August 2024

During the summer, we wondered if we could extend last year's idea further and create an app to actively help prediabetics control their sugar levels. We thought a realtime application with recommendations could be accepted by the user and he/she could follow them to see if the recommendations helped. Eventually, all the data could be used by AI to propose proper recommendations to users.

We came up with our Scientific Question: Can a real-time software-enabled recommendation engine reduce postprandial glucose spikes?

Summary of Background Research: Diabetes is a disease in which blood glucose levels in the human body are not properly controlled. After a diabetic eats a meal, they usually encounter a high glucose spike, known as a postprandial glucose spike. We find it very crucial to help people experiencing diabetes reduce these glucose spikes, and in this project, we want to test this out using a real-time software-enabled recommendation engine. We already have some ideas as to what pre and post-meal recommendations we will include in this app:

Pre-Meal

- Consume Protein
- Consume apple cider vinegar
- Meditation for 15 minutes before meal
- Consume Fiber

Post-Meal

- 15 minutes of yoga
- 20 minutes of walking
- 20 minutes of weightlifting
- Consuming green tea
- Consuming apple cider vinegar

Our main goal is to motivate users to adopt these recommendations and promote a healthier glycemic index. We are excited to help pre-diabetics and diabetics with this app.

September 1, 2024

We did research on premeal and postmeal recommendations to see if there was scientific evidence showing that they could improve blood sugar levels. Here is the final list we came up with:

- Consume protein before a meal
- Consume fiber before a meal
- Consume apple cider vinegar before a meal

- Meditate before a meal
- Go for a walk after a meal
- Do yoga after a meal
- Do weight lifting after a meal
- Consume green tea after a meal
- Consume apple cider vinegar after a meal

September 2, 2024
Started working on the wireframes of the app. We started by creating a powerpoint to help explain our vision. See following pages.

September 9, 2024
The Science Fair club meeting was led by Dr. Garcia, Mrs. Gierus, and Ms. Ghanem. They introduced the club and encouraged students to join the Google Classroom. Key dates and timelines were discussed, with the next meeting on September 18th at 11:30 AM in Room 230. A new mentorship program for JH students was also introduced (however, we will not be participating in this mentorship program). Students should fill out the Google Form by September 17th, bring their logbooks, and start brainstorming project ideas.

September 11, 2024 - We already have some ideas as to what we want this app to look like. However, my sister and I cannot code, so asked our uncle who is a computer programmer to help.

September 13, 2024 - Today we had a second call with my uncle AI who we introduced our project. He tasked us to:

- Create wireframes
- Figure out how to acquire a Dexcom API so we could take the incoming readings from our Dexcom app and transfer them into our app.

September 14, 2024 - Today, we emailed our lawyer to start an incorporated business. We also used Upworks to hire a patent agent to see if our idea was patentable.

September 15, 2024 – We completed rough drafts of our wireframes to pitch to our uncle.

September 17, 2024 - Today, we're now ready to delve into the first phase of the project, which is to test the Dexcom API's connectivity with the app. It is important to figure out how we can connect the sensor to this app to detect changes in glucose levels, provide smart recommendations, etc.

September 28, 2024 - We have successfully tested and validated the real-time capability of the Dexcom API connectivity today. We were able to connect our app to the Dexcom app by finding a loophole in Dexcom's system, and thus, scrape the data off of Dexcom and use it in our app. This marks a huge milestone because it is very difficult to do this in realtime.

October 1, 2024 – Our uncle was successfully able to create four working wireframes out of the drawings we sent them. The following is a DESCRIPTION of each of the wireframes, and below are further CHANGES that need to be made in each. We sent this feedback to my uncle, and he told us that he would send us the improved versions later:

Wireframe #1

- Focused on making the app professional
- Create an Account process
- Filling out initial information (date of birth, gender, weight/health, meds) → not affecting the recommendations JUST YET
- Adding your personalized pre-meal recommendations to evaluate how good they are

Wireframe #2

- In this wireframe, a notification is being sent to ask if someone is going to eat. They say no in this case.
- When your blood glucose is getting higher/lower or time of day from historical data (when they usually eat)

Wireframe #3

- In this wireframe, a notification is being sent to ask if someone is going to eat. They say yes in this case.
- Then there's a notification that says "Here are your pre-meal and post-meal recommendations". At first, it's going to be random, but after we train the model and collect a bunch of data, it will be smarter.
- We don't want to annoy the person with a bunch of pop-ups, so we add the pre and post-meal recommendations in one pop-up.

Wireframe #4

- Asking if they followed the pre-meal recommendation → when did you have your pre-meal **(timing of this is important.)**
- After you eat, three prompts will come up: did you do pre-meal, did you eat your meal, and did you do your post-meal
- There are also notifications that you haven't answered.

MANY CHANGES NEED TO BE MADE:

- Manually enter additional pre-meal/post-meal recommendations that you would prefer to test instead of Manually enter pre-meal/post-meal options that fit your taste (keep personalized options to 5)
- My Recommendation Follow Rate instead of the Rate at which recommendations are adopted.
- Put the percentage behind the number.
- Change range for mmol/L (0-20)
- Add the little speech bubble (time & glucose reading) on the corresponding line graph when the historical recommendation graph icon is clicked.
- Be specific when asking if you followed the pre and post-meal recommendations in case they forgot.

(See following slides)

October 11, 2024 - Today, with our parents, we talked to an accountant to receive government grants, as the Dexcom CGMs will get expensive and we need them to test.

October 26, 2024 - We also talked about our patent results that came in today - the patent agent said that there is no patent around detecting hunger and providing real-time recommendations that allow you to drop your glucose levels. We also cannot patent the alarming/notification system that is used whenever your sugar level goes up and down. This has already been patented by Dexcom. Moving forward, we have decided to continue building the app. We will patent once we are done and we will only patent once we truly understand each of our app's processes, to make an educated patent.

October 27, 2024 - After taking a look at more of our wireframes, our uncle has finally finished the user authentication module, as well as all the settings and profile pages! This, essentially, is the first part that users will see of our app including user information, preferences, login information, etc. Even though this is the first fully completed part of the app, we are getting lots done for our project and things are going very well. The next step is to get the Glucose Monitoring Interface and actual recommendation notifications done.

November 12, 2024 - We finally finished the front-end development for the Glucose Monitoring Interface! This means that the part that tracks the glucose levels through the CGM, and the part that shows the data chart in the home screen is all done. Now, we need to finish the actual recommending part that analyzes this data and actually transfers it into useful recommendations.

November 29, 2024 - Vizio finished the front-end development for meal logging and recommendation interface. This is the part where users can type in what food they're using and receive these notifications afterwards, the most important part of our app! Now, debugging of the application can begin!

December 12, 2024 - The push notification system for the app is done, which is the button in the bottom right corner of the home screen that users can click to log in when they are hungry. This is a very crucial part of our app. They were also able to fix some bugs that we had with the automatic notification system (where the app sends out notifications during specific parts of the day for breakfast, lunch, and dinner). The notifications weren't sent at the correct times or weren't sent at all. However, thankfully, my uncle was able to fix this after nearly two weeks of testing. We are so excited!!!!!!!!!!!!

January 20, 2025 - We have received the final application! We did some further testing and debugging to make sure that there were no bugs that had huge effects. Most of the bugs and problems that we had at the beginning of this project were finally gone! My entire family put on sensors to begin the final debugging phase!

All the bugs fixed during the testing period (Nov 2024-Jan 2025) are attached on a separate document

January 20, 2025 – February 20, 2025 – Our family completed testing of the app and all results were obtained by Feb 20.