**Question 1**

# Problem Space

Approximately 12% of people deal with migraines. Migraine symptoms are very diverse, ranging from headaches to nausea to auras, and can prevent someone from being able to accomplish everyday tasks. While there are treatments for migraines, most medicines work as preventative measures but fail to stop a migraine that has already started. Because of this, it is vital for people who struggle with migraines to know what triggers the start of their migraines and also for them to take medicine at the first sign of the migraine.

Many types of migraine trackers currently exist, however they rather fail to predict migraines and identify triggers or they intervene too much in the users life. Simple migraine diaries are used by users and help them keep track of when their migraines occur and identify potential triggers. While these can be useful, they are limited due to limited data. All data is given by the user, not detected by sensors. Along with this, migraine diaries don't process the data but leave it up to the user to find patterns. On the opposite end, there was a new app released in 2020 that uses AI to help prevent migraines. This app attempts to reduce migraines by showing the user their body signals in an attempt to relax them. It also aims to be able to predict for individual users when they will get a migraine. The drawback to this app is that rather than collecting data constantly through everyday devices (like a phone or activity-tracking watch) it relies on two sensors, one that the user must place on their neck muscles and one that is placed on their fingertip. The user must take 10 minutes everyday to use these sensors in order for the app to help. Another restriction to this app is that while it attempts to predict migraines through body signals, it fails to monitor external factors.

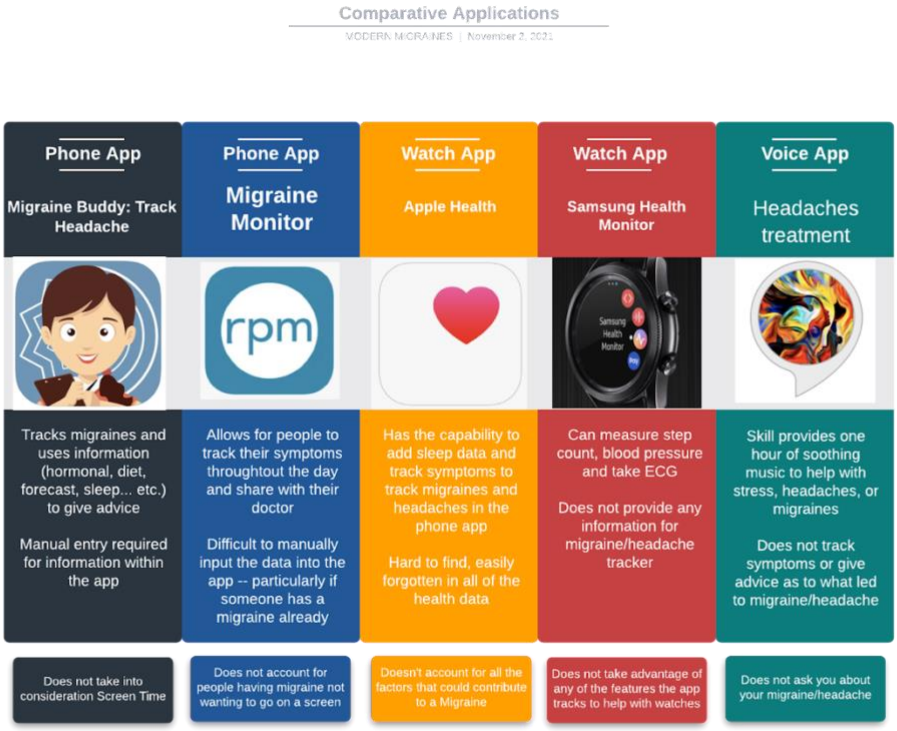
Both migraine dairies and the AI migraine app fail to track enough factors that trigger migraines. Some of the main triggers of migraines include atmospheric pressure, humidity, inconsistent sleep patterns, and not getting enough sleep. The AI migraine app doesn't track these, while migraine diaries rely on the user to manually log all this information, which can lead to incomplete and/or inaccurate data. By using sensors that are present in our everyday devices to track these factors we can record more data and ensure its accuracy without putting an extra burden on the user.

