Talk For Me

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1 Project aim and scope

This application development project is driven by the need to help neurodivergent individuals nonverbally specify their needs to the public. To achieve success given the time constraints and specialities, the project scope is limited to only the application aspects of UI, functionality, performance, and analytics. The project will not encompass other aspects such as security, compatibility, localization, documentation, and support. By limiting the scope, a high quality and scalable application can be made within the given time span of the project. The aim is to improve the application such that it can later seamlessly integrate into the neurodivergent community and enhance the health caregiving market. In particular, the application development process will delve into the following: user-interface (UI) improvements, Large Language Model (LLM) exploration and experimentation, incorporation of location and time-based systems to improve user experience (UX), and Apple Watch watchOS integration.

2 Background

People who are nonverbal often struggle with the challenge that is communication with those who are verbal. This is an issue previously solved with tools such as sign language, although this does not fix the problem for every situation, as sign language is not universally known. As a result, text-to-speech applications have been developed to help nonverbal people communicate in real time with those who are verbal in a common language (Berryman, 2024).

The motivation of this project is to expand upon the use of text-to-speech applications, using Artificial Intelligence (AI) to assist in communication for nonverbal people (Berryman, 2024). Previously, text-to-speech applications have been slow and hard to use, due to the requirement to type and edit every word that is to be spoken, but with the inclusion of AI, the conversation will hopefully become more natural as there is not a pause while the person must type out each word. This will be achieved using AI to predict the most likely sentence given several factors, including location, key words, and previous behaviour/chosen sentences (Hancock, 2020).

The project will be completed in conjunction with Matthew Berryman of Across the Cloud Pty. Ltd acting as a stakeholder, being the current sole developer of the Talk For Me application, as well as an advisor towards for group in terms of any significant technical issues. Talk For Me is the pre-existing application the project will work to improve upon, expanding upon much of the current uses of AI in the application (Berryman, 2024). The group will also look to expand on the current WatchOS version of Talk For Me (for the Apple Watch), such that it can be used as another tool for nonverbal people to communicate (Berryman, 2024).

Artificial Intelligence, more specifically the use of Large Language Model (LLM), is the main tool behind the improvements to be made on Talk For Me (Hancock, 2020). LLM's can complete language generation and natural language processing in a way that will allow the user of Talk For Me to provide some keywords in the form of images and generate a complex sentence. With numerous options for LLM's on the market, this project aims to also explore performance of LLM's, to assist in the overall goal of improving speed of communication, also exploring LLM's that can perform locally on the user's mobile phone.

3 Technical objectives

Notable improvements to the application and subsequent project success can be determined through the accomplishment of significant technical objectives. UI improvements will assist with the readability as well as marketability of the product to cater to neurodivergent audiences. Large Language Model (LLM) exploration and experimentation will allow for provision of consistently appropriate answers in terms of generated sentences, and not show regular cases of failing. Incorporation of location and time-based systems creates a more personalised UX and better quality of life for the user. Apple Watch watchOS integration will incorporate text-to-speech functionality to more than just the IPhone improving functionality.

Table 1: Objectives of the project and their key specifications and outcomes.

#	Objective description	Specifications	Deliverables / outcomes
1.	Improve UI of the application, implementation involving designing user friendly visuals, improving usability.	Incorporate checkboxes to streamline user interaction and improve usability and experience. Optimize the UI to prevent overlapping of elements on narrow screens. Increase aesthetic of application to improve visual readability.	Implementation of checkbox as buttons. Responsive design for narrow screens. New visual representation of the application interface.
2.	Explore and experiment with large language model (LLMs). Conduct research and test different LLM models to find the optimal solution for the application.	Enhance the prompt system by improving LLM integration to provide a clearer and more intuitive text-to-speech for users. Explore generating multiple outputs from Language Model responses to provide diverse and relevant information to users. Investigate efficient LLMs for IOS devices for possible integration into application.	More intuitive text-to-speech prompts. Multiple output LLM usage for text-to-speech prompts. Use of IOS device specific LLM into application.
3.	Apply location and time based modules to	Implement features for filtering and sorting images based on location and time,	Location and time-based filtering and sorting.

	enhance personalization and UX.	enhancing content discovery. Implement dynamic menus that adjust based on user location providing contextually relevant options.	Location-based recommendations (e.g. menu to fast food restaurant).
4.	Develop a working watchOS implementation of the IOS app, such that a user may also be able to make requests and speak using their watch (as well as their phone).	Port current iPhone IOS based application into Apple Watch watchOS. Optimise and test port for adequate performance measures.	Application functionality is seamlessly transferred and useable on Apple Watch. Implemented UI specific to watchOS. Algorithm performance meets benchmark.

