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| **CS102** | **Spring 2022/23** |  | 2J |
|  | Project Group |
| Instructor: | **Aynur Dayanık** |
| Assistant: | **Vahid Namakshenas** |  |

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| **Criteria** | **TA/Grader** | **Instructor** |
| Presentation |  |  |
| Overall |  |  |

~InsuChef ~

Meal Magicians

## Emine Fidan

**Umay Dündar**

## Edip Emre Dönger

## Elif Ercan

## Yiğit Kemal Can

**Requirements Report**

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**1. Introduction**

Introducing InsuChef, the ultimate solution for people with diabetes who require insulin injections. For those with Type 1 diabetes, the pancreas doesn't produce insulin, so they need a fast-acting insulin injection whenever they eat food that raises their blood sugar levels. Calculating the correct amount of insulin to inject involves several factors, including blood sugar levels, total carbohydrate intake, insulin sensitivity factor, and more. Additionally, to calculate the correct insulin dose, patients need to know how many grams of carbohydrates are in their meals. That's where Insuchef comes in! The first task of Insuchef is to ensure that patients know precisely how many grams of carbohydrates they are consuming. The second task is to calculate the correct amount of insulin needed. With a user-friendly interface, Insuchef aims to make the process as simple and easy as possible, allowing patients to take control of their insulin dosage without any additional stress or effort.

**2. Details**

# Problems & Solutions

"In 2014, 8.5% of adults aged 18 years and older had diabetes. In 2019, diabetes was the direct cause of 1.5 million deaths, and 48% of all deaths due to diabetes occurred before the age of 70 years. Another 460 000 kidney disease deaths were caused by diabetes, and raised blood glucose causes around 20% of cardiovascular deaths " (1). Although diabetes is a prevalent disease affecting millions, most people, even patients, don't have enough information about it.

1. Some patients inject more or less insulin than needed. Both cases are not optimum for the human body. If there is more insulin than required, pancreas cells have to produce glucagon to balance the blood sugar. If there is less insulin than needed, the patient might suffer severe diseases, such as heart diseases and neurological diseases. This application tries to pre-vent these problems by calculating the sufficient insulin dose for the patient.

2. Other than injecting more or less insulin, some patients inject themselves with insulin at the wrong time. The InsuChef application will create a message to notify users about when they should inject insulin.

3. Although insulin injection helps people with diabetes to maintain a healthy and standard life, patients must be careful about their consumption. However, some patients are careless about it. InsuChef will help patients to keep their carbohydrate intake limited since it calculates their carbohydrate intake for each meal.

# Features

This app has five different screens, each with different functionalities. The first screen, the Profile Screen, collects important patient information that will be used in calculations, including weight, insulin-to-carbohydrate ratio (per meal), insulin sensitivity factor, and target blood sugar levels. If a patient's total daily carbohydrate intake has been predetermined by a dietician or doctor, this information is also recorded and saved. The second screen, the Main Screen, contains a button that directs patients to the Profile Screen for updating purposes, as well as a "Eat" button that takes patients to the third screen. The third screen, the Food List Screen, shows foods sorted by categories, such as vegetable and fruit group, dry beans, dairy products group. Frequently used items are shown at the top. Patients select the food items they will eat for their meal and proceed to the fourth screen. The fourth screen, the Distribution Screen, has two possibilities. If a predetermined total meal carbohydrate value is entered into the Profile Screen, the selected foods will be adjusted so that the total amount of carbohydrates does not exceed the predetermined value. The selected food items and their corresponding amounts (which can be increased or decreased) will be displayed. If a patient wants to change the amount of a food item, the amount of other food items will be adjusted automatically to maintain the total meal carbohydrate value. The second option allows users to customize their meals to their liking without a predetermined total carbohydrate value. If users select this option, they can adjust the amounts of each food item freely regardless of the total carbohydrate value. Once food adjustments are completed, patients can either return to the Main Screen or proceed to the fifth screen, the Insulin Calculation Screen, which calculates bolus insulin doses based on current blood sugar levels and patient profile information. Patients can then return to the Main Screen.