## Question 2

# Intervention

We plan to address the problem by creating an app that can be used in multiple ways that takes advantage of the current products that are currently being used in day to day life. In creating a voice feature, it makes tracking every day easier. The biggest problem is the need for each person to manually import all of their data to get the results. This is problematic as many people get worsened migraines by looking at screens and if they don't do it right away they may forget to input it at all. In using the watch features, we make it easy for people to know about how their surroundings and sleep affect them without them having to put in any effort. In implementing this, we will make migraine tracking and predicting migraines simple and effective for users.

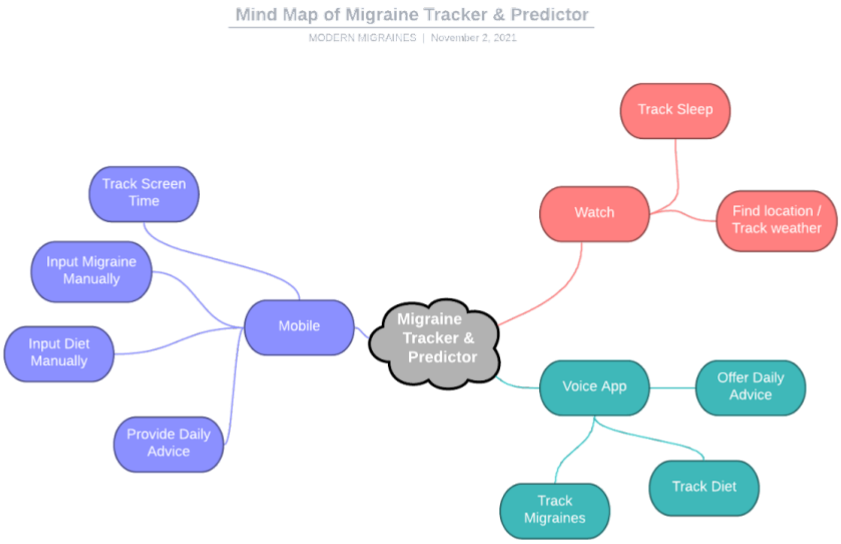
Similar applications don't meld well together and require the user to input all of their information, which makes it difficult for busy people. Looking in the voice space, a similar product could not be found. This will help immensely as it will allow for people to track their symptoms easily. In addition, combining the watch means people don't have to input as much data manually as well. In having people do less work, they will be more inclined to keep using it.




Our solution to the problem is to create an interface that uses information gathered from a watch and questions answered by either input from a voice program or

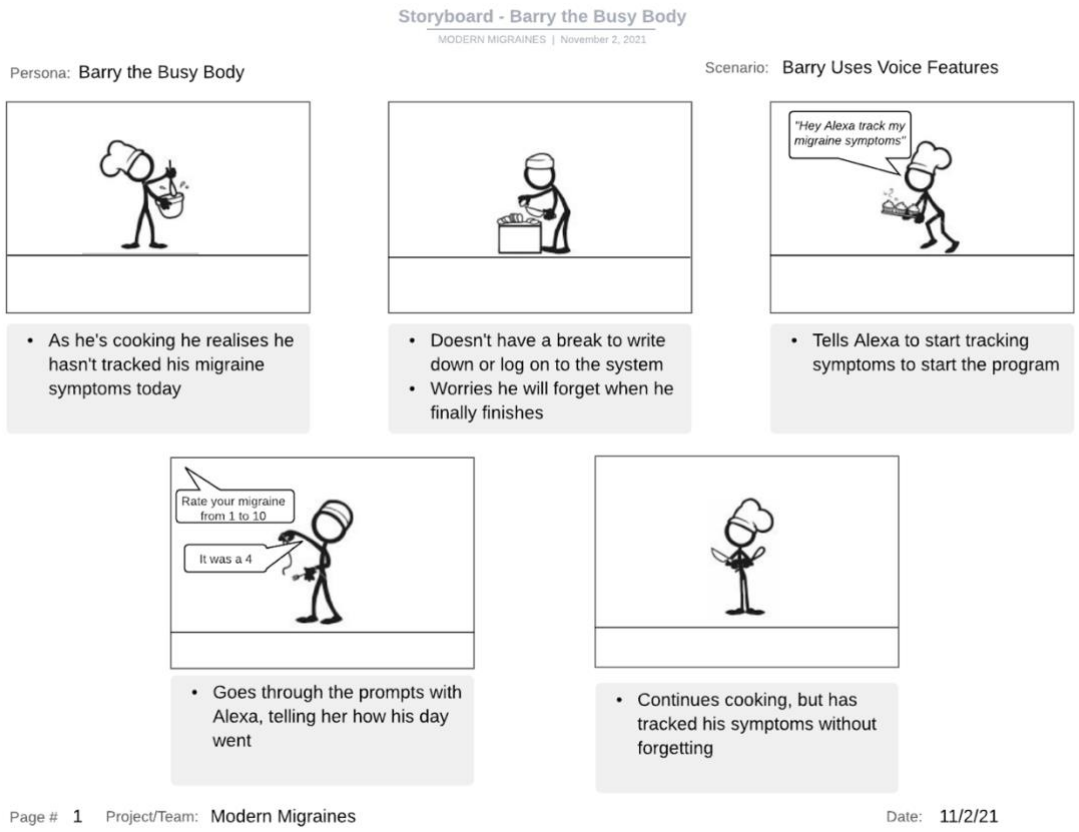
manual input to make tracking and predicting migraines easy for the user. On a typical day, the user could ask the voice interface in the morning of the likelihood of a migraine in the day and throughout the day input information about if they've had a migraine by speech or text. The user will also have a watch that will track data about the weather and sleep patterns. These patterns as well as the input will allow the user to input less but get the same results.

