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## PROJECT SPECIFICATION REPORT 2023/2024

# Title: DEVELOPING A MOBILE APP THAT LEVERAGES LOCATION AND ARTIFICIAL INTELLIGENCE TO PROVIDE TIMELY REMINDERS.

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**Word Count:** 2018 Words

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## **Abstract**

The project endeavours to develop a personalized mobile application that seamlessly combines location-based services with artificial intelligence to enhance user engagement and activity management. The app aims to provide users with tailored activity recommendations based on their current location, preferences, and historical behaviour. This innovative fusion of technologies offers a unique user experience, optimizing the discovery and participation in local events, activities, and services. Through rigorous research, iterative development, and robust testing, the project aspires to deliver an intuitive, efficient, and personalized platform for enhancing users' daily experiences.

## Table of Contents

Abstract .....	2
Table of Contents .....	3
1.1 Background of Project .....	5
1.2 Aims and Objectives of the Project.....	6
1.2.1 Project Aims.....	6
1.2.2 Project Objectives .....	6
1.3 Definition of relevant terms .....	7
1.4 Scope of the Project .....	8
1.5 Literature Review.....	8
1.5.1 Intelligent apps characteristics .....	8
1.5.2 LBS Using GPS .....	9
1.5.3 Operationalization Considerations for Including Reminders .....	10
1.6 Research Methodology.....	11
1.6.1 Problem Definition.....	11
1.6.2 Proposed Solution and Justifications .....	12
1.6.3 Research method for investigation.....	13
1.6.4 Research deliverables .....	13
1.6.5 Resources needed.....	13
1.6.6 Risk Assessment .....	14

1.7 Conclusions.....	15
References .....	16
Appendix: Gantt Chart .....	18

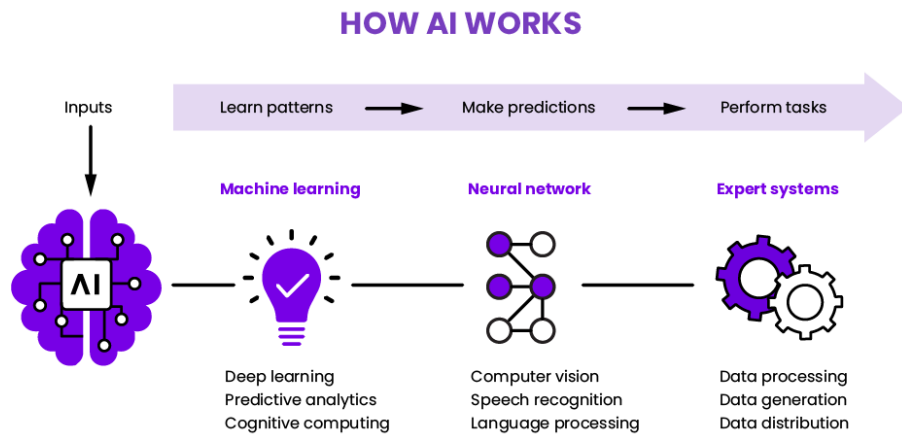
## **1.1 Background of Project**

People live in a busy and stressful society where, due to procrastination or tiredness, they postpone their daily tasks or even forget about them. To find a solution for the mentioned problem, the use of Location-Based Services (LBS) and Artificial Intelligence (AI) in mobile applications is proposed. Since these services utilize the connectivity of smartphones and the wealth of data they generate, they offer users personalized experiences.

Max Freedman (2013) states, 'LBS use real-time geodata from a smartphone to provide information, entertainment, or security.' Smartphones can use GPS technology to track people's locations if the user allows it. This technology depends on real-time position tracking to function. It used to be employed on mobile devices or even on desktop PCs.

AI is defined as the 'simulation of human intelligence processes by machines' (Burns, E. 2022). Broadly speaking, AI systems operate by assimilating extensive sets of labeled training data, examine the data for connections and patterns, and leveraging these patterns to forecast future states.