* 1. **Technologies**

**2.3.1 API technology**

To calculate enough insulin, it is crucial to know the total amount of carbohydrates in the chosen foods for meals. For calculating the total carb count, it is sufficient to have information about the carbohydrate amount of common foods. To get the carb count of foods, we will extract data from a database called USDA FoodData Central. We will extract data about foods using an API key which we will request from the website. For requesting information, we will use REST API which is a commonly used API that mainly uses HTTP requests for getting data. With the help of the methods that are provided with the API, we can get the data we wanted. We will also use the java HttpUrlConnection class for controlling whether the connection is ok with the website before getting the information. After getting the raw data the data type must be determined and if it is not appropriate must be parsed into another type. Because we will use java as our main programming language, we will create our android application using object-oriented programming approaches so our data type must be object-oriented as well. Because of that reason, we choose JSON as our data type. In the REST API that we are going to use data types of website responses can be changed so to maintain JSON type data we will cast the data that we get from the database using API. After casting the data, we will store the data in a file. In this way, we can always get the data by using readers from the file that we created and stored without using the key. Additionally, in this way, we do not need to connect to the internet all the time to get data. We can also solve the issue about the website's API request limit by not doing the request all the time. Although we do not need to get data all the time from the website’s database, we will update the data regularly.

**2.3.2 Android studio**

Our target audience must always calculate their carb counts and insulin amount, so the portability and accessibility of the insulin calculator are very important. Some insulin calculators are web-based, but the lack of an internet connection may have a problem. Because of that, we want to make an android application. For making the user interface, we will use android studio which is a development environment that has advanced properties such as adding configurations and running the code on an android emulator**.**

**2.3.3 Searching Algorithms**

In our application users can choose foods from the food list they can also search for the foods they want to eat. For the searching part, we will use approximate string-matching algorithms. In this way, users can write some part of the name of the food while they can see the food list and suggestions for their search changing while they write more and they can find the foods they want to eat more easily.

# 2.4 Existing Projects and Innovations in Our Project

Some of the existing projects that are similar to our project are:

1. Karbonhidrat - Bolus Hesaplayıcı (2)

2. mySugr - Diyabet Takip Günlüğü (3)

3. Diyabet Kontrol (4)

These applications have a similar idea to our project. However, we are going to add different features to our application. First of all, some of these applications have complicated interfaces. It might be difficult for some patients to use these applications since diabetes affects people of every age. Application number 1 has a more straightforward interface, but the current an-droid version does not support this app. Therefore, we will design a simpler interface to enable people to use it conveniently. Besides that, we will create a profile for users and get information from them, such as weight and target blood sugar. Hence, they won't have to input these continuously. Additionally, we are going to make developments in the food list, such as limiting the total carbohydrate intake or warning about harmful nutrition.

# Target Audience

InsuChef is an application that designed for people with diabetes. But other than patients, people who want to keep track of their carbohydrate intake and keep it limited can also use InsuChef since one of its main features is to calculate the carbohydrate intake.

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**3. Summary & Conclusions**

In conclusion, InsuChef is a useful application that aims to help diabetic people in their daily struggles by providing a reliable and easy way of calculating their sufficient insulin dosages, as well as helping them keep track of their carbohydrate intake. The app has a user-friendly and straightforward interface, which includes a user profile to keep track of information, a food list to pick meal contents from, and an insulin calculation tool. The technologies used in this project will be API keys to extract information from databases and Android Studio to create the mobile application.

# References

1. “Diabetes.” *World Health Organization*, World Health Organization, 16 Sept. 2022, <https://www.who.int/news-room/fact-sheets/detail/diabetes>.
2. <https://play.google.com/store/apps/details?id=com.boluscalculator&hl=tr&gl=US>
3. <https://play.google.com/store/apps/details?id=com.mysugr.android.companion&hl=tr&gl=US>
4. <https://play.google.com/store/apps/details?id=melstudio.msugar&hl=tr&gl=US>

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