Functional Specification

Project Title	SUM-UP
Module	CA400 - Final Year Project
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1. Introduction

1.1 Overview

The goal of our project, SUM-UP is to focus on extractive summary of spoken audio, potentially leveraging Spotify's podcast collection. In terms of our project summaries could be created in response to user queries. As summaries help us discover our areas of interest and provide a quick context for the tale.

We are looking to create a prototype web application that will support playback of recorded audio of summary contents or if the user prefers they can . We will implement summarisation algorithms upon datasets provided by Spotify collection and convert that to audio or text based on the user's wants. This will be done through the use of machine learning tools. There will be a further implementation of an accounts system that keeps track of the users summaries.

This application would be ideal for those who are avid listeners of podcasts or other audio forms but do not have the time to spend listening to multiple hour-long episodes. They can upload their desired audio and control the summarisation parameters and obtain an accurate but brief summary.

1.2 Business Context

There are currently no business organisations sponsoring the development of this system. However, the following are examples of what this application could be done with in the context of business

- This application is highly flexible in use for many industries therefore we see a potential opportunity if made available to the public.
- Another possible route is monetization with advertisements if receiving enough traffic.
- The Verge has stated that podcasting will become a $4 Billion dollar industry by 2024 [1]. Therefore, there are many people who will want such technologies and applications.

1.3 Glossary

Term	Definition
Summarisation	Summarization is the act of mechanically reducing and rewriting a huge amount of text into a short, concise summary.
Extractive Summarisation	The goal of extractive summarising is to find the important information, which is then extracted and organised together to make a short summary.
NLP	Natural language processing is a branch of linguistics, computer science, and artificial intelligence that studies how computers interact with human language, specifically how to design computers to process and evaluate huge volumes of natural language data.
Machine Learning	The usage and development of computer systems that can learn and adapt without explicit instructions by analysing and drawing conclusions from data patterns utilising algorithms and statistical models.
Algorithm	A procedure or set of rules that must be followed in computations or other problem-solving procedures,
Dataset	A collection of connected pieces of information made up of discrete parts but controlled as a whole by a computer.
API	A programming interface allows two or more computer programs to communicate with one another. It is a form of software interface that provides a service to other programs.
Backend	The portion of a computer system or application that is not directly accessible to the user and is typically responsible for data storage and manipulation.
Frontend	Pertaining to or signifying the component of a computer system or program with which the user directly interacts

2. General Description

2.1 Product / System Functions

We intend on producing our system to be consisting of a full stack website that is adaptable by both mobile and desktop devices. The application will incorporate the following key features, which are mentioned below. Although these are the main program elements that we wish to include, we expect that our functionality may vary and evolve over the next months as we add additional or modify certain functionalities.

Authentication: The application will have a signup/login system that will help keep track of users and provide an extra layer of security.

Audio Breakdown: The application will allow the user to upload an audio file of their choice where these will be broken down and converted into text form in order to perform further analysis on the data. This data will then go through the summarisation process and the user will be given the result.

Summarisation: This process will be done using various algorithms and will be carried out using the extractive method.

Filtered Summarisation: Users will have the option to further specify extra parameters which will filter the results further.

History Management: The user will have the ability to view all their previous and current summaries by using the accounts system. The user will be able to manage their own account.

Export / Data Change: The user will be able to view and edit the resulting data after summarisation. They would have the option to keep it in the current form or opt for audio playback form. They will be able to export if needed.

Regular Summarisation: The application will have an extra feature that will allow the user to summarise textual based data if needed.

2.2 User Characteristics and Objectives

This application is universal based on the ages of its user, the only limitation in terms of users would be that the user would have to be of legal age to view and indulge in the audio media that they have in their possession which they would like to summarise. The user must at least have some form of data that they wish to input into the application.

The intended audience of this application would be business professionals, teenagers, university staff and students and basically anyone who has an interest in audio content and would like for it to be in a shorter & digestible and a more time friendly form. Users must be familiar with how to use a desktop computer or a mobile phone.

The application will have an attractive yet simple user interface and be clear and straightforward to use.

