**📑 Minor Project Proposal & Synopsis**

**1. Title of the Project:**

**MedAnalysis AI – Fully Secured : Privacy-Preserving Medical Image & Report Analysis**

**2. Team Members:**

* Uttam Kumar Mahto (Roll No. 15571024001)
* Jiten Pramanik (Roll No. XXXX)
* Suryakanta Ghosh (Roll No. XXXX*)*
* Subhodeep Gorai (Roll No. XXXX*)*

**3. Introduction / Background:**

With the increasing use of Artificial Intelligence in healthcare, medical image and text analysis tools have become vital for supporting doctors and radiologists. However, most AI-based healthcare systems are **cloud-based**, which introduces serious **data privacy, compliance, and security risks**, especially with sensitive medical records.

This project aims to design a **local-first AI system** using **Ollama and MedGemma models** to analyze medical images (X-rays, MRIs, CT scans) and clinical reports **securely on the user’s device**. By ensuring that **data never leaves the machine**, the system guarantees **HIPAA compliance** and addresses the growing need for **privacy-preserving AI healthcare solutions**.

**4. Objectives:**

* To develop a **secure web-based platform** for analyzing medical images and clinical text reports.
* To ensure **HIPAA compliance** by performing all AI inferences locally.
* To provide doctors and radiologists with **fast, accurate diagnostic insights** in less than 30 seconds.
* To generate **downloadable structured PDF reports** for medical use.
* To build a **scalable, modular system** that can be extended into a Major Project.

**5. Problem Statement:**

Existing AI medical analysis platforms are mostly **cloud-dependent**, which exposes sensitive medical data to risks such as **data breaches, legal non-compliance, and high infrastructure costs**. Healthcare professionals require a **reliable, private, and efficient** system that allows them to analyze medical images and reports **without compromising patient data security**.

**6. Methodology / Approach:**

The project will be implemented using the following tools, technologies, and methods:

* **Frontend**: React, Next.js, TailwindCSS (for responsive UI)
* **Backend**: Node.js, Express.js (for API and business logic)
* **Database**: MongoDB with Mongoose (for metadata storage)
* **Authentication**: JWT tokens, bcrypt hashing, HTTPS, CORS policies
* **AI/ML Model**: **Ollama + MedGemma-4b-it:q8 model** for local medical image and text analysis
* **Testing Tools**: Jest, Cypress, JMeter, Postman
* **Deployment**: Docker, Kubernetes, GitHub Actions CI/CD
* **Architecture**: Modular MVC design with RESTful APIs

**7. Expected Outcome:**

* A **functional AI-driven medical analysis system** with a web-based dashboard.
* Support for **uploading and analyzing medical images & reports** securely.
* **Accurate diagnostic results** within 30 seconds of file upload.
* **Downloadable PDF reports** for doctors and patients.
* A **HIPAA-compliant, privacy-preserving system** ready for real-world healthcare usage.

**8. Future Scope (for Major Project):**

* **Multi-language support** for doctors and patients globally.
* **Integration with Hospital Management Systems (HMS)** for seamless adoption.
* **Real-time video scan support** (e.g., ultrasound, endoscopy).
* **Advanced AI explainability features** for medical validation.
* **Mobile application development** for on-the-go accessibility.
* Expansion into **telemedicine platforms**, connecting patients and doctors securely.

**9. References:**

1. PRD, Architecture & Test Docs – *MedAnalysis AI – Ollama Edition* (team documentation).
2. HIPAA Compliance Guidelines – U.S. Department of Health & Human Services.
3. MongoDB Documentation – <https://www.mongodb.com/docs/>
4. Next.js Official Docs – https://nextjs.org/docs
5. Ollama Documentation – https://ollama.ai/docs
6. Research Papers on AI in Healthcare:
   * Esteva A. et al. “A guide to deep learning in healthcare” (Nature Medicine, 2019).
   * Lundervold A. & Lundervold A. “An overview of deep learning in medical imaging” (Computers in Biology and Medicine, 2019).