

PROJECT PROPOSAL
FACULTY OF ENGINEERING TECHNOLOGY
DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING
BACHELOR OF SOFTWARE ENGINEERING HONOURS
LEVEL 6 – EEY6689
FINAL PROJECT
JUNE OF 2025

**PERSONALIZED AI-BASED GUIDANCE SYSTEM
FOR REPRODUCTIVE PLANNING, PREGNANCY
AND POSTPARTUM CARE IN SRI LANKA**

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Date: 04/06/2025

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1. Introduction

Pregnancy represents one of the most significant and sensitive phases in a woman's life. It is encompassing a complex interplay of physical, emotional and psychological changes. It is a period that demands not only regular medical monitoring but also comprehensive support systems to ensure the well being of both the mother and the unborn child (World Health Organization). However, despite significant advances in global healthcare technologies, many women (especially in developing regions) still face many challenges in accessing timely, reliable, and personalized maternity care. There is a significant gap between the health services available and the needs of mothers, especially in rural or underserved areas in Sri Lanka (Ministry of Health Sri Lanka).

Conventional pregnancy related mobile applications and healthcare platforms often provide only generic information and overlook the importance of personalization, interactivity and cultural relevance. These systems typically fail to adapt to the unique health profiles, socio economic conditions and medical histories of individual users (Irosha *et al.*, 2021). Furthermore, there is limited integration of tools for reproductive planning, personalized guidance and real time interaction with healthcare providers. The lack of an AI driven approach to cover all aspects thus creates a critical gap in maternal health management.

So, it is a important to development of a comprehensive AI Based Guidance System for Maternal Health in response to these challenges. So This smart, interactive and user centric platform aimed at revolutionizing how women experience pregnancy and motherhood in Sri Lanka (Mapari *et al.*, 2024). The proposed system will leverage artificial intelligence to provide real time and personalized data driven support throughout the various stages of the mother's journey. This includes not only pregnancy but also preconception and postnatal care.

The primary aims of this research include:

- Reproductive Planning Assistance: Offering intelligent tools for women who are planning to conceive, including ovulation tracking, fertility tips and early health advice.
- Personalized Health Recommendations during pregnancy period: Utilizing AI algorithms to analyze individual health data, lifestyle patterns and medical history in order to deliver tailored advice, nutritional guidance and activity suggestions.
- Support for Healthcare Professionals: Assisting midwives, nurses and obstetricians/gynecologists (VOGs) by providing up to date clinical knowledge, alerts and evidence based best practices.

- Reminder System for Vaccines and Treatments: Ensuring timely vaccinations, routine check ups and critical treatment milestones through automated reminders and scheduling support.
- Postpartum Guidance: Extending care beyond childbirth by offering mental health support, breastfeeding advice, newborn care tips and family planning options.

The proposed system seeks to bridge the gap between traditional maternal healthcare and the future of smart, inclusive and adaptive medical assistance by integrating modern AI technologies with user friendly interfaces and localized content. This project contributes to the broader goal of improving maternal and child health outcomes in Sri Lanka through innovation and underscores the potential of AI as a transformative force in public health and digital healthcare delivery.

1.1 Key Validation:

1.1.1 Interview Process

To gain practical insights into bridging the knowledge gap in maternal health through professional led digital tools, we conducted a series of semi structured interviews with eight healthcare professionals.

- ☐ 2 Doctors:
 - Dr. W.A.T.Sandaruwan (Negombo Hospital)
 - Dr. Sherley Wayijyanthe (Matara Hospital)
- ☐ 1 Nutritionist:
 - Mr. Premalal Athukorala (Hambantota District Hospital)
- ☐ 3 Nurses
 - Ms.Nishani Ruwanpathirana (Ambilipitiya District Hospital)
 - Mrs. Ishari udeshika Sewwandhi (Hambantota District Hospital)
 - Mrs.Dilki Hettiarachchi
- ☐ 2 Midwives (Ambilipitiya and Angunukolapelessa area)

Initially, It is worth mentioning that Dr. W.A.T.Sandaruwan brought to our attention the need for such a system for pregnant women. Later, we investigated the field and were able to get a detailed explanation of it. Later, we discussed this with several parties related to this field.

