 **NELSON MANDELA UNIVERSITY**

**School of Information Technology**

**IT PROJECT 3 (ITPV302)**

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***Implementation***

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# 3. Introduction

This document outlines the implementation of our Recipe Application, detailing the tools and technologies used, complex code excerpts, and challenges encountered during development. The primary purpose of this document is to explain the choices made during development, demonstrate the complexity of the code that drives the app’s unique features, and reflect on the technical problems faced and how they were resolved.

This document has 4 key sections. The Choice of tools section describes the specific tools, frameworks and APIs used in developing the app and why they were chosen. The extracts of code section displays code snippets of complex code that caused significant challenges during the development of the app and provides detailed explanations for each code snippet. The source code reference section provides references for any external code or resources we used or adapted for our project. The Problems encountered section provides a reflection on the technical difficulties we faced while developing the app, such as specific coding errors or technical limitations and how we eventually resolved them.

This document serves as the comprehensive overview of the technical implementation of our project.

# 3.1 Choice of Tools

## 3.1.1 Visual Studio 2022

We chose Visual Studio Code (VS code) 2022 as our primary Integrated Development Environment (IDE) because it is very lightweight, highly customizable and provides various useful extensions for Dart and Flutter. VS code integrates Git for version control which provides a useful way of working in a group. VS Code also allows for the projects to easily developed within isolated environments away from external packages on the system which made it the best choice for our app development.

## 3.1.2 Firebase

We used Firebase to store all recipe data, user details and images in real-time. Firebase was selected because of its built-in security features and smooth integration with flutter. Firebase handles authentication for user login and registration and ensures the data is handled securely. It also supports real-time updates through Firestore which allows for data synchronization when internet is available. Firebase has a console that has monitoring tools allowing us to track app usage and performance.

## 3.1.3 Kaggle

To build our initial recipe dataset, we used data from Kaggle, a platform with various datasets, we chose the “Food Ingredients and Recipes Dataset with Images” dataset (Sashi Goel, 2019) with license [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/). This allowed us to quickly get a collection of recipes which were later enhanced using the Edamam API for nutritional information.

## 3.1.4 Edamam API

We used Edamam API to get accurate and detailed nutritional information for our recipe data which will be needed for fihltering and search functionality. The API provided various nutritional information such as diet labels, calories and macronutrients.

## 3.1.5 Python and Java

We used Java and Python to preprocess the recipe dataset before sending it to Firebase. Python was used to clean ad format the data into an appropriate format, so all our data entries were consistent. Java was used for automating the uploading process for images and recipes data to the Firebase and Firestore which saved a lot of time.

## 3.1.6 Dart and Flutter

We chose flutter and Dart to develop our application because of its ability to create native like applications for various platforms from a single codebase. Flutter also has a rich set of widgets and customizable components which provide a lot of flexibility when it comes to building visually appealing user interface.

## 3.1.7 Figma

Figma was used to create the interactive prototypes for the app. The designs were shared and used to guide our development.

# 3.2 Extracts of complex code

Figure 3.1 shows the formatIngredient method. The formatIngredient method is used to extract key details from an ingredient string from a recipe. This method finds the quantities, units, and the ingredient name from text strings that come in various formats, such as “1/2 cup sugar “or “200g flour”. This method makes use of two regex expressions (shown in Figure 3.2 and Figure 3.3) to match the ingredients to known quantity and unit patterns

The method starts by removing any extra inverted commas and spaces from the ingredient string. If the ingredient includes both a quantity and a unit (“2 cups” or “½ teaspoon”), this pattern is then caught by the “quantity\_unit\_pattern” regular expression. Any fractions are then converted into proper numbers for easier storage and later calculations.

If a unit is not found, the method searches for just a quantity using the “quantity\_pattern” which finds ingredient strings like “3 egg”.

If there is no quantity and unit present (“pinch of salt”), the method checks if the first word in the string is a known unit such as “pinch” and then extracts the ingredient name from the remaining words in the string.

Finally, the method removes any extra information such as text in brackets like “3 cups flour (plus more)”, leaving only important ingredient data.

Figure 3.2 shows the “quantity\_unit\_pattern” which is responsible for identifying ingredient strings that contain both a quantity and a unit. It is flexible enough to match common formats like "1/2 cup," "100 g," or even fractions like "¾ teaspoon." The pattern captures number quantities and fractions, and matches units from a predefined list (e.g., "cup," "teaspoon," "gram").

Figure 3.3 shows the “quantity\_pattern” which is used for cases where the ingredient has a quantity but no unit ("2 eggs"). This pattern finds fractional and number quantities, ensuring that even ingredients like "1/4" or "½" are correctly extracted.