We aim to demonstrate our product by preparing days in advance to create a history of data that will allow the program to be more predictive. The day of, we aim to use the voice interface to display its functionality. We will demonstrate the voice interface by asking about the day, having it predict how the day will go, and have it give advice on how to mitigate migraines in the future.

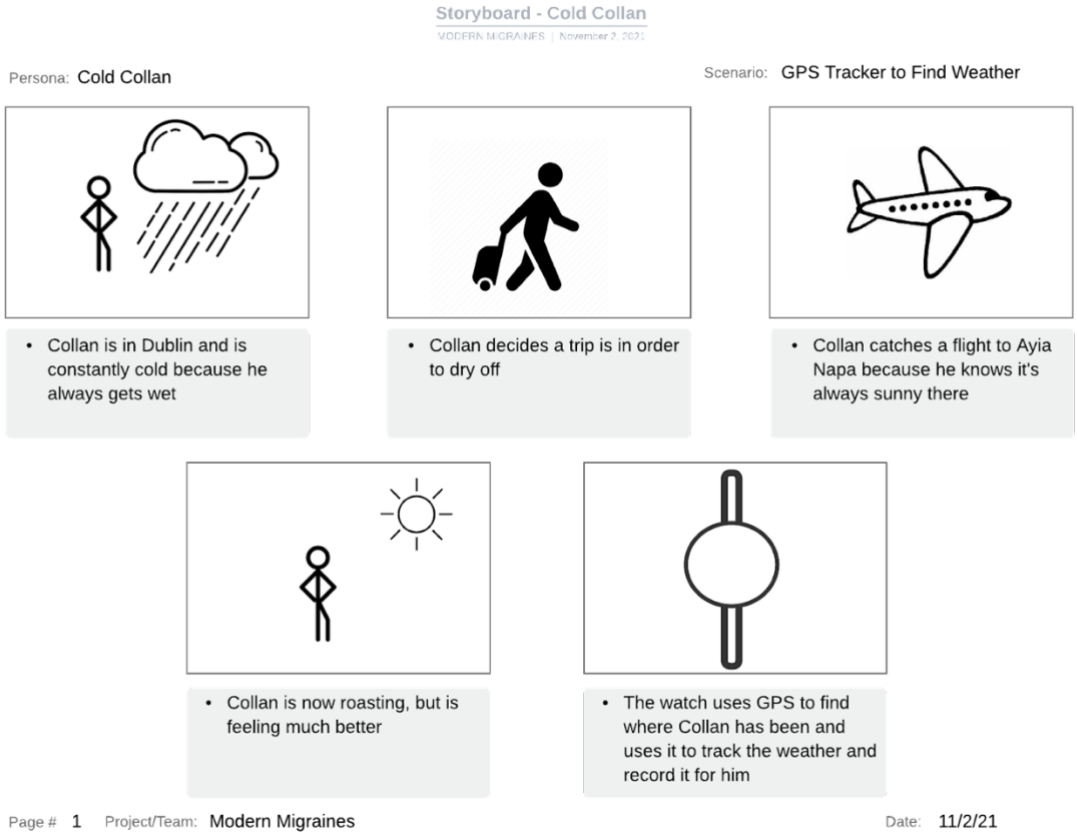


## Question 3

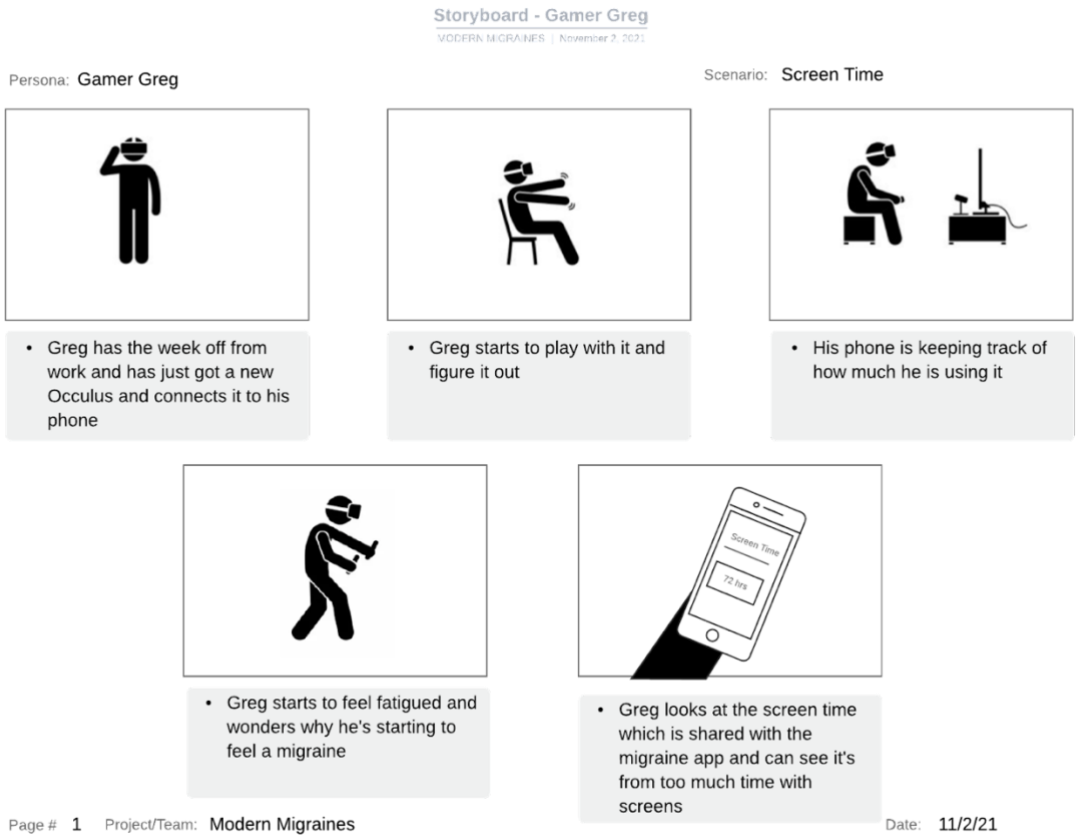
# Feature List




The voice feature will ask the user about their day to help them track their migraines as well as help them track their food choices so they will be better able to tell if any food triggers migraines for them. Asking them about their day is important so we can know what causes this person to have a migraine. This feature is particularly useful for busy people that don't have tons of time to manually input their data every day all of the time because it allows them to still be able to track their migraines.




The GPS functionality within the watch is a feature that will be used to get information about the weather the person is experiencing. This is important as a lot of migraines can be caused by the weather. This feature will mainly work behind the scenes and the user will not be directly interacting with it, so as to make it less work for them.



