

## 1. Objective

- To build an **AI-powered reproductive health platform** that reduces infant mortality through improved **prenatal and postnatal care**.
  - To support **PCOS management** for women using digital tools (symptom tracking, diet, exercise, and guided interventions).
  - To implement a **deep learning and federated learning-based semen analysis system** for predicting male fertility.
  - To enable **offline health predictions** via Federated Learning for areas with limited internet access.
  - To empower **healthcare providers and health workers** with real-time dashboards, patient monitoring tools, and mobile accessibility.
  - To bridge the healthcare gap between rural populations and medical institutions through **telemedicine and remote diagnostics**.
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## 2. Summary of the Proposal

This project proposes a smart, AI-driven mobile platform aimed at **reducing infant mortality** and addressing **reproductive health issues** on both maternal and paternal sides. The application provides a **holistic solution** that covers:

- Prenatal and postnatal monitoring
- High-risk pregnancy alerts
- PCOS symptom tracking, QOL assessment, diet/exercise guidance
- Deep learning-based semen analysis and fertility prediction
- Real-time monitoring using portable ECG devices
- Growth tracking for infants and immunization management
- Telemedicine and community support modules

The platform is designed for **urban and rural deployment**, offering both **online and offline support** using **federated learning** to perform local AI predictions securely. It integrates multiple stakeholders—pregnant women, doctors, healthcare workers, and administrators—into one centralized system with analytics, content, and communication tools.

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## 3. Detailed Project Proposal

### Core Features:

- **Prenatal Care & High-Risk Alerts:** Automated reminders, fetal movement tracking, contraction counters, and ECG-based maternal monitoring.
- **Postnatal Support:** Infant growth tracking, mental health screening, vaccination scheduling.

- **PCOS Management:** Lifestyle monitoring, symptom analysis, personalized exercise/diet plans, QOL scoring, cycle tracking.
- **Men's Fertility:** AI-based semen analysis from lab reports or image inputs with local predictions via Federated Learning.
- **Admin Dashboard:** Approval of healthcare professionals, analytics, content management, and monitoring of community health.
- **Health Worker Dashboard:** Patient assignment, field visit tracking, and region-based maternal statistics.

#### Technology Stack:

- **Mobile Development:** Flutter
  - **AI/ML:** TensorFlow, PyTorch for deep learning; TensorFlow Federated for FL
  - **Backend:** MySQL
  - **Data Analytics:** Graphs for growth tracking, weight charts, and risk heatmaps
  - **Cloud & Offline Sync:** Data stored locally with sync when online
  - **Security:** Role-based access, encrypted storage, and consent-based sharing
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## 4. Societal & Industrial Impact

#### Societal Impact:

- **Reduction in preventable infant deaths** through early detection and health education.
- **Empowerment of women** through cycle awareness, PCOS management, and reproductive education.
- **Inclusion of male fertility** promotes gender-equal responsibility in pregnancy planning.
- **Accessibility in rural areas** via offline AI predictions and health worker modules.
- **Mental health awareness** for mothers post-delivery via integrated support systems.

#### Industrial Impact:

- Scalable as a **GovTech health solution** for national and state health departments.
  - Useful for **healthcare startups and digital clinics** to integrate AI-based diagnostics.
  - Potential for **integration with insurance providers** and **EHR systems** for better data handling.
  - Creates avenues for **medical device manufacturers** to integrate with ECG and fertility devices.
  - Sets a precedent for **AI + Federated Learning** in maternal care and fertility tech.
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## 5. Scalability & Market Readiness

- Designed to be **device-agnostic** and operable in **low-resource settings**.
  - Can be launched as a **B2B product** for hospitals or as a **B2C app** for end users.
  - Compatible with **government health schemes (e.g., Ayushman Bharat, CM Health Cards)**.
  - **Modular architecture** enables addition of wearable integrations (e.g., glucose monitors, Dopplers).
  - Future-ready with **API support for third-party devices and hospital systems**.
  - **Market potential** across maternal health, fertility tech, rural health tech, and insurance analytics.
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## 6. Technology Utilization

The integration of **technology** will further elevate the system's capabilities:

- **Real-time ECG & health data streaming** to doctors for quicker interventions during emergencies.
- **Faster uploads of medical imaging** (e.g., semen samples or ultrasound scans) for remote analysis.
- **Low-latency video consultations** in the telemedicine module, enhancing accessibility.
- **Ultra-reliable connectivity** for rural field workers to sync data instantly upon coverage.
- **IoT device communication**—smart fetal monitors, ECG bands, and weight trackers can sync data in real time with the cloud
- Enables **edge-computing with federated learning**, minimizing server dependency and ensuring **data privacy compliance** (HIPAA, GDPR).

Note:

We have already developed several mobile applications for the doctors of Saveetha University Hospital, based on the specific requirements of each department. These applications are available on both the Play Store and App Store for use by doctors and patients. We now propose to integrate all these features into a unified master project, with a focus on addressing prenatal and postnatal health issues, particularly for rural populations. This initiative will leverage AI integration to enable local offline access, ensuring better healthcare delivery in resource-limited settings.