2.3 Operational Scenarios

- User Login / Signup:
    - Primary actor
        - User
    - Description
        - Once the application is fully set up and ready to be used the user will first be requested to login or signup if they do not have a pre-existing user account. The page that they will be greeted first will be the Login screen however if they are a new user they will have a link or button to the registration screen. They will have to input information such as name and email and once successfully completed they will be redirected to the initial login screen.
    - Successful Scenario
        - The user is successfully registered with correct information OR user successfully authenticates themselves and are redirected to the next screen.
    - Unsuccessful Scenario
        - The user will failed their registration by providing invalid credentials and must retry with correct information OR the user is unable to login due to forgotten credentials, they will have to go through recovery options for this.

- Media Selection:
    - Primary Actor
        - User, Database
    - Description
        - After successful authentication and user login they will be presented with a screen where they can choose what media they would like to use and upload. They will be given two options; Saved Media & New Media. As the names state, Saved Media will be past uploads that the user has decided to keep and New Media will be used if the user would like to upload new content that isn't already saved. New Media will have two subcategories; Text & Audio. Text option will allow the user to add textual data to be summarised whereas Audio will take in audio media files.
    - Success Scenario
        - The user is able to successfully upload an audio file or input textual data if they are adding a new media. The user is able to use the saved data.
    - Unsuccessful Scenario
        - The user is trying to upload the wrong media type and it fails. The user has no pre saved data that they can use to perform the task.

- Pre-Summary Filters:
    - Primary Actor
        - User
    - Description
        - Once the user has selected their media they will be able to set custom filters in order to get a more specific result, this could include the length of the output, the structure or style.
    - Successful Scenario
        - The user is able to apply all their selected filters and find the correct combination of criteria.
    - Unsuccessful Scenario
        - The user is unable to filter the media based on the content of the file or the available options for the program.

- Summarization:
    - Primary Actor
        - User, Database

    - Description
        - Once the user is satisfied with all their chosen options they can then proceed onto the main focus of the application which is the summarization. The application will take the media and run it through an Audio Breakdown and provide it in a text format where the appropriate summarization will take place. This could take longer or quicker based on the specified filters chosen by the user.
    - Successful Scenario
        - The data gets summarised successfully and returns the output in a quick response.
    - Unsuccessful Scenario
        - The data takes a substantially long time to get outputted. The data summarised is incorrect and not to an appropriate standard.

- Resulting Output:
    - Primary Actor
        - User, Database
    - Description
        - Once the user has summarised the data they will be presented with the resulting output in text form where they have the option to view the result and assess whether or not this is the result that they would like. However this is not the final outcome.
    - Successful Scenario
        - The data shown is correctly summarised with the filtered data matching the criteria
    - Unsuccessful Scenario
        - The outputted data is not correct based on the filters for example if it is longer than the length specified.

- Exportation
    - Primary Actor
        - User, Database
    - Description
        - Once the user is satisfied with the resulting output they can then proceed onto the exportation of data. They will have the option to either export with the textual results or in audio form (this would be the preferred option when it comes to podcast summarisation)
    - Successful Scenario
        - The summarised data is successfully exported to the correct media type

    - Unsuccessful Scenario
        - The summarised data is not exporting successfully into the specified format. The file gets corrupted or loss of data.

2.4 Constraints

- Time:
    - This project has a highly constrained time period as it must be completed by the 28th of April 2022. Due to these limitations, we are unable to offer as much functionality or add as many advanced capabilities.
    - As a result, we will concentrate on making sure that the application's fundamental functionality is working well before moving onto extra features.

- Summarisation Speed:
    - The long the audio media the longer it will take to summarise the file, in order to provide a useful response, the data has to be worked with and successfully analysed as promptly as possible.

- Internet:
    - This application is a web based application and having access to the internet is a must in order for some of the functionality to operate accordingly.

- Languages & Frameworks:
    - We both have low level experience with JavaScript and would ideally need to familiarise ourselves with it more in order to allow our application to work and look the best.
    - We will be using Firebase for the database element of our project. However, Firebase’s free version is very limited in terms of the features that are available for use.

