SMART INDIA HACKATHON 2025

TITLE PAGE

- **Problem Statement ID – 25049**
- **Problem Statement Title- AI-Driven Public Health Chatbot for Disease Awareness**
- **Theme- MedTech / BioTech / HealthTech**
- **PS Category- Software/Hardware**
- **Team ID-**
- **Team Name (Registered on portal) - EMAA**

EMAA

EMAA: Emergency Medical AI Advisor

Federated Learning Platform for Healthcare Innovation

Advanced Healthcare AI • Privacy-First Architecture • Scalable Deployment

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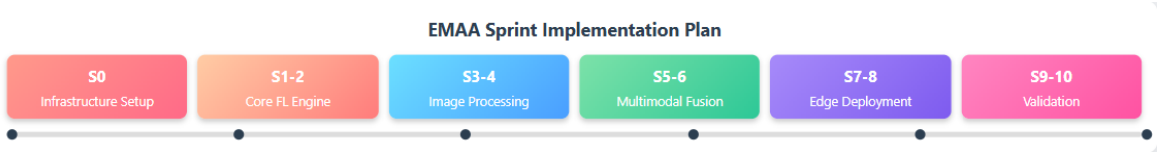
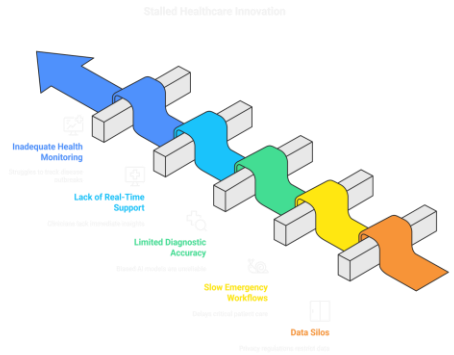
IDEA / SOLUTION :

EMAA (Emergency Medical AI Advisor) introduces a revolutionary federated learning platform for privacy-preserving healthcare AI collaboration.

- **Privacy-Preserving Federated Learning**: Hospitals train models locally; only encrypted updates are shared, ensuring data privacy compliance.
- **Multilingual Accessible Chatbot**: Available via WhatsApp/SMS in local languages for rural populations without internet or smartphones.
- **Real-Time Outbreak Alerts & Vaccination Reminders**: Informs users about local outbreaks and upcoming vaccinations using government health database integration.
- **Symptom Checker & Preventive Guidance**: Provides accurate advice on symptoms, hygiene, and disease prevention to reduce early-stage spread.
- **Efficient & Scalable Deployment**: Uses LoRA for reduced model size and supports thousands of simultaneous users in low-resource areas.



Problem Resolution :



PROBLEM

Hospitals possess vast amounts of sensitive patient data but cannot share it due to privacy regulations, creating data silos that prevent the development of robust medical AI models.

Privacy-Preserving FL

Hospitals train models locally, share only encrypted updates—never patient data.

Real-Time Edge AI

Sub-second inference for critical findings at point of care.

15% Accuracy Boost

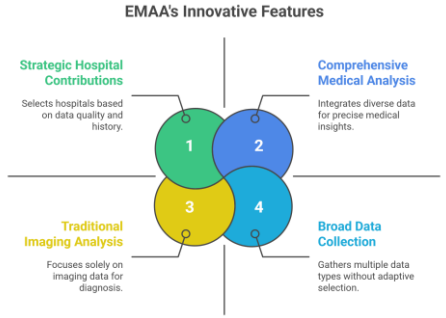
Collective training improves diagnostic accuracy across all hospitals.

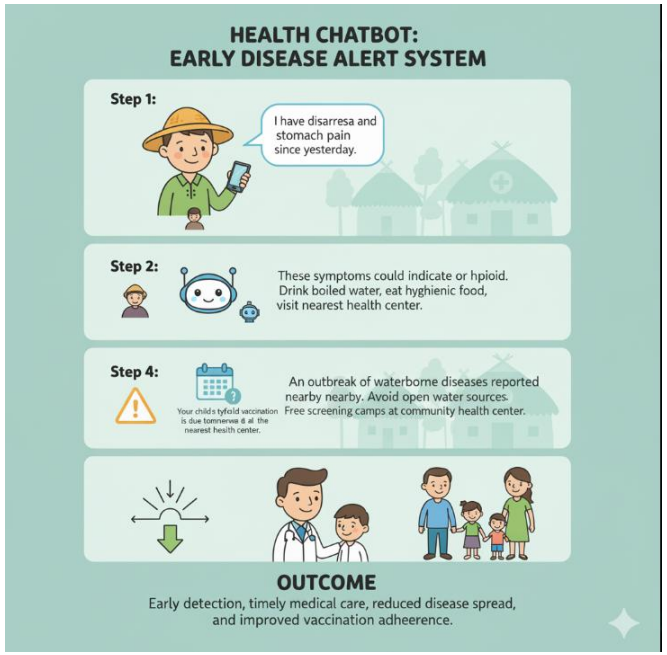
Seamless Integration

Works with existing hospital systems without workflow disruption.

