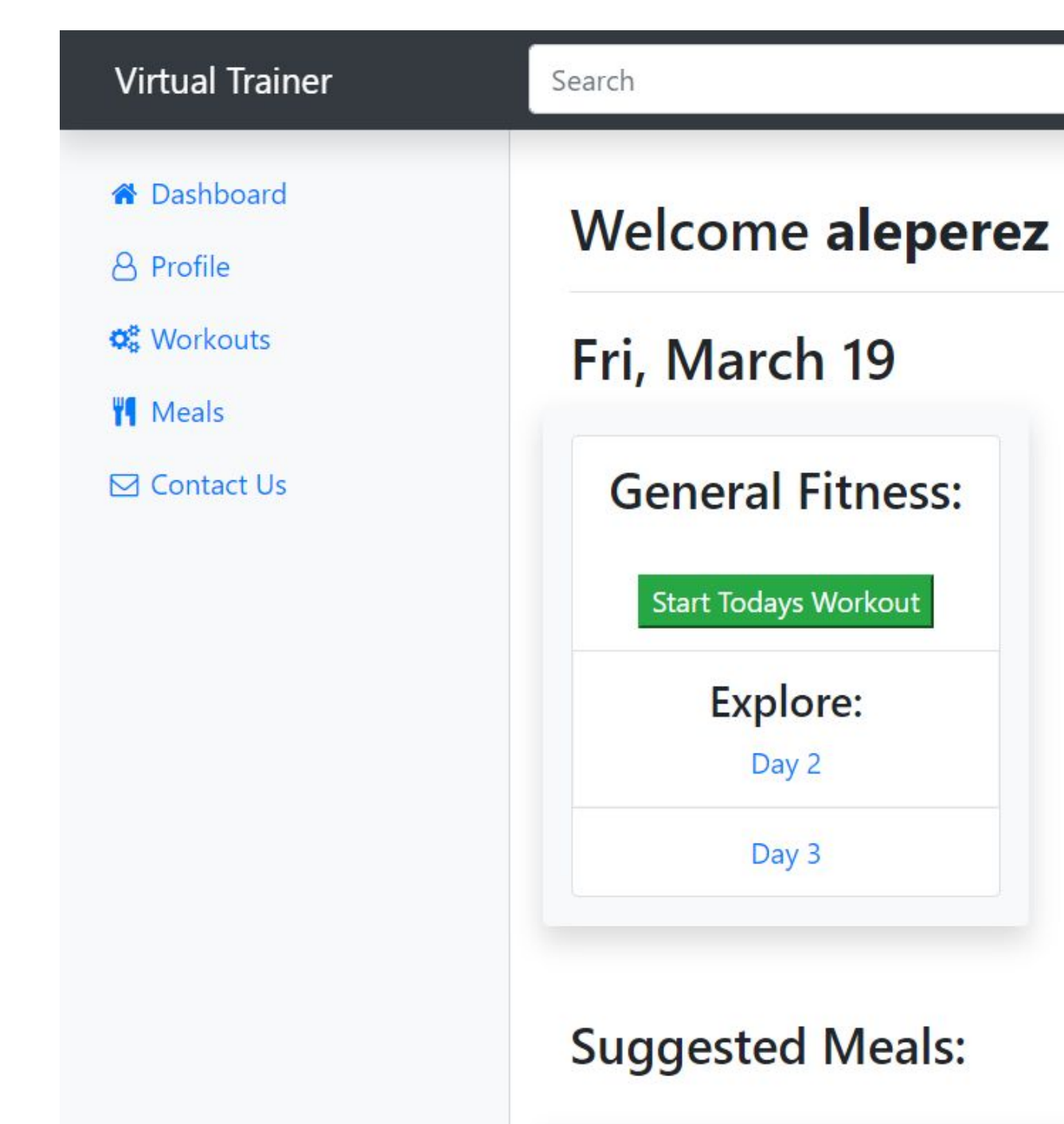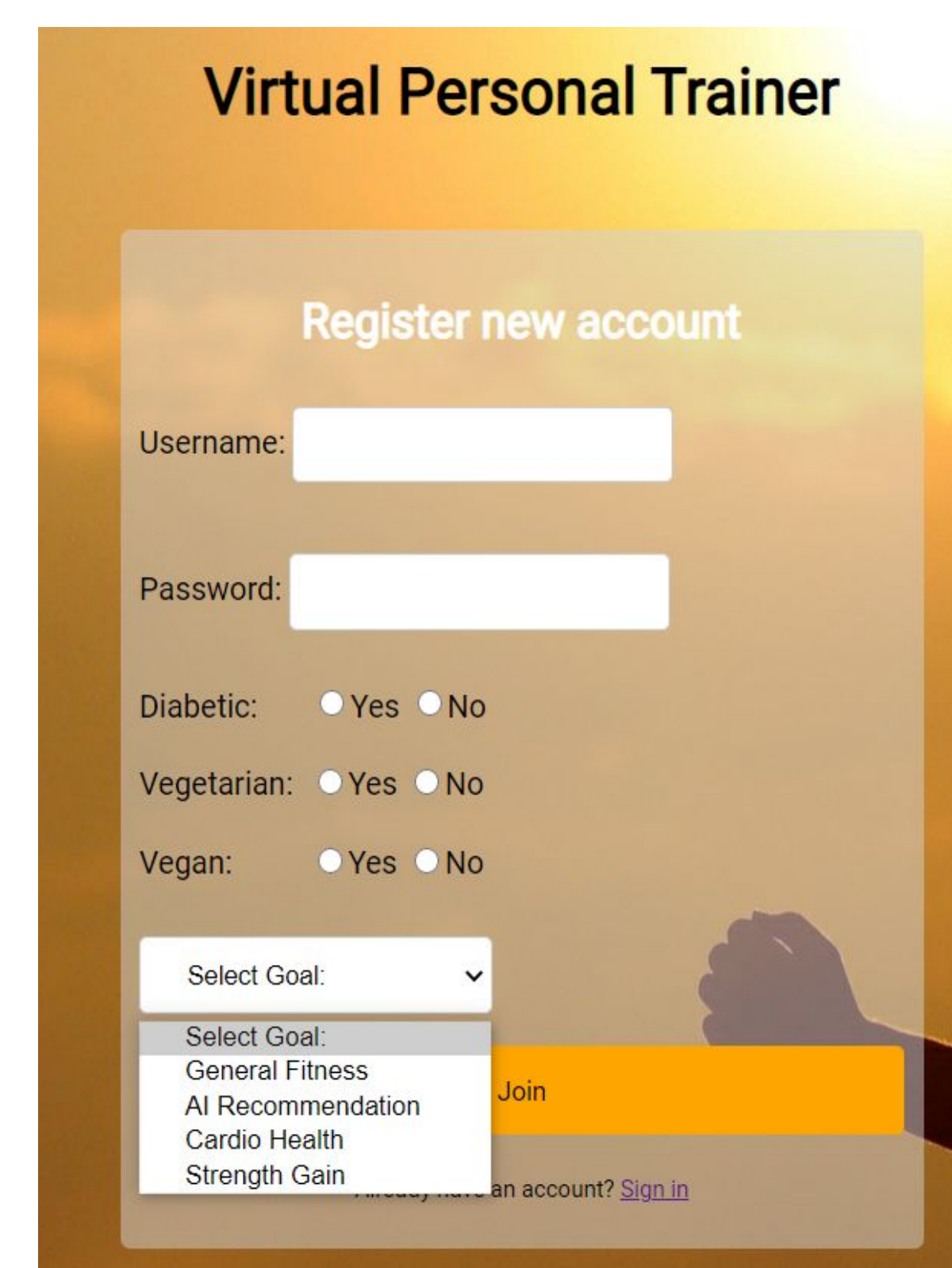
AI Implementation