- Algorithms:
    - There are various algorithms that can be used to help perform the main task of this application however making sure to use

the ideal and most effective algorithm or the correct combination must be well researched and looked into.

- Security
    - We must comply with GDPR as we will be requesting user details upon registration in order to create their profile accounts on the app.

3. Functional Requirements

3.1 User Signup

Name & No.	User Signup - 1
Description	When the application is fully configured and ready to use, the user will be prompted to login or sign up if they do not already have an account. The first page they will see is the Login screen, but if they are a new user, they will see a link or button to the registration screen. They will be required to provide information such as their name and email address, after which they will be forwarded to the initial login screen.
Criticality	High
Technical Issues	Making sure the information collected validates the form correctly and displays the correct responses when the user clicks the final signup button.
Dependencies	NA

3.2 User Login

Name & No.	User Login - 2
Description	If a user is already registered they will require a login page to securely enter their information and access their account.
Criticality	High
Technical Issues	It’s important our login pages works correctly as

	users may experience issues otherwise. One of the biggest issues would be forgetting passwords and allowing the option for a password recovery or change feature.
Dependencies	1

3.3 Media Selection

Name & No.	Media Selection - 3
Description	After successful authentication and user login, they will be redirected to a screen where they may choose their preferred media. They will be presented with two options: Saved Media and New Media. Saved Media will be prior uploads that the user has opted to save, and Fresh Media will be utilised if the user wants to submit new content that hasn't already been saved. Text and audio will be the two divisions of New Media. The Text option allows the user to enter textual data to be summarised, whilst the Audio option accepts audio media files.
Criticality	High
Technical Issues	Giving the user to pick a new or saved media file, making sure they have the option for text and audio and these options are executing their functions.
Dependencies	1, 2

3.4 Filters

Name & No.	Filters - 4
Description	After selecting their media, the user will be able to apply custom filters to get a more specific result, which could include the length of the output, the structure, or style.
Criticality	High
Technical Issues	This will be challenging as it incorporates the algorithms to provide the output according to the

	selected filter.
Dependencies	1, 2, 3

3.5 Summarization

Name & No.	Summarization - 5
Description	Once the user is pleased with all of their selections, they may go on to the application's main objective, summary. The application will take the media and put it through an Audio Breakdown before presenting it in text format with the relevant summaries. This might take longer or shorter depending on the user-specified criteria.
Criticality	High
Technical Issues	Having the output with the specified criteria is key. Also making sure the application takes in the given media correctly is vital to the process as well.
Dependencies	1, 2, 3, 4