4 Gantt chart

The following is the Gantt chart of the project, highlighting the key submission dates and milestone objectives. These milestone objectives refer to the different phases which span the overall development process of the engineering project. Whereas the technical objectives refer to the specific technical tasks associated with the practical development of the application in objective 4 (seen in 3. Technical objectives).

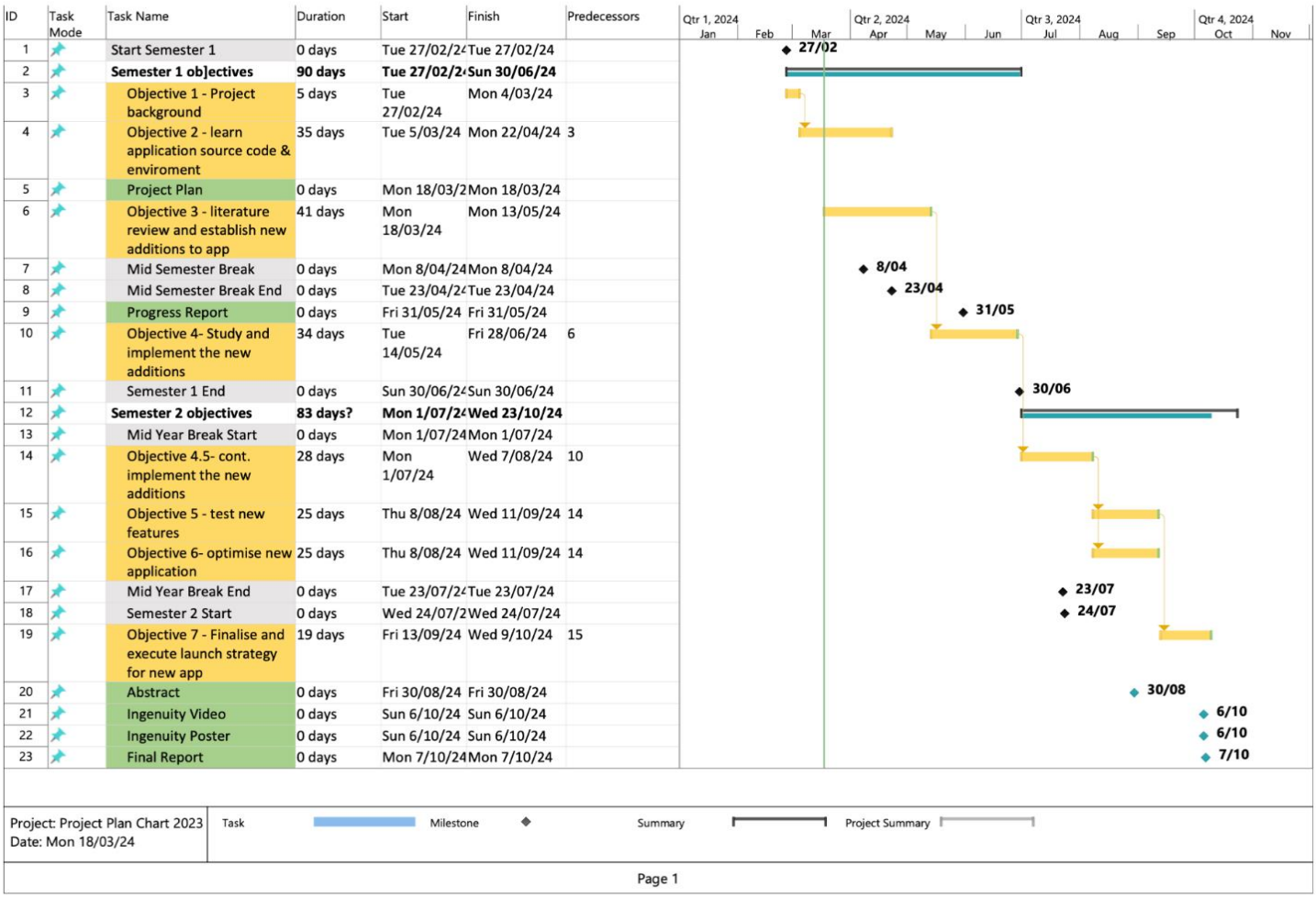

Figure 1. Gantt chart representing the plan of the project throughout the 2024 academic year