Unique Value Propositions (UVP) :

- **Comprehensive Multimodal AI**: Integrates imaging, lab results, vitals, and clinical notes for accurate, holistic disease analysis.
- **Adaptive Federated Learning**: Uses Shapley value-based client selection for efficient, high-quality model training from diverse hospitals.





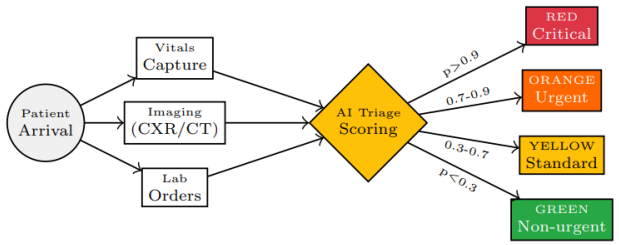


Figure 4: AI-Powered Emergency Triage Workflow

PROCESS FLOW ARCHITECTURE

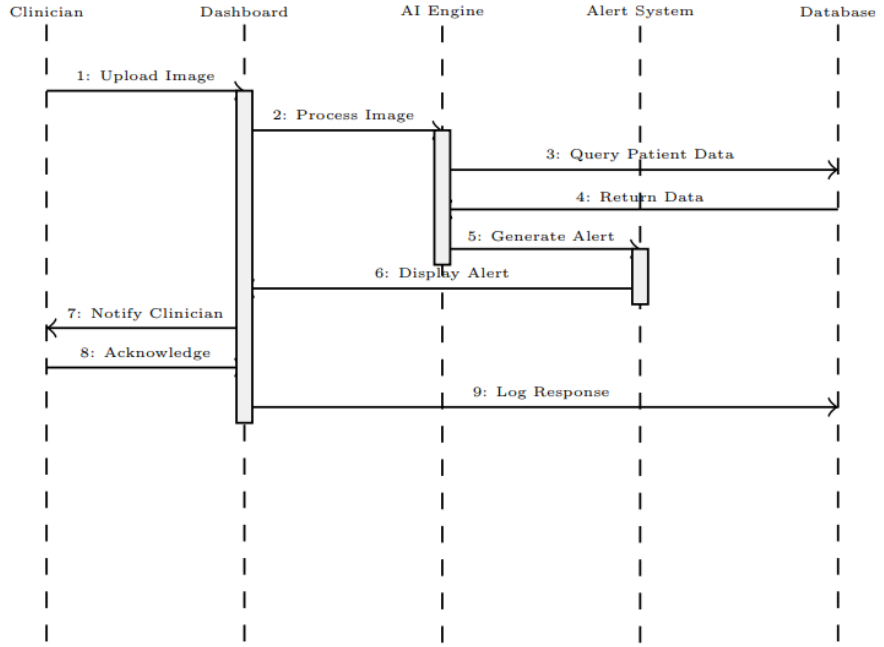
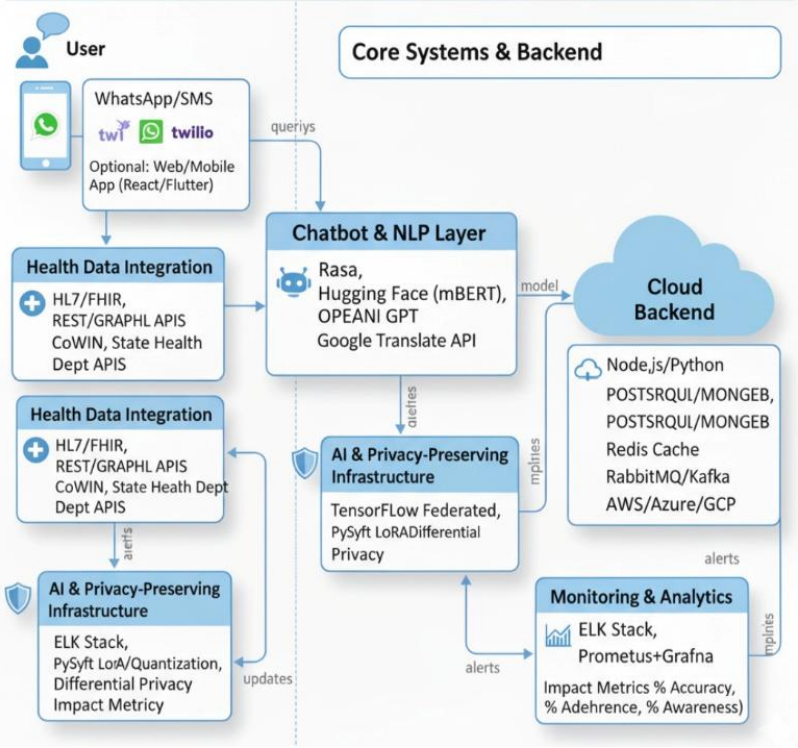
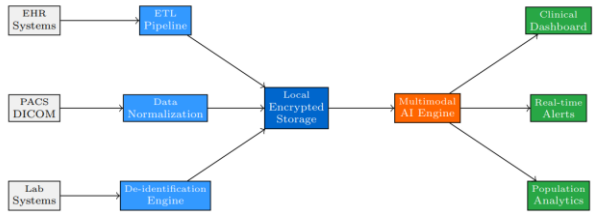