On the back end of the Virtual Personal Trainer, we created a simple yet efficient AI through a series of functions. After successfully logging in to Fitbit through our webapp, the AI will gather the user's physiological statistics, calculate the daily averages then rate the user's statistics on a scale of 1 to 3 according to the recommended fitness levels found through our sources. These ratings are inputted in our final function seen below which outputs the workout recommended for the individual user. The set of algorithms used to make our AI simulate how a personal trainer would analyze one's strengths and weaknesses and offer a workout which helps improve the trainee's physical fitness.

```
function result(cardio, activity, calorie, bmi) {
    var reccomendedWK;
    if ((cardio + activity + calorie) <= 5) {
        if(bmi == 1)
            reccomendedWK = 1;
        else
            reccomendedWK = 0;
    }
    else {
        if (bmi <= 2)
            reccomendedWK = 2;
        else
            reccomendedWK = 1;
    }
    return reccomendedWK;
}
```

Conclusion

We achieved all our initial objectives, and the Virtual Personal Trainer can perform its fundamental functions of retrieving then analyzing an individual user's data and outputting meal suggestions as well as a workout recommendation. When tested using our fitness data, we received two different workouts. Since we both have very different body types and lifestyles, this proves how effective the AI is at accommodating the individual user. Some possible future improvements are to develop more workouts to fit a wider range of users. Also, we could add in functionality for more statistics since some Fitbit devices also store body fat percentage and blood pressure. While there will always be room for improvement, the Virtual Personal Trainer can help many people get an affordable starting point towards a healthier lifestyle.

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