The main interview process included open ended questions focusing on:

- The effectiveness of current maternal health education tools
- Awareness & perceptions of digital health platforms & needing of system
- Challenges in patient engagement and health communication

Each interview lasted approximately 15 - 30 minutes and was conducted in person or online, depending on participant availability.

As well as we are hope to conduct interviews with them again to gain all details and then we planned to conduct interview with pregnancy women also.

1.2 Experience and Qualifications

Our team includes only final-year students from the Bachelor of Software Engineering Honours program. We have gained practical experience in software development, including AI, web and mobile applications, and database systems. We have studied AI technologies and health systems. We have conducted interviews with midwives to deeply understand the real-world needs in maternal care. In addition, we have studied books and collected data about pregnant mothers' requirements. With this knowledge, we are confident in our ability to develop a useful and reliable system.

1.3 Problem Statement and Research Questions:

Exact Problem:

Despite advancements in global healthcare and mobile health technologies, pregnant women(especially in rural or underserved regions of Sri Lanka) continue to face challenges in accessing timely, reliable and personalized maternal care. Existing pregnancy related applications and systems typically offer generic information, lacking personalized recommendations, localized content and interactivity. Furthermore, there is limited integration of reproductive planning tools, real time healthcare guidance and postnatal support. The absence of a comprehensive AI driven maternal health platform creates a critical gap in maternal care services, potentially affecting the well being of both mother and child. Therefore, there is a pressing need for an user friendly system that can deliver real time, culturally relevant and individualized support throughout the maternal journey.

Research Question:

- How can artificial intelligence be used to deliver personalized health recommendations for pregnant women based on their medical history and health data?
- What are the most essential features and functionalities that an AI based maternal health system should include to support reproductive planning, pregnancy and postnatal care?

- How effective is an AI driven platform in enhancing decision making and care quality for healthcare professionals such as midwives and obstetricians(VOG)?
- To what extent can reminder systems powered by AI improve adherence to vaccination schedules and treatment milestones during pregnancy?

1.4 Research Main Aim:

The aim of this research is to develop a comprehensive, AI based maternal health guidance system that provides personalized, real time support for women throughout the stages of preconception, pregnancy and postpartum. The system will utilize artificial intelligence technologies to deliver healthcare advice, aiming to bridge the gap in maternal health services(in rural and underserved areas of Sri Lanka) by offering intelligent reproductive planning, health monitoring and continuous care.

1.5 Research Objectives:

- 1. To develop an AI driven reproductive planning, pregnancy care and postpartum guidance module:**
Predicting optimal conception windows and providing personalized fertility guidance based on menstrual cycles, medical history, and biomarkers. As well as providing pregnancy care and postpartum guidance based on medical data and basic personal data with preferences.
- 2. To create a nutrition focused recommendation engine:**
Generating customized meal plans addressing Sri Lankan dietary patterns, prenatal nutrient requirements (iron, folic acid) and personal constraints (allergies, vegetarianism).
- 3. Support for Healthcare Professionals:**
Assisting midwives, nurses and obstetricians/gynecologists (VOGs) by providing up to date clinical knowledge, alerts and evidence based best practices.
- 4. To design an adaptive reminder system:**
Automating vaccine schedules and medical checkup alerts.

1.6 Scope of the Project:

The scope of this project includes the development, implementation and evaluation of an artificial intelligence based maternal health guidance system tailored for women in Sri Lanka. The system aims to support women through preconception, pregnancy and postpartum phases by offering personalized, interactive and culturally relevant healthcare guidance. The key elements of the project scope include:

Population:

- ☐ Focused on women of reproductive age, pregnant women and new mothers, particularly in Sri Lanka.
- ☐ Excludes patients with high risk conditions requiring specialized clinical interventions beyond the scope of general maternal health guidance.

AI Based Maternal Health System:

- ☐ Developing an AI integrated platform that offers real time personalized recommendations, including dietary tips, health alerts and activity suggestions based on user input.
- ☐ Utilizing natural language processing (NLP) and machine learning to analyze health data, user queries and interaction history.