Figure 3: Critical Alert Sequence Diagram





(a) Comprehensive Data Flow Architecture

EMAA

FEASIBILITY AND VIABILITY

Assessing practicality before pursuing possibility

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Technical Feasibility

EMAA builds on established technologies with a novel combination for healthcare applications.

Strengths

- Proven federated learning frameworks
- Existing components (DICOM, Bio-ClinicalBERT)
- AWS cloud scalability

Challenges

- Byzantine robustness expertise needed
- Differential privacy implementation
- Edge deployment complexity

Financial Feasibility

Large addressable market with clear path to profitability and strong unit economics.

₹42.2B Market Size (2024)	44.9% CAGR
34:1 LTV/CAC Ratio	Y3 EBITDA Positive

Market Feasibility

Unique positioning in a growing market with regulatory tailwinds and limited competition.

₹1.8B Clinical Decision Support	₹4.2B Medical Imaging AI
₹2.1B Population Health	Unique Market Position

Operational Feasibility

Agile approach with experienced team and clear regulatory strategy for implementation.

10 Sprints	6-18 mo FDA Timeline
Phased Rollout	Expert Team

EMAA

IMPACT AND BENEFITS

Translating efforts into measurable value

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Potential Impact on Target Audience

Positive Impacts

- **Improvement:** 20%+ increase in diagnostic accuracy leading to better patient outcomes
- **Economical:** Reduced operational costs through helpines through automated automated responses
- **New Opportunities:** Enables tracking & alerts for outbreaks without data integration via data integration
- **Social Benefits:** Improved healthcare accessibility access in multiple regions throultiple regional languages

Negative Impacts

- **Cost:** Initial investment for platform develoncture and imfielemnture & API subscriptions
- **Technology Adoption:** User traiing reqive medical staff to effectively use diverse deomogoraphics
- **Integration Challenges:** Potential issues syn dring in integration Govt health databas systems (HL7/FHIR)
- **Dependency Risk:** Over-reliance on AI sttona thwithout human support for complex complex cases

Privacy First
Zero patient data exposure

Real-Time Analysis
Sub-second diagnosis

Multi-Hospital
Collaborative learning

AI Powered
Continuous improvement

Overall Impact Assessment

EMAA represents a transformative approach to healthcare AI that balances technological innovation with privacy preservation. While there are implementation challenges and costs, the positive impacts significantly outweigh the negatives. The solution offers substantial social benefits through improved healthcare access, economic advantages via increased efficiency, and environmental benefits through reduced resource consumption. By enabling collaborative learning while preserving data privacy, EMAA has the potential to accelerate medical AI adoption and improve patient outcomes globally.

Benefits of the Solution

Social Benefits

- **Improved Access:** Democratizes expert-level medical diagss regions, even sen multiple languages.
- **Empowerment:** Enhances capabilities on of healthcare professional and vaccination schedules
- **Reduction:** Decreases health disparities through more mo reliable public health guidance quality
- **Trust:** Privacy-first approach increases patient contient confidence in digital health healthcare systems

Economic Benefits

- **Productivity:** 20% reduction in diagnosis time increases healthcare throughput
- **Cost Reduction:** Lower operational costs throughed FAQ ried analysis and reduced errors
- **Cost Reduowth:** Creates new market opportunities in privacy-preserving AI healthcare
- **Efficiency:** Optimizes resource allocation thir tracking of triage and diagnosis

Environmental Benefits

- **Energy Efficiency:** Federated learning reduces need for large data transfers, saving energy
- **Reduction:** Less need for physical transportation of medical data experts
- **Waste Reduction:** Digital-