Beat

Cameron Keene
Dillan Maraj
Thomas Pena
Charles Richardson

CIS4301 - Dr. Markus Schneider

University of Florida

Table of Contents

The overview and description of the application

Beat serves as a digital health tool for users seeking personalized insight into their daily routine. Beats' main purpose is to visualize the user's health vitals overlayed with their daily schedule. Inputs to Beat include health data coming from the user's wearable devices; as well as their digital calendar data. This data must be exported from the device and imported into Beat manually. The calendar data should be simplified to improve finding trends. As the calendar data changes, the user must re-export and import the calendar file to maintain an updated status in Beat.

The output of Beat is fully visual: graphical representations of the trends revealed from the data. These outputs can be modified to specific timeframes and activities. To ensure the user has the most seamless experience with Beat, it will be designed to work in a familiar environment to the user. Using the web to host this application is the most straightforward way of doing this. Ultimately, this application will improve the lives of its users by providing them with valuable personalized health data.

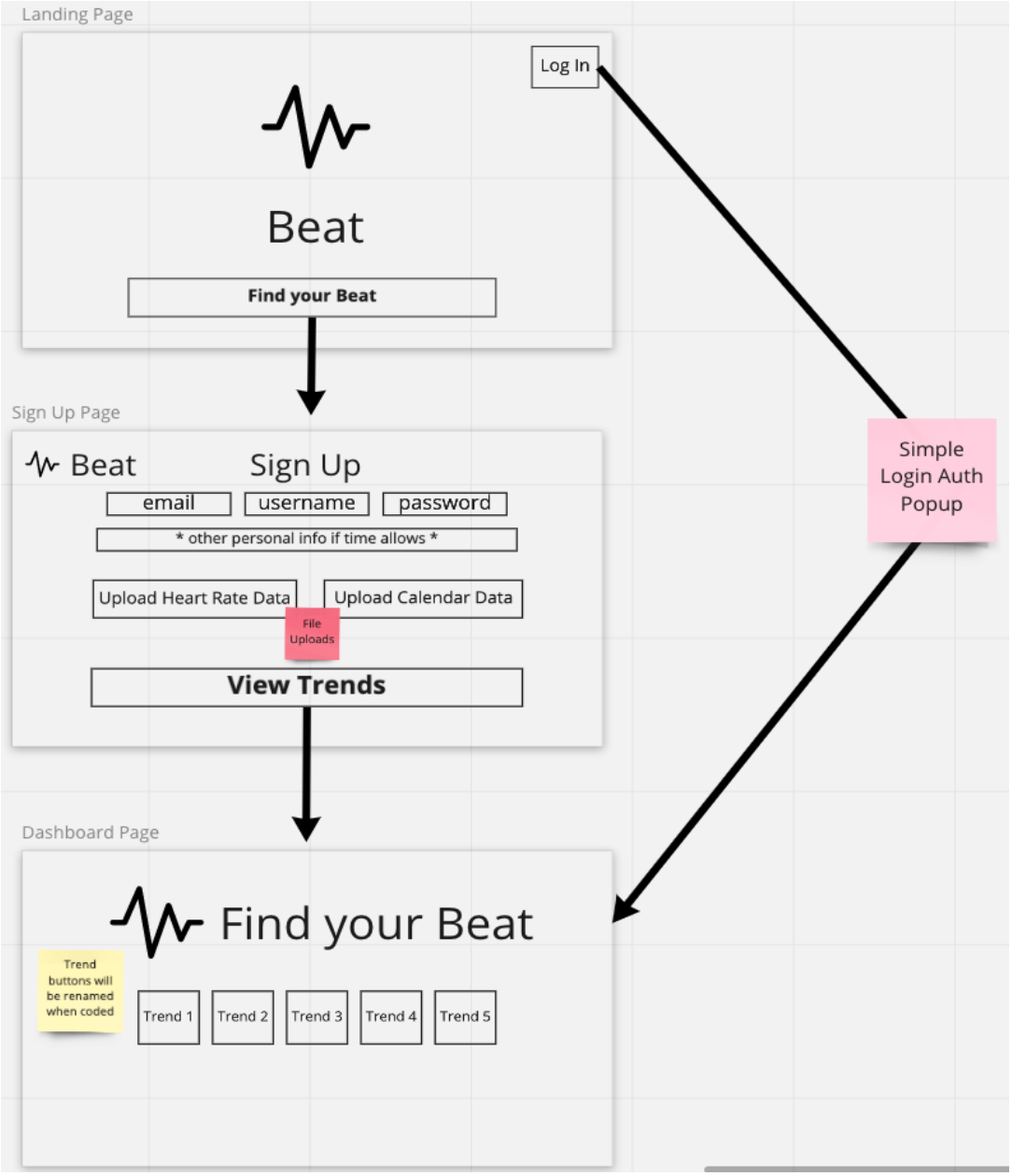
User interface design including the application-specific network or graph of web pages and the integration of the complex trend queries