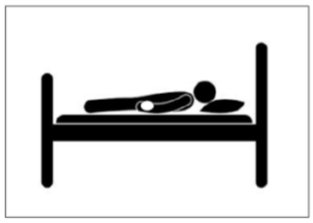

This feature will work with pre-existing data that the phone collects in order to find out how much time is being spent on devices as many people seem to get headaches and migraines after too much exposure to screens. Thus, it is important to include it so it provides a more full picture as to what is causing the person to have a migraine. This feature will run behind the scenes and although the user will be able to see if the migraines are caused by their screen exposure, they will not be manually entering this data for their own ease.

Storyboard - Sleeping Sally of Sleeping Sally

MODERN MIGRAINES | November 2, 2021

Persona: Sleeping Sally

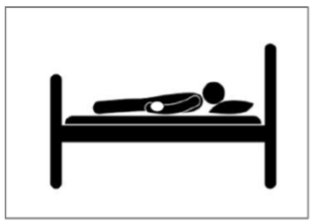
Scenario: Tracking Sleep



- Sally is tired and gets to sleep right away

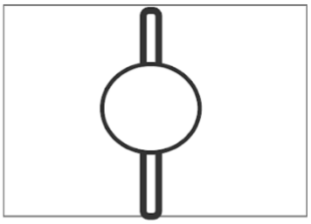
- Sally awaked in the middle of the night with a fright

- Sally tries to go back to sleep, but has a hard time falling back to sleep



- Sally eventually winds down and gets back to sleep after

- Sally awakes the next morning feeling a bit groggy



- Sally's watch tracked her sleep overnight, and the data will automatically record into the migraine tracker

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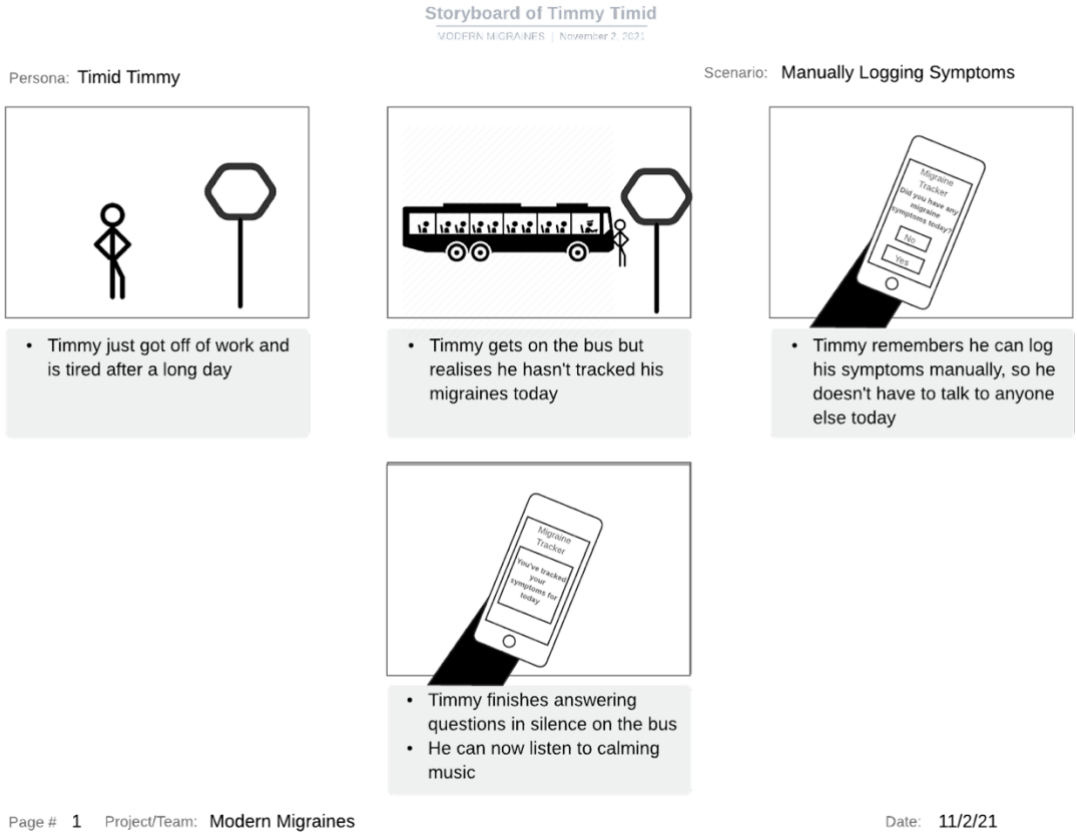
Using the watch to track a person's sleep, the sleep pattern will be recorded as sleep can greatly affect the likelihood of a migraine. The person simply wears the watch and it gathers the data that the app will be using. Thus, the person has to do very little to reap the benefits of finding out whether their sleep pattern is what is causing their migraines.