Data collection and integration:

- ☐ Collecting relevant user data such as age, medical history, lifestyle habits, pregnancy stage and biometric data.
- ☐ Collaborating with obstetricians, midwives and public health officials for domain specific knowledge and accurate data modeling.
- ☐ interviewing women who has in preconception, pregnancy and postpartum
- ☐ Ensuring robust privacy, security, and data protection in compliance with healthcare regulations.

Development:

- ☐ Designing a user friendly web based interface accessible to users with low digital literacy.
- ☐ Creating modular features including reproductive planning tools, pregnancy tracking, vaccine reminders and postpartum support.
- ☐ Training AI models using anonymized historical health data, other data and expert rules.

Implementation:

Provide guidance to users including health care providers and pregnant women, to use the software effectively.

Limitations and future work:

- ☐ Addressing limitations in AI prediction accuracy, especially in cases with limited user input.
- ☐ Enhancing multilingual support.
- ☐ Planning future integration with telemedicine platforms and wearable health devices for continuous monitoring.

Impact: The primary goal is to improve maternal and child health outcomes by bridging the gap between traditional healthcare and digital health innovation. The system aims to empower women through informed decision-making and contribute significantly to public health in Sri Lanka using AI driven, personalized healthcare support.

1.7 Methods for Modeling the AI Based Maternal Health Guidance System:

The development of an AI driven maternal health guidance system involves a structured, multi phase approach that includes data collection, AI and machine learning model development, health recommendation generation, software implementation, system evaluation and deployment. The methodology integrates clinical insights with intelligent technologies to deliver personalized and interactive relevant healthcare support for mothers.

1. Data Collection and Integration
 - Electronic and Paper based Health Records from hospitals and clinics (with privacy compliant access)
 - User self reported data (menstrual history, pregnancy symptoms)
 - Community health workers and rural clinics for localized and cultural data.
2. Application of Artificial Intelligence and Machine Learning

The AI engine will incorporate the following techniques:

- Predictive Modeling to anticipate potential maternal health risks (gestational diabetes, anemia).

- Natural Language Processing (NLP) for analyzing user queries, symptoms and providing chatbot based interactive responses.
 - Recommendation Systems using classification and clustering algorithms to deliver personalized nutritional advice, mental health support and reminders for treatments and vaccinations.
 - Rule Based Systems to align AI outputs with WHO and Ministry of Health guidelines in Sri Lanka.
3. Personalized Health Recommendation Engine
- The system will generate dynamic guidance across all stages such as preconception, pregnancy and postpartum.
 - The system will provide tailored suggestions on diet, exercises, doctor visits, supplements and vaccinations.
4. Software and Interface Development
- A mobile friendly application will be developed featuring:
 - A secure, scalable backend for AI processing.
 - User dashboard for mothers and healthcare providers.
 - Compliance with digital health and data privacy standards (HIPAA/GDPR like frameworks).
5. Quantitative and Qualitative Evaluation
- Quantitative: Impact assessment through metrics such as reduced missed checkups, improved nutritional adherence and maternal well being indicators.
 - Qualitative: User satisfaction surveys, interviews with midwives and doctors and feedback from rural community members to assess usability and trust.
6. Implementation and Future Maintenance
- Training sessions for midwives, public health officers and mothers.
 - Continuous system updates based on evolving health guidelines and user needs.
 - Exploring partnerships with government and NGOs for broader rollout.
 - Future enhancements may include telemedicine features and multilingual AI voice assistants.

2. CURRENT PROCESS

Sri Lanka has made great progress in maternal healthcare, especially through its free public health services and the hard work of midwives and other health workers. Midwives play a key role, they visit homes, guide pregnant women and help track their health. But even with these efforts, many mothers(especially in rural or remote areas) still face big challenges.