The non-trend query section of the application consists of an attractive landing page, leading to a sign-up page. If the user already has an account, they can log in to go directly to their dashboard. A condition of signing up is having a file with heart rate data in XML format (from the Apple Health App) and a file with calendar entries in ICS format. In order for proper functionality, users must categorize their calendar entries with one of 6 categories (bulleted below). Once the files are uploaded and the user has input their information, they are led to the dashboard.

Categories

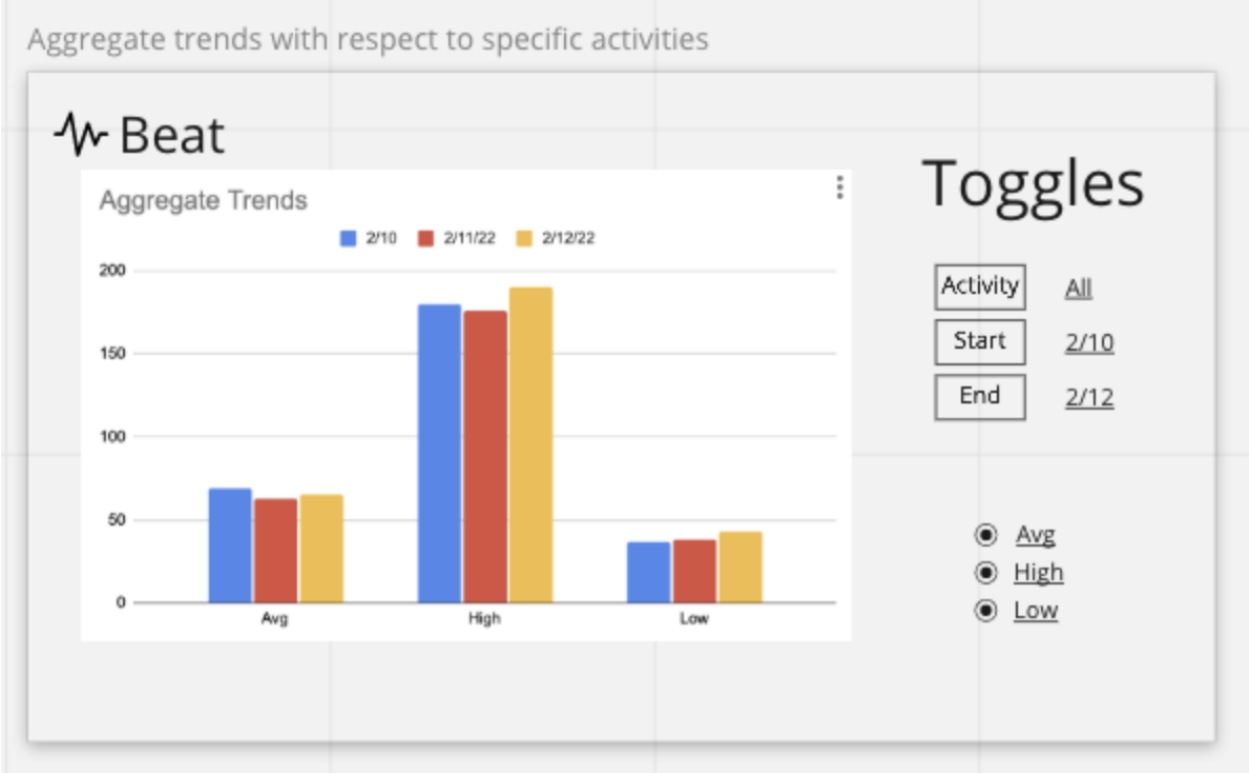
- Fitness
- Work
- Social

- Rest
- Eating
- Other

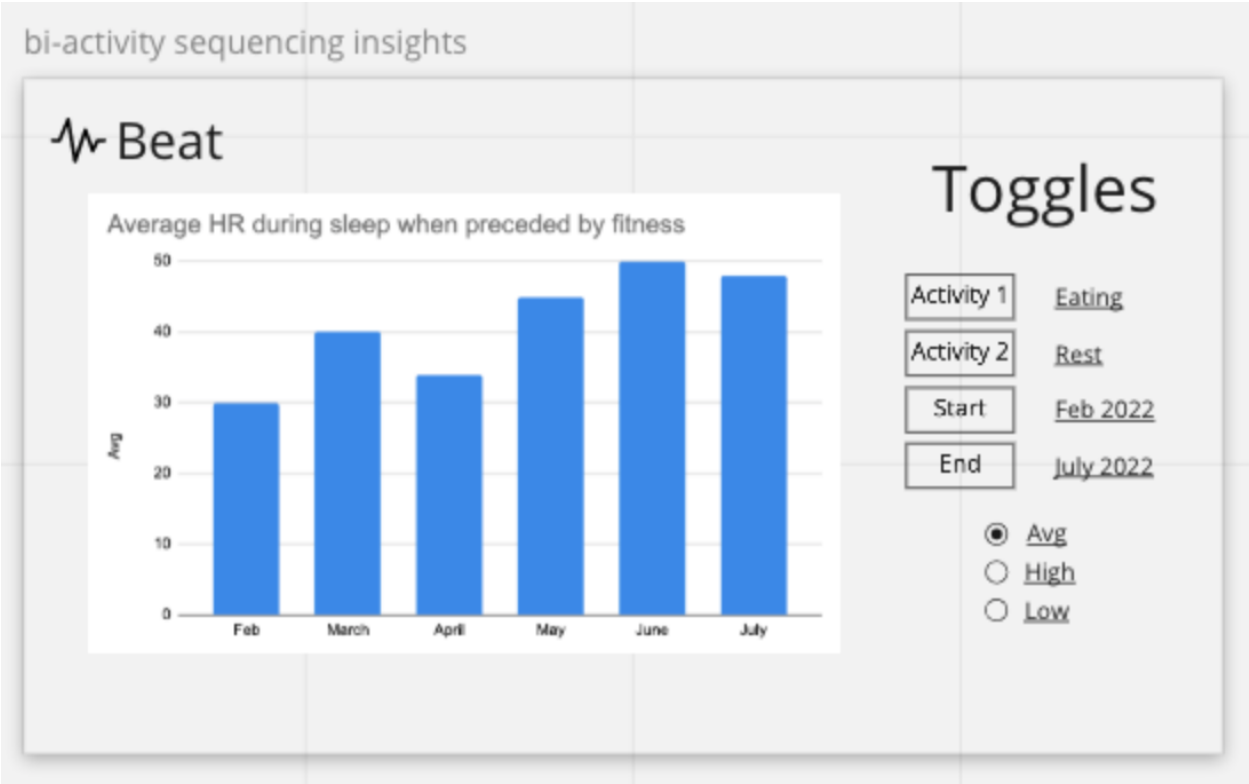


The dashboard will see some style and word choice changes in subsequent deliverables, as noted in the wireframe. Each of the buttons will lead to a unique page. Within each of the trend pages, clicking the top left corner will redirect the user back to the dashboard.