By combining these two technologies, it is expected to create an application, a new way for people to manage their daily tasks without forgetting about them and to make this engaging. This ensures that AI-driven recommendations are attuned to the user's interests and context.



**Figure 1 How Artificial Intelligence Works**

## **1.2 Aims and Objectives of the Project**

### *1.2.1 Project Aims*

This research aims to design a location-based mobile app that integrates AI techniques for machine learning, including prediction and classification, to make suggestions according to user.

### *1.2.2 Project Objectives*

- 1 Research the implementation of AI in mobile applications and location-based apps, and study similar application in the market.
- 2 Research Machine Learning algorithms to select most appropriate technology.

3 Design, develop, and test a Position Based mobile application that integrate reminders using AI.

### 1.3 Definition of relevant terms

- **Mobile app:** According to Chat GPT, It is software application designed to run on mobile devices such as smartphones and tablets. These apps are tailored to take advantage of the unique capabilities of mobile devices, offering various functionalities to users, ranging from communication and productivity tools to entertainment, information access, and more. (Open AI Chat GPT, 2023). A copy of this response is in Appendix (Figure 3).
- **Android:** According to Chat GPT, It is open-source operating system developed by Google for mobile devices like smartphones and tablets. It provides a customizable platform for app developers, allowing them to create a wide range of applications for Android-powered devices. (Open AI Chat GPT, 2023). A copy of this response is in Appendix (Figure 4).
- **Machine learning:** According to Chat GPT, It is a field of artificial intelligence (AI) that focuses on enabling computers to learn and make decisions or predictions without being explicitly programmed. It involves algorithms and statistical models that analyze data and improve their performance over time, enabling machines to discern patterns, formulate predictions, and enhance tasks through experiential learning. (Open AI Chat GPT, 2023). A copy of this response is in Appendix (Figure 5)

## 1.4 Scope of the Project

- **Achievable expectations:** With this project it is expected to achieve a comprehensive study of Artificial Intelligence and Machine Learning, along with research on Android APIs, especially location-based services.

It is also expected to design and create a location-based reminder activity mobile app that use ML to offer suggestions to use. For example, if the user forget to set up a reminder that they usually have weekly, ML will be able to provide a reminder.

Additionally, while user walks, depending on the weather, ML will be capable of suggesting a place for shelter if it's raining or, a nearby green park in case that it's clear.

- **Outside the scope of project:**

This application will only be available and designed for the Android mobile platform, making it platform dependent. Additionally, it will not be published on Google Play Store, mitigating the risk to user/customer identities.

## 1.5 Literature Review

A review of relevant work supporting the goals and objectives of the research is presented in this section. The thematic approach of the literature review will be discussed. The selected subjects provide an analysis of the body of knowledge on mobile applications for reminders based on user position and artificial intelligence, or similar.

### 1.5.1 *Intelligent apps characteristics*

Sarker, I.H. et al. (2020) assert the rapid growth of Artificial Intelligence (AI) techniques in the context of smart mobile devices. They emphasize the use of popular AI methods like machine



learning, deep learning, natural language processing, and knowledge representation to enhance the intelligence and effectiveness of mobile applications. The author's paper stresses the importance of tailoring AI-based modeling to suit specific data characteristics and highlights the need for training algorithms with relevant data. This paper has defined some characteristics that will be key to developing the mobile application for this project, such as being Action-Oriented, Adaptive in Nature, Suggestive and Decision-Oriented, Data-driven, and Context-aware.

Lu, H., Li, Y., Chen, M., Kim, H., and Serikawa, S. (2017) conclude on the limitations AI faces nowadays, as it is not able to cooperate with all human brain functions such as understanding, self-control, and self-motivation. They define four types of limitations, but the one which this paper is going to consider is the limitation of the Frame Problem. AI is usually limited to a single type of problem due to the large amount of time it takes to get data training.