- Lack of personalization and smart tools is one of them. The current system offers general advice to all women, without considering each person's unique health needs or background. Available mobile apps often give basic information and don't offer personalized support based on medical history or lifestyle.
- There are gaps in knowledge and reliable information. Many pregnant women depend on family or social media for advice, which may not always be accurate. There's a real need for reliable, easy to understand health information that's tailored to local needs and culture.
- Current reminders and education systems are outdated. Vaccination and appointment reminders are often given verbally or on paper. While SMS reminders exist in some areas, they are not widely used or consistent. There is little use of smart, automated reminder systems.
- Midwives, nurses, and doctors work hard, but they don't have digital tools that help them share or access information easily. There's limited integration between their work and any digital systems.
- Health education varies depending on the location and the midwife. Some women receive clear guidance, others don't get enough information about pregnancy care, nutrition or warning signs of complications.
- There is no system in place for real-time communication between pregnant women and healthcare providers. This means mothers can't easily ask questions or report symptoms between clinic visits.

3. Proposed Approach

3.1 Development Approach

The development of the AI based maternal health guidance system will follow an Agile methodology to ensure flexibility, user centered design and continuous feedback integration. The system will be developed in iterative sprints, allowing for early validation with stakeholders including healthcare professionals, preconception, pregnancy and postpartum women.

The approach consists of the following key phases:

1. Requirement Gathering and Analysis

This phase involves refining the functional and non-functional requirements through interviews, questionnaires and literature review. Specific attention will be given to the cultural and clinical relevance of the system for Sri Lankan users.

2. System Design and Architecture

A modular architecture will be designed to support scalability and maintainability. The system will consist of separate layers for the frontend, backend, AI engine and database. As well as we are planning to use microservices architecture. It may be helped to enhance flexibility and future integration with telemedicine platforms.

3. AI Model Development

AI modules such as predictive models, recommendation systems and NLP based chatbots will be trained using anonymized datasets. Clinical guidelines from WHO and the Sri Lankan Ministry of Health will be embedded in rule based logic to ensure safe and ethical recommendations.

4. Frontend and Backend Development

The frontend will be built using Next.js for responsiveness and ease of use, particularly for users with low digital literacy. The backend will utilize Python Flask to manage APIs, data processing and business logic securely and efficiently. As well as we planned to use MySQL for databases. Finally we integrate JWT authentication for provide security.

5. Integration and Testing

All components will be integrated and tested using unit, integration and user acceptance tests. Feedback from real users and health professionals will be collected for iterative improvements.

6. Deployment and Maintenance

The system will be deployed on a secure cloud platform(AWS) with robust data protection mechanisms. Ongoing maintenance, updates and monitoring will be conducted to ensure system reliability and accuracy.

This approach ensures that the system is developed with continuous input from the end users and stakeholders, enabling a high-impact solution aligned with real-world maternal healthcare challenges in Sri Lanka.

4 Project Plan

4.1 Assumptions and Constraints

Assumptions:

1. Users Have Access to Internet.

It is assumed that most target users, including women in rural areas, own or can access a basic smartphone.

2. Basic Digital Literacy Exists Among Users

Users are assumed to have basic skills needed to use digital devices.

3. Healthcare Providers Will Engage with the Platform

It is assumed that midwives, nurses and doctors will be willing to interact with and provide feedback via the app.

4. Reliable Health Data Input Will Be Provided

The system assumes that users or healthcare providers will input accurate health data (ex: weight, age, blood pressure).

5. Internet Access Is Available at Least Periodically

While full-time access may not exist, the system assumes users can connect to the internet occasionally to sync or receive updates.

Constraints:

1. Limited Digital Infrastructure in Rural Areas

Poor internet connectivity and unstable electricity may limit real time features like video consultations or cloud based processing.

4.2 Work Distribution

1. Team Lead - P.A.H.Niluminda
2. Frontend Developer - R.P.H. Prabhani
3. Backend Developer - H.I.M. Rathnasiri
4. AI/ML Engineer - Y.A.S. Himaruwani
5. QA Engineer - R.W.S. Dileka

5. Cost Proposal**5.1 Overview**

This cost proposal outlines the simulated budget for the design, development and deployment of the Personalized AI Based Guidance System for Reproductive Planning, Pregnancy and Postpartum Care in Sri Lanka. While the project is student led, the following estimates reflect real world industry practices in Sri Lanka to simulate project planning and cost estimation.