3.6 Resulting Output

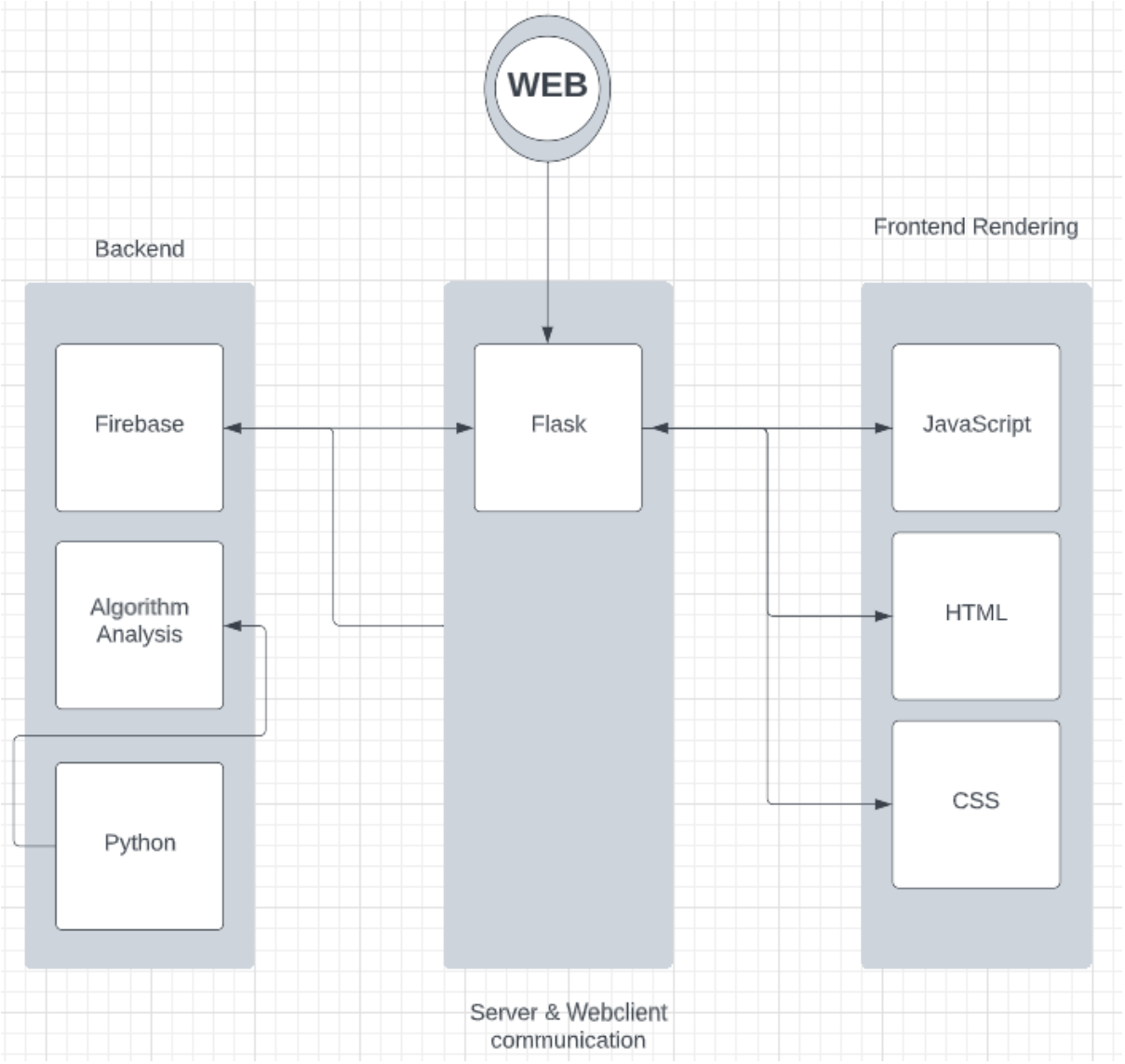
Name & No.	Resulting output - 6
Description	Once the user has summarised the data, they will be presented with the final output in text form, where they may see the outcome and decide whether or not it is what they want. However, this is not the ultimate result.
Criticality	High
Technical Issues	Needs to be summarised correctly and must have followed the filters correctly.
Dependencies	1, 2, 3, 4, 5