### *1.5.2 LBS Using GPS*

Gupta, S. et al. (2018) report on an Android application that addresses security concerns related to smartphone use in sensitive organizational environments. It leverages Location-Based Services (LBS), the Device Policy Manager, and GPS technology to enhance security measures. Specifically, the app allows users to save their office location, and upon arrival, the camera functionality is automatically disabled. This crucial security feature is under the control of the administrator, who also has the authority to uninstall the application. Through these measures, the application aims to safeguard organizations against potential breaches and unauthorized photography, ultimately preserving their privacy and security.

This paper has established fundamentals of LBS and GPS and it can be integrated within the research for the design of the proposed app. The aims of this paper are quite different from the aims presented in this report but it can still be useful.

Anju S. and J. Joseph (2015) proposed the LocX technique, which encrypts location data before storing it on servers. This prevents both third parties and the server itself from tracking the location. Additionally, LocX employs a dual encryption method using cost-effective symmetric keys, enhancing security. While LocX does introduce some computational and communication complexity, it represents a significant advancement in location privacy for emerging geo-social applications.

This final project will not consider this method due to its complexity, but this is an approach that could be introduced for data security in LBS.

### *1.5.3 Operationalization Considerations for Including Reminders*

Stawarz, K., Cox, A.L., and Blandford, A. (2015) examine the effectiveness and theoretical basis of habit formation apps. The study suggests that effective apps should allow users to select trigger events that serve as cues for habit formation. However, the authors found that researchers have not conducted comprehensive evaluations of existing habit formation apps and are deficient in a solid foundation in research related to habit formation and behavior change.. The authors make three key contributions:

1. It demonstrates the influence of reminders and triggering events on the establishment of habits..
2. It highlights the current lack of grounding in habit literature in available habit formation apps, Especially in aiding users in linking their new behavior with triggering events.
3. It furnishes design principles for technology-driven interventions aimed at fostering behavior change and habit formation., emphasizing the importance of developing automaticity in new behaviors for long-lasting results.

The paper suggests that mobile technologies, through supporting contextual cues and implementation intentions, could play a crucial role in helping users establish new, lasting habits. This shift away from simple self-tracking and reminders is seen as a promising approach in behavior change.

## **1.6 Research Methodology**

### *1.6.1 Problem Definition*

This project aims to address the challenge that people face in completing their daily objectives, particularly due to forgetfulness or lack of motivation. Additionally, it will investigate the limitations of reminders and location-based mobile applications.

In the context of these limitations, there exists a gap in the literature regarding the utilization of AI methods to enhance the performance and usability of reminder apps.

### *1.6.2 Proposed Solution and Justifications*

This study proposes the use of AI algorithms, specifically Machine Learning (ML), integrated into a mobile application. Users will utilize this application to set reminders for tasks they need to complete when they arrive at specific locations. The role of ML will be to study user behavior and provide suggestions regarding routines or reminders. Additionally, it will suggest routes while walking based on weather conditions. For instance, if it's raining, the app may suggest a nearby place for the user to take cover, and if it's sunny, it could recommend a green park for a walk.

The proposed solution is justified in that using this application, users can create and manage their habits in an organized manner. The incorporation of AI will be especially helpful if users forget to activate a periodic reminder or if, for any reason, they do not achieve their objective at the expected moment. Stawarz, K., Cox, A.L., and Blandford, A. (2015) report that habits play an important role in supporting behavior change and ensuring its long-term effects. According to the authors, for a person to make decisions to change their behavior and actions, these changes need to be regularly repeated in order to become permanent and automatic.

Additionally, due to the exponential increase in the use of mobile phones and apps, it's reasonable to consider these applications useful, since many people spend a significant amount of time in front of their phones.

### *1.6.3 Research method for investigation*

- Study user needs to understand their requirements for an app of this kind and conduct a market analysis to identify strengths and weaknesses in other apps for potential improvement. (Literature Review)
- Investigate and select the appropriate technology for app development and AI integration.
- Design and develop the app using established software development methodologies.