Although the voice feature will be the heart of this project, we recognise that sometimes people are not in a place where they can easily speak to devices as they are in a quiet or crowded place. For those moments, we've also decided to add a feature where a person could manually enter the data in a simple manner so they could still make the most of our product. This feature works like many mobile interfaces, but asks very simple questions that don't require too much detail. The goal is that the ease inspires people to continually track their symptoms so they have an easy way to predict their migraines.

## Question 4

# Devices

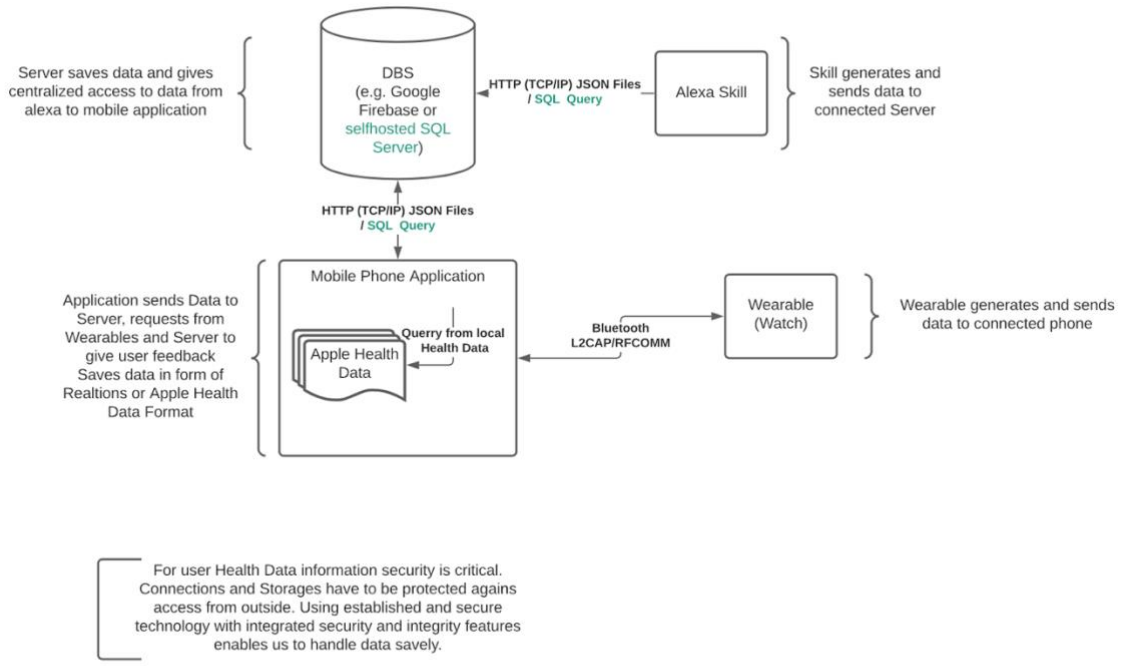
We are planning to use the Alexa to ask for health updates on a regular basis. We can power the Alexa with a stationary power outlet and connect it via Internet to a Server where to it uploads the information about the health status.

There is the need to store and access all the data in a safe way. That's why we are planning to establish a Database System. The alternatives are between an online NoSQL Database Service like Google Firebase or an Alexa alternative and a SQL server in a local network. First has the advantage that we don't have to set up and maintain our own server, but integration could be more complex. Having a local SQL Server could provide us with more control about how our data is stored and prototyping may be easier, but in the end we have to care about our server.

We are also planning to implement an ios application which can access the health data collected by the phone or a watch, compute the information and give the user specific suggestions on how to behave and do risk assessment.

## Question 5

# Architecture



## Question 6

# Timeline