5.2 Assumptions

- Project Team: 5 undergraduate software engineering students
- Duration: 20 weeks (Part-time effort, June to October 2025)
- Workload: 800 total hours
- All technologies used are open source: cloud infrastructure uses educational credits where applicable
- Costing is based on average Sri Lankan freelance/contractor rates for similar technical work

5.3 Estimated Cost

Category	Description	Est. Hours / Units	Cost (LKR)
Requirement Analysis	Stakeholder interviews, domain research, scope definition	40 hrs	20000/=
UI/UX Design	Responsive layouts (Next.js)	50 hrs	75000/=
Frontend Development	Next.js	150 hrs	180000/=
Backend Development	Python Flask REST APIs, logic for authentication, CRUD	300 hrs	160000/=
Database Design	MySQL schema	40 hrs	60000/=
Machine Learning Integration	Training models	150 hrs	150000/=
Testing & QA	Manual and automated testing, bug fixes	40 hrs	60000/=
Documentation & Training	Technical guide, user manuals, training material	30 hrs	30000/=
Deployment	AWS	6 months	45000/=
Miscellaneous	Travel, internet, data storage, field logistics	Lump sum	20000/=

Total Estimated Cost: LKR 800000/=

6. Proposal to do Work

Proposal to Do Work	
Customer: <ul style="list-style-type: none"> • Women of Reproductive Planning, Pregnancy and Postpartum. • Midwives • Other related parities 	Vendor: Supervisor: Mr. N.M. Ziyad Group Members: <ul style="list-style-type: none"> • P.A.H. Niluminda – 221428846 • H.I.M. Rathnasiri – 521424581 • Y.A.S. Himaruwani – 421642710 • R.W.S. Dileka – 721445639 • R.P.H. Prabhani – 121642452 Final year group project - BSE (Hons) in Software Engineering Department of Electrical & Computer Engineering Faculty of Engineering Technology The Open University of Sri Lanka
Brief Description of Work: <p>This project involves the design, development, and deployment of a Personalized AI-Based Guidance System aimed at improving maternal healthcare services across Sri Lanka. The system will address critical gaps in access to personalized, culturally sensitive care by integrating modern AI technologies into a user-friendly web platform.</p> <p>The system will support women through preconception, pregnancy and postpartum stages with features including:</p> <ul style="list-style-type: none"> ➤ Reproductive Planning Assistance ➤ Personalized Health Recommendations during pregnancy period. ➤ Support for Healthcare Professionals. ➤ Reminder System for Vaccines and Treatments. ➤ Postpartum Guidance. 	

Deliverables: <ul style="list-style-type: none"> ➤ Web Application ➤ Documentation ➤ Research Report 	
Cost Estimate: 800000/=	Work Estimate: 800hrs
Expected Start Date:	Expected Completion Date: 30/11/2025
Customer Decision: <ul style="list-style-type: none"> <input type="checkbox"/> Approved as is. <input type="checkbox"/> Approved with changes <input type="checkbox"/> Rejected because: 	
Approval by Customer:	Approval by Technology Providers:
Customer Approval Date:	Technology Providers Approval Date:
Proposal Date:	Proposal Expires On:

7. Time Plan

Activity	Year 2025/26																											
	May				June				July				August				September				October				November			
Discuss the project theme																												
Making project proposal																												
Requirement gathering																												
Design the project																												
Develop the project																												
Test the project																												
project implementation																												
Reflective log and Final Report																												

Final Proposal Due (08 June)

Progress Report 1 Due (20 July)

PR 1 Presentations (2 August)

Progress Report 2 Due (28 September)

PR 2 Presentations (18 October)

Progress Report 3 Due (12 December)

PR 3 Presentations (10 January)

Final Draft Report Due (31 March)

Reflective Log and Final Report Due (24 April)

8. Signatures

Role	Name / Signature	Date
Customer Representative	_____	_____
Supervisor	_____ Mr. N.M. Siyad	_____
Team Leader (Vendor)	_____ P.A.H. Niluminda	_____