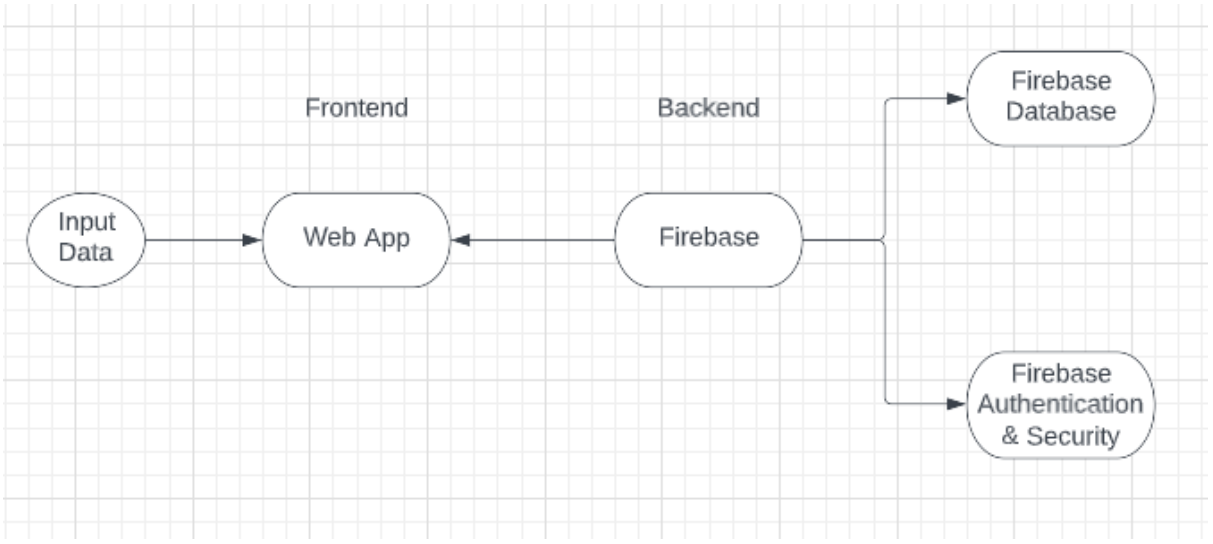
3.6 Exportation

Name & No.	Exportation - 7

Description	When the user is pleased with the outcome, they can proceed to data exportation. They will have the choice of exporting either the written or audio results. This would be the preferred option when it comes to podcast summarisation.
Criticality	Medium
Technical Issues	Data could get lost or corrupted during the exportation phase.
Dependencies	1, 2, 3, 4, 5, 6