5 Resources and procurement

The main resources and hardware required to complete the project was acquired by each group member prior to the development. Since the project is to develop an existing application, a device capable of writing and running the existing code for the project was needed. As a result, it was compulsory to obtain macOS computers due to their ability to run Xcode, an integrated development environment (IDE) with the ability to simulate and run Swift (Apple's proprietary language for Application Development). Although this perquisite was achieved, there are still necessary resources that need to be procured for the project. These will be acquired using the University given budget of $250 per student. Since this is a three-person project, an overall budget of $750 can be used. The budget will be allocated to the following:

GitHub seats: This is a service fee which allows members access to private GitHub repositories. GitHub seats are a necessity as it allows collaborative development and secure version control of the project.

Apple watch: This is needed for integration of the application into the watchOS. Only one is required and Apple watch series 6 and above should be satisfactory. The cost given to this resource is only an estimation of the max cost, for cost efficiency the cheapest adequate model will be purchased.

Table 2: Direct costs intended to be spent by the project.

#	Item (and supplier, if known)	Lead time	Cost
1.	GitHub seats x3 – Matthew Berryman	1 day	$165.23
2.	Apple watch – Apple	1 day	$596
3.	In-kind credit – Matthew Berryman	1 day	-$11.23
	Total		**$750**

Table 3: In-kind resources that will be used by the project.

#	Item	Source
1.	In-kind credit	Matthew Berryman

6 Project risks

Identification of project risks are needed to implement mitigation measures which ensures high quality project development and use of safe engineering practices to protect resources and users. The likelihood, consequence, classification of the risk events are determined by the risk matrix as shown in Appendix A.

Table 4: Identified project risks, their inherent risk classifications before mitigation, and their mitigation measures.

#	Risk event	Impact	Likelihood / Consequence / Classification	Mitigation measures
1.	Lack of technical knowledge required for specific development	Lower project quality / Compromise functionality.	Possible / Moderate / High	Undertake sufficient literature reviews to gain necessary skills and understanding of the programming language and machine learning tools.
2.	Budget overrun	Delay in deliverables / Lower project quality	Unlikely / Minor / Low	Adhere to resource plan. Regular monitoring of resources. Efficient use of university resources.
3.	Delay in code development	Lower project quality / Compromise functionality.	Possible / Moderate /High	Adhere to Gantt chart and conduct regular progress check ins with advisor
4.	Client dissatisfaction with new features	Delay in deliverables / Wasted resources	Possible / Major / High	Prioritize client wish list in design and regularly check in with client.
5.	Introduction of bugs due to development	Delay in deliverables / Wasted resources / Poor user experiences / Increase cost / Damage to product	Likely / Moderate / High	Prioritise testing phase and quality assurance. Adapt safe version control practices such as abstraction and modularity.
6.	Unforeseen dependencies on third party services	Delay in deliverables / Lower project quality / Increase cost	Possible / Moderate / High	Avoid unnecessary use of third-party services. Ensure thorough research and invest in high-quality third-party services.

7.	Introducing security risk due to new features	Damage to product / Lower project quality / Increase cost	Possible / Moderate / High	Ensure secure programming practices. Include security testing measures. Research cyber security.

7 References

1. Jeffrey T Hancock, Mor Naaman, Karen Levy, AI-Mediated Communication: Definition, Research Agenda, and Ethical Considerations, Journal of Computer-Mediated Communication, Volume 25, Issue 1, January 2020, Pages 89–100, https://doi.org/10.1093/jcmc/zmz022

2. Berryman, M. (2024) *APPS:Talk For ME*, *Apps*. Available at: https://acrossthecloud.net/apps.html (Accessed: 18 March 2024).

8 Appendices

Appendix A: Risk Matrix for University of Adelaide Hazard Management Handbook

The level of risk will increase as the likelihood of harm and its severity increases					
Likelihood of exposure	Consequences – level of seriousness of the injury following exposure to the hazard(s) -				
	Negligible	Minor	Moderate	Major	Severe
Almost certain	Medium	High	Very High	Very High	Very High
Likely	Medium	Medium	High	Very High	Very High
Possible	Low	Medium	High	High	Very High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	Medium