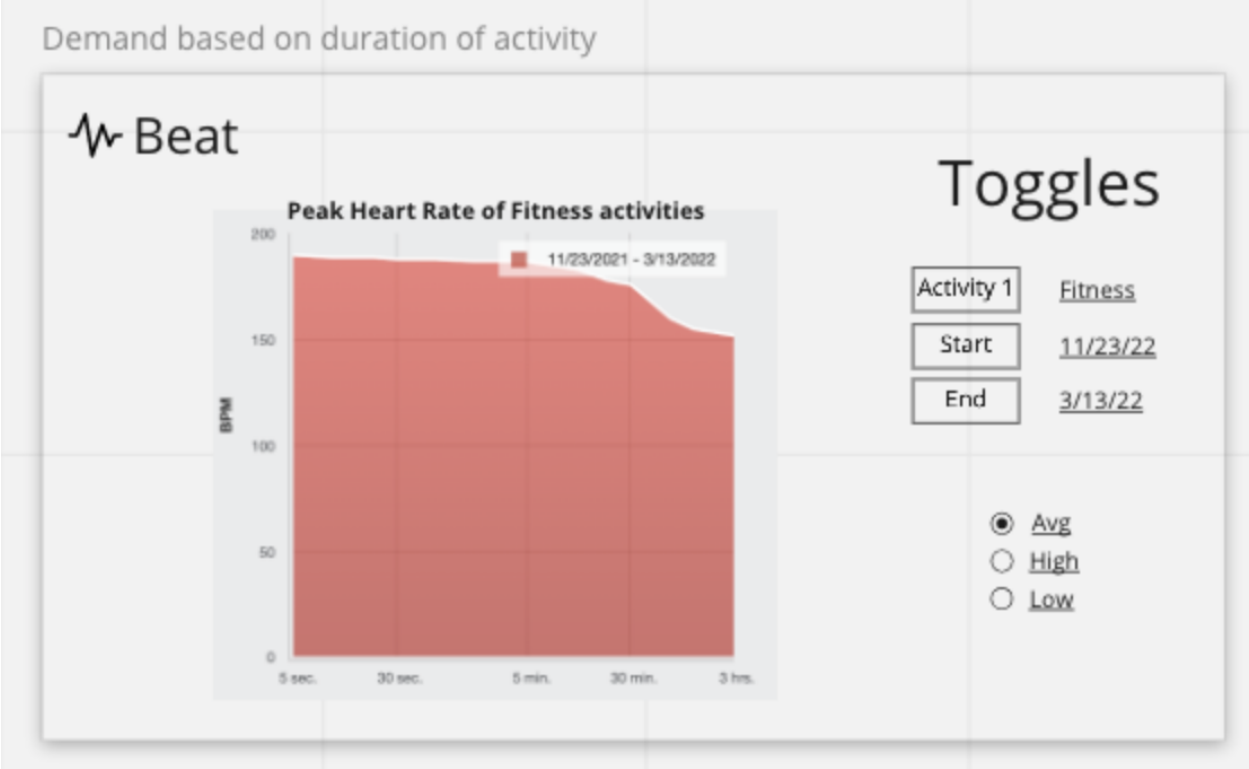
Complex Trends



The aggregate heart rate with respect to a specific activity trend first collects base heart rate data with respect to a given activity and computes averages. Different colors visually separate activity category averages, a day's worth of activities are grouped together and these information sets, representing days within a user-specified interval of dates, are contrasted against each other to give the user an idea of general similarities and activity tendencies through specified dates.



Finding the aggregate values of categories when preceded by a distinct activity will show the users how their heart responds when they do two activities in succession. Extending this over time will reveal positive or negative changes that can provide the user with insight to optimize the sequencing of their schedule around their heart's responses. For example, if a user completes an eating activity, and follows it with rest, they could witness an increase in their usual heart rate during their rest-activity. This will suggest that users should not eat immediately before resting (sleeping).