4. System Architecture

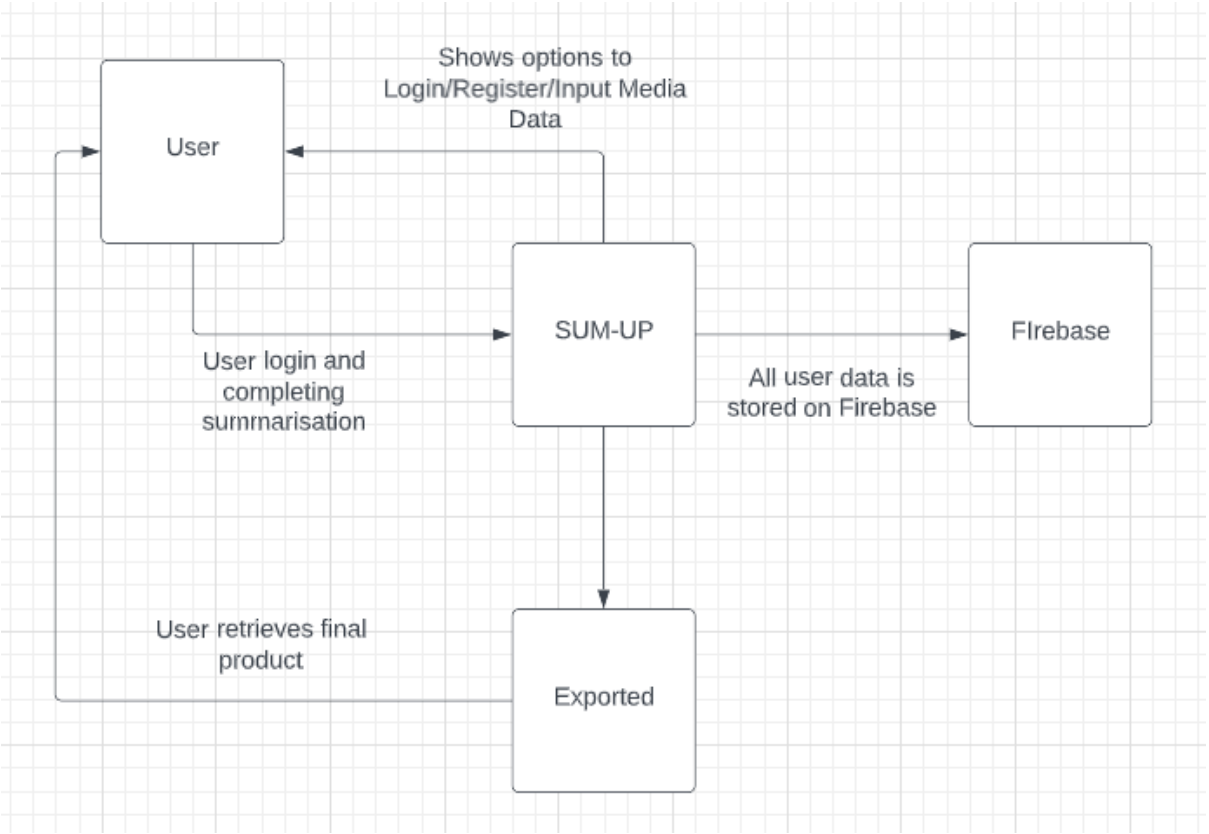




For our Backend we will primarily be using Python in accordance to web development frameworks such Flask. We chose Flask instead of Django due to its lightweight and versatile nature. To manage our Frontend component we shall be utilising HTML, CSS, JavaScript and smaller styling frameworks. In order to make sure that our system is as sturdy and reliable as possible we shall be using PyUnit to carry out our tests along with PyTest and potentially Selenium. Firebase will handle our user authentication and security with its built in features. We will be using the Firebase database in order to store our information about the user and also the resulting data.

The Frontend is the client side part of the project which is the part that the user will be presented with and therefore it must align well with design principles and guidelines. Making sure that the UI is both easily understandable and opertable.

5. High-Level Design



* Context diagram above

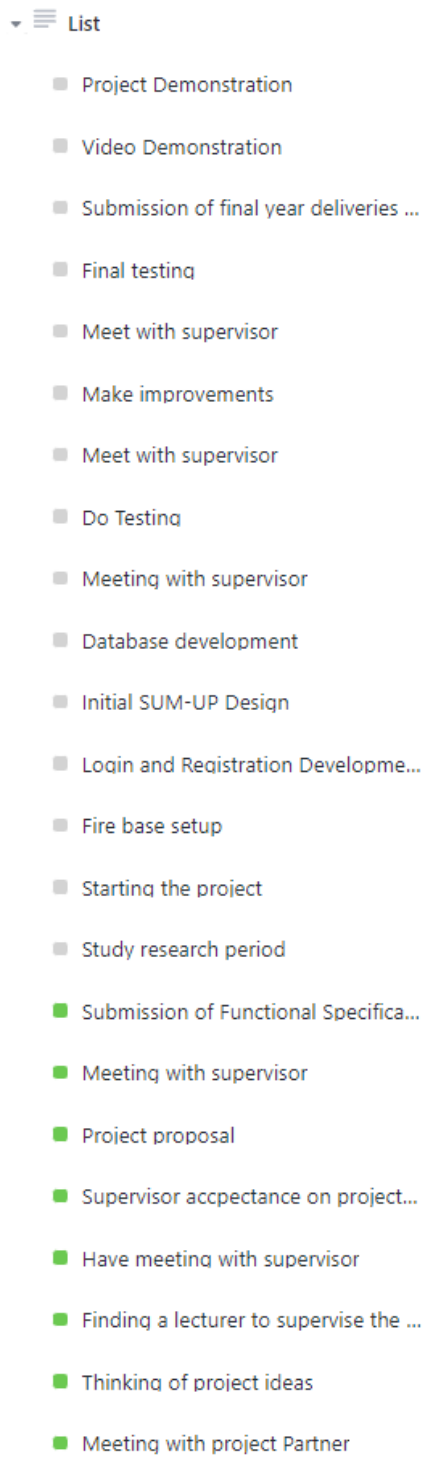
6. Development Tools that will be used

Software: Python, Flask, Firebase, Visual Studio code, Windows OS, Javascript, CSS, Html.

Hardware: A working PC work internet connection.

7. Preliminary Schedule

The timetable below was created using a Gantt chart builder. It contains a listing of all of our completed activities (tasks and events), as well as upcoming projects.



Task	Date
Project Research	19 Nov- 20 Nov
Start Development	21 Nov
Backend Implementation	17 Nov - 28 Dec
Frontend Implementation	28 Nov - 20 Jan
Algorithm Development	20 Dec - 15 Jan
Testing	28 Feb - 13 Apr
Documentation & Video	13 Apr - 14 Apr
Finish	14 Apr

7. Appendices