### *1.6.4 Research deliverables*

- Technical reports such as Project Specification, Literature Review and, Final Year Report.
- Poster for use in Poster Presentation.
- Portfolio documentation with the project progress.
- Logbook.
- Working prototype of Mobile App

### *1.6.5 Resources needed*

- Computer (Personal laptop and occasionally Nelson computers)
- Supervisor's support (Periodic meeting with supervisor)
- Android Studio, Kotlin and Python as main tooling.
- Kaggle web site for learning AI.
- Library resources

- Journals publication (from Google Scholar)
- Using AI tools as Chat GPT to provide further guidance.
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#### 1.6.6 Risk Assessment

	Risks	Actions to reduces risk
1.	Big Project	Ensure good planning and prioritize tasks.
2.	Loss data due any reason	Always have a backup using version control copies.
3.	Lack of preparation	Conduct necessary research and seek help from the supervisor if you encounter any difficulties.
4.	Project prototype does not go as expected	Monitor every step of the project to ensure it aligns with the desired outcome. If not, make adjustments or adaptations accordingly.
5.	Integration Challenges	Use well-documented and supported APIs for location services and AI integration. Conduct extensive testing during the integration process.

6.	Technical Skills Gap	Allocate time to learn and gain proficiency in the necessary technologies. Utilize online tutorials, courses, and forums for guidance.
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## 1.7 Conclusions.

In this paper, the creation of a mobile app that integrates AI has been proposed as a solution for procrastinators. It is often challenging for people to complete their daily tasks, and with this app, they may be able to set up reminders and receive suggestions to help them achieve their goals. Location-Based Services (LBS) and AI work together to provide accurate and location-specific recommendations, while AI customizes ideas based on user preferences. This combination should enhance user interactions with their immediate surroundings.

Furthermore, this paper lays the groundwork for the future Final Year report, which will involve coding, implementation, and testing. The aim is to deliver a user-centric app that increases efficiency in activity planning for the optimization of resources.

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## Appendix: Gantt Chart

WP1: Literature Search of mobile apps with AI	10 days	Mon 02/10/23	Fri 13/10/23		
WP1.1 Intelligent apps characteristics	4 days	Mon 02/10/23	Thu 05/10/23		
WP1.2 LBS Using GPS	3 days	Fri 06/10/23	Tue 10/10/23	2	
WP1.3 Operationalization Considerations for Including Rem	3 days	Wed 11/10/23	Fri 13/10/23	3	
TR1: Project Specification and Literature Review	11 days	Fri 13/10/23	Fri 27/10/23		
TR1.1 Meeting with Supervisor to discuss Report	1 day	Fri 13/10/23	Fri 13/10/23		
TR1.2 Initial Draft of the Report	6 days	Mon 16/10/23	Mon 23/10/23	6	
TR1.3 Review Report wit Supervisor	1 day	Wed 25/10/23	Wed 25/10/23	7	
TR1.4 Complete and Finalize Report	1 day	Thu 26/10/23	Thu 26/10/23	8	
M1 : Submit Project Specifications and Literature Review Rep	1 day	Fri 27/10/23	Fri 27/10/23		
WP2:Research Machine Learning Algorithms	30 days	Mon 06/11/23	Fri 15/12/23		
WP2.1 Research	15 days	Mon 06/11/23	Fri 24/11/23		
WP2.2 Design Algorithms	15 days	Mon 27/11/23	Fri 15/12/23	12	
M2: Progress review with tutor	1 day	Mon 11/12/23	Mon 11/12/23		
WP4: Programming Location-Based app	44 days	Mon 15/01/24	Thu 14/03/24		
WP4.1 App Layout	5 days	Mon 15/01/24	Fri 19/01/24		
WP4.2 App Permissions	7 days	Mon 22/01/24	Tue 30/01/24	16	
WP4.3 App Specifications	7 days	Wed 31/01/24	Thu 08/02/24	17	
WP4.4 Integrate AI	15 days	Fri 09/02/24	Thu 29/02/24	18	
WP4.5 Testing	7 days	Fri 01/03/24	Mon 11/03/24	19	
WP4.6 Review with tutor	3 days	Tue 12/03/24	Thu 14/03/24	20	
Christmas Break	15 days	Mon 25/12/23	Fri 12/01/24		
TR2: Draft of final Year Report	36 days	Mon 05/02/24	Mon 25/03/24		
TR2.1 Drafting on Chapters 1-3	14 days	Mon 05/02/24	Thu 22/02/24		
TR2.2 Drafting on Chapters 4-6	18 days	Fri 23/02/24	Tue 19/03/24	24	
TR2.3 Review and Discussion with supervisor	4 days	Wed 20/03/24	Mon 25/03/24	25	
M3: Submit Final Year Report Document	1 day	Thu 28/03/24	Thu 28/03/24		
M4: Submit Project Portfolio Document	1 day	Fri 12/04/24	Fri 12/04/24		
M5: Submit Project Poster and Employability Documents	1 day	Tue 21/05/24	Tue 21/05/24		