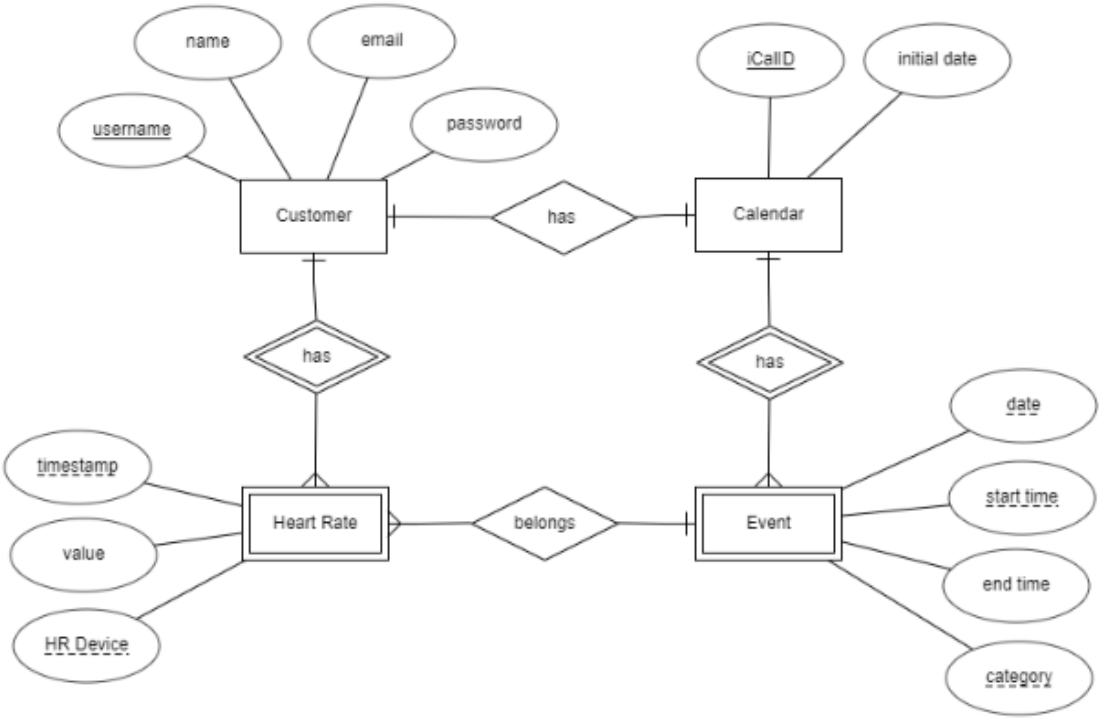


The demand based on duration query calculates peak heart rate (maximum data point in a fitness category activity), calculates the duration of that activity and maps all such associations to within an interval to visualize trends in demand based on duration and its behavior on a mid to long term basis.

This query attempts to allow users to get a better idea of the effect of their sleep duration on heart rate in the subsequent day's activities. Sleep duration taken from rest category activity length on a given day is plotted against average daytime heart rate and included on a user-specified interval.

This trend computes and displays an average recovery score based on a given day's average *rest category* heart rate, a computed quantity, and the average heart rate of all the *rest categories* calculated on a seven-day interval.

Conceptual database design based on the Entity-Relationship Model and a careful analysis of the deployed data sources



Customer:

When a customer signs up to use our product, they will enter a few pieces of data such as username, password, name, email, and HR Device ID. The username and HR Device ID will be used as the unique attributes of this entity. The HR Device ID will also be the identifying attribute when combined with the TimeStamp (partial) of Heart Rate to identify the records pertaining to each user.

Calendar:

The calendar information will be accessed through the users' Google calendar URL, which will be referenced as icalID. This will be the unique identifier for the calendar. Additionally, there will be a start date that will be the first date to be considered in the calendar, any information before this date will not be considered as part of the calendar.

Heart Rate:

The heart rate data will be imported by the user and inserted into the database. The Heart Rate entity is a weak entity that will be identified by the HAS relationship from the Customer entity. The Username (unique) from the Customer will be combined with TimeStamp (partial) from Heart Rate to

identify each Heart Rate record. Heart Rate will also have the following attributes: value and date. The references below will show a sample record entry of Heart Rate from the sample data collected when exporting from the Apple Health app. The important attributes are underlined in red in Figure 1.2. Figures 1.1 and 1.2 show a sample record of heart rate data.