A screenshot of a computer program

Description automatically generated

Figure 3. 1: A method that formats ingredients from recipes

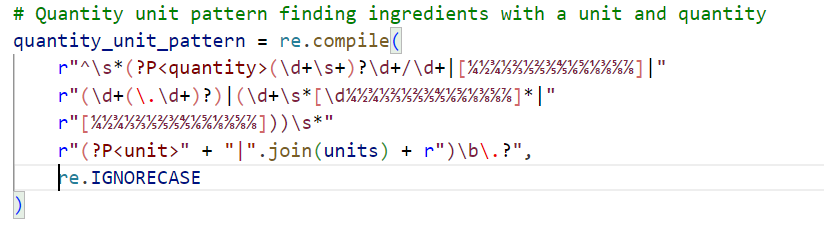


Figure 3. 2: Regex pattern that matches ingredients with quantities that are followed by units

A screenshot of a computer program

Description automatically generated

Figure 3. 3: Regex pattern that matches ingredients with just a quantity and no unit

Figure 3.4 shows the ExtractTimeInfo method which is used to extract time-related data from the recipe instructions. This is done for the “Cook with me” feature of our app, which will help users follow recipes with built in timers.

The method uses two regex expressions which are also shown in Figure 3.5 and Figure 3.6 to identify both single times and time ranges ("bake for 20 minutes" or "simmer for 5 to 10 minutes").

First, the method looks for individual time mentions using the “time\_pattern”, which matches time units such as "minutes," "hours," or "seconds" along with their corresponding numeric values ("20 minutes" or "1 hour"). Each time match is converted into an integer and stored in a dictionary, which contains the time value and the unit, and this is added to the “time\_data” list.

Next, the method looks for ranges of time using the “time\_range\_pattern”, which captures expressions like "5 to 10 minutes" or "1 to 2 hours." Both the start and end times are extracted and converted into integers, with the unit identified. This data is then added to the time\_data list as well.

The method returns a list of dictionaries, where each dictionary contains either a single time or a time range with its corresponding unit, allowing the app to create timers based on the recipe’s instructions.

A screen shot of a computer program

Description automatically generated

Figure 3. 4: A method that extracts the time from the instructions of a recipe

# 3.3 Source code references

## Flutter and Firebase Tutorial

**Description**

To learn more about the dart programming language, flutter and the fundamentals of firebase we followed a course created by Vandad Nahavandipoor.

**Usage**

* Flutter setup
* Login View
* Email Verification
* Firebase backend setup
* Auth service
* Migration to Firestore Service
* Bloc for routing and dialogs

**Reference**

freeCodeCamp.org (Director). (2022, February 24). *Flutter Course for Beginners – 37-hour Cross Platform App Development Tutorial* [Video recording]. <https://www.youtube.com/watch?v=VPvVD8t02U8>

## Grid view UI

**Description**

Implementing the grid view of the screen and structuring UI elements by using GridView.builder.

**Usage**

UI elements of Saved Recipe screen

**Reference**

Mitch Koko (Director). (2022, November 4). *Donut App UI • Flutter Tutorial* [Video recording]. <https://www.youtube.com/watch?v=OmYL-VK75-o>

# 3.4 Problems encountered

## Creating a Flutter App

Our goal to create a cross-platform app meant that we needed a framework that allowed for simple cross platform development which was Flutter. We hadn’t used Flutter and the language dart which it uses before and needed to learn how to make use of it in order to begin creating the app.

We found a video on YouTube that helped us to gain insight on how to use Flutter and code an app with dart. The tutorial allowed us to learn and use that knowledge to start developing the app.

## Using Firebase

For authentication we did not want to have to handle an authentication for the app as it would add unnecessary complexity to the app. Within the same YouTube video that taught us flutter, Firebase was used to handle the Authentication and provide storage which we decided to make use of for the app.

Firebase also solves the problem of syncing changes to the database when a user returns to an area of internet connectivity.

## Bottom Overflow Error

Occasionally we encountered an error that would pop up whenever a text field was pressed and brought up the keyboard which was the bottom overflow by x pixels.

This error comes about when the screen is made to be static and then an element such as the keyboard will push the content below it off the screen. To fix this we wrapped the widget that is shown under a Single Child Scroll View which allows the screen to be scrollable.

## Right Overflow Error

When designing the UI elements for the saved recipe screen there was a right overflow error as seen in Figure 1. This occurred when using the GridView.builder widget to allow two items per row. Causing an overflow due to the items overlapping.

To fix the error we needed to ensure the width of the grid items do not overflow by using a combination of crossAxisSpacing and padding. To avoid a bottom overflow error for the grid items we used mainAxisSpacing as well. The aspect ratio of the grid items was also changed so that all contents fitted inside.

A screenshot of a recipe

Description automatically generated

Figure 3. 5: A picture of the right overflow error

## Stack Overflow Error

On the search screen where we were testing a placeholder model for displaying data, we got a stack overflow error. There were no errors highlighted in the code, but the debug console showed it was occurring because of the model class.

The problem occurred because it was calling the getRecipe() method, which caused an infinite loop of the data being displayed. To fix the issue the recipe list itself was returned.



Figure 3. 6: A picture of the stack Overflow error on the search screen

# References

Sashi Goel, A. D. (2019, February 19). *Food Ingredients and Recipes Dataset with Images*. Retrieved from Kaggle: https://www.kaggle.com/datasets/pes12017000148/food-ingredients-and-recipe-dataset-with-images