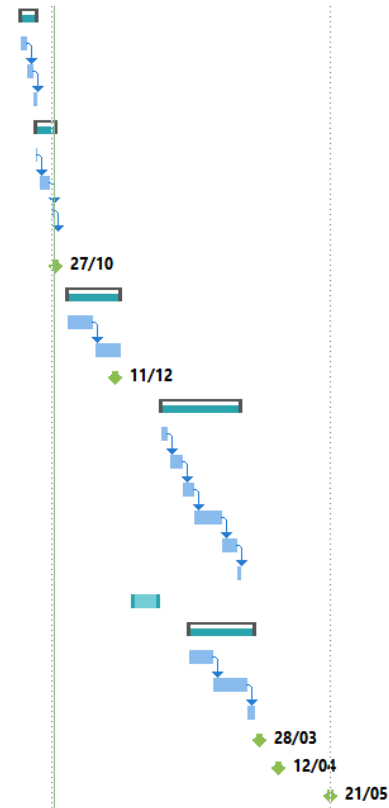
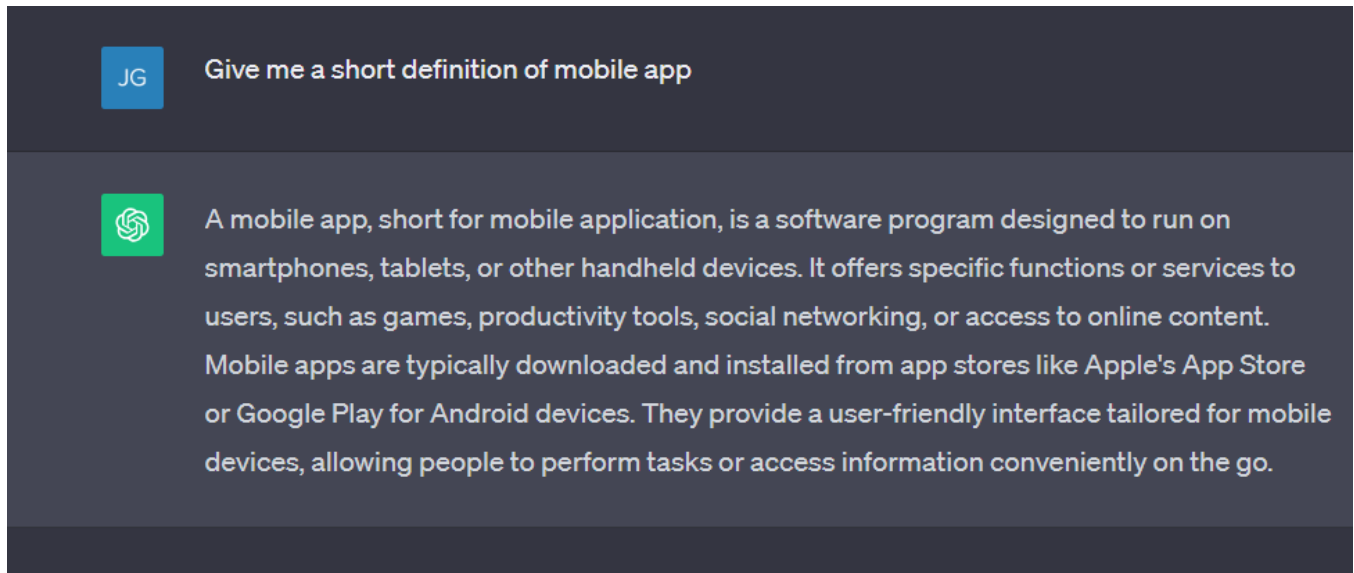
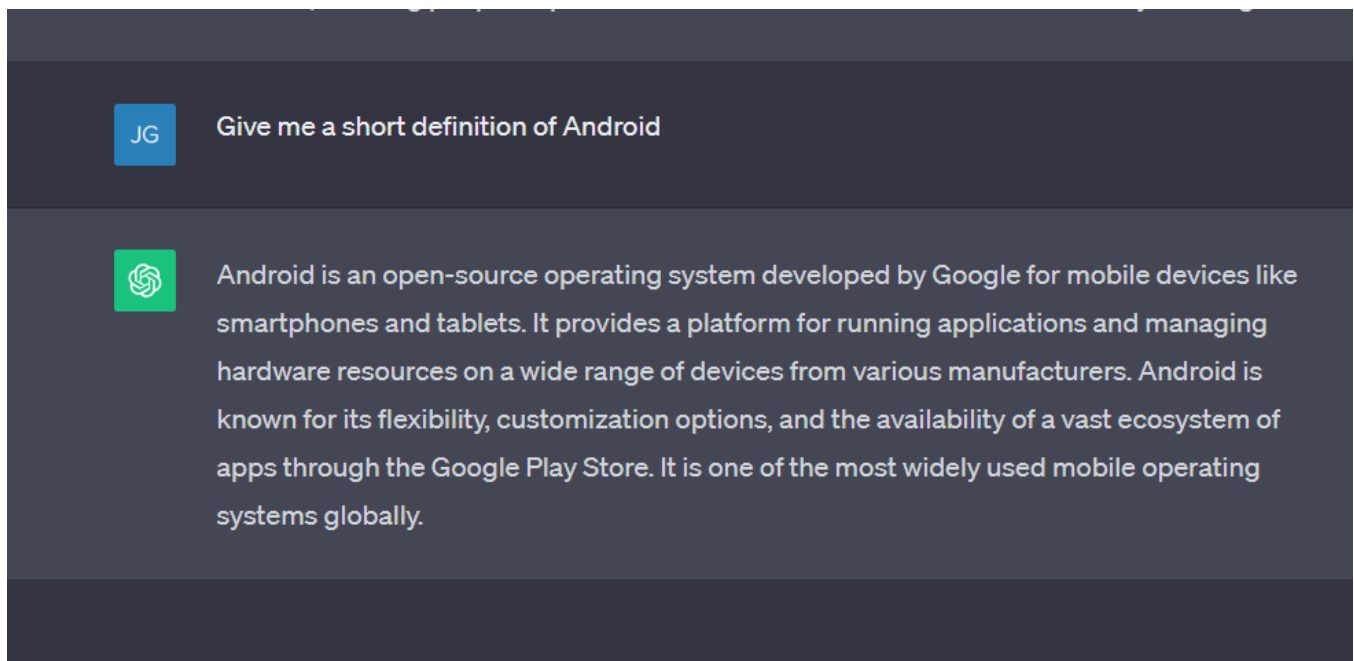


Figure 2. Project Gantt Chart



**Figure 3 Definition of Mobile app by Chat GPT**



**Figure 4 Definition of Android by Chat GPT**

JG

Give me small definition of Machine Learning



Machine learning is a branch of artificial intelligence (AI) that focuses on enabling computers to learn and improve from experience without being explicitly programmed. It involves algorithms and statistical models that allow machines to recognize patterns in data and make predictions or decisions based on that analysis. Essentially, it enables computers to learn and adapt to new information, making them capable of performing tasks or making decisions without explicit human instructions.

**Figure 5 Definition of Machine Learning by Chat GPT**