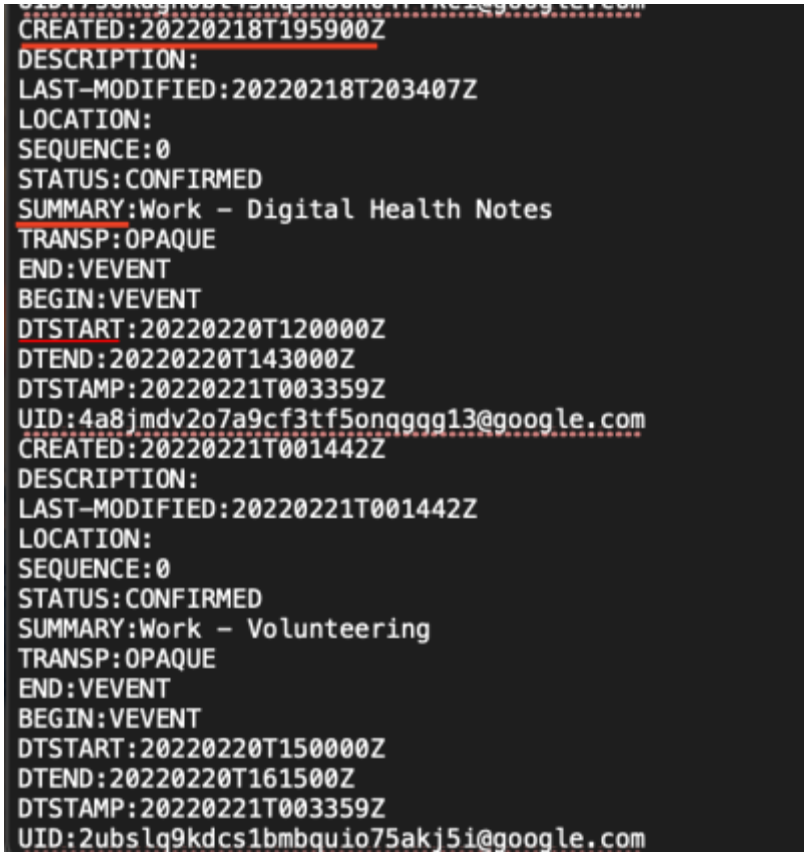
Figure 1.1:

Figure 1.2:

Event:

All events will be imported from the user calendar. This entity is a weak entity that is identified by the HAS relationship from the Calendar entity. The icallID (unique), date (partial), start time (unique), and category (unique) will be used to identify each Event. Additionally, this entity will also have an end time attribute. Figure 2.1 illustrates a record entry of an Event.
Note that 'CREATED' is the date, 'SUMMARY' contains the category [work], 'DSTART' shows the start date, and icalID is represented by 'UID'.

Figure 2.1


CREATED:20220218T195900Z
DESCRIPTION:
LAST-MODIFIED:20220218T203407Z
LOCATION:
SEQUENCE:0
STATUS:CONFIRMED
SUMMARY:Work - Digital Health Notes
TRANSP:OPAQUE
END:VEVENT
BEGIN:VEVENT
DTSTART:20220220T120000Z
DTEND:20220220T143000Z
DTSTAMP:20220221T003359Z
UID:4a8jmdv2o7a9cf3tf5ongggg13@google.com
CREATED:20220221T001442Z
DESCRIPTION:
LAST-MODIFIED:20220221T001442Z
LOCATION:
SEQUENCE:0
STATUS:CONFIRMED
SUMMARY:Work - Volunteering
TRANSP:OPAQUE
END:VEVENT
BEGIN:VEVENT
DTSTART:20220220T150000Z
DTEND:20220220T161500Z
DTSTAMP:20220221T003359Z
UID:2ubslq9kdcs1bmbquio75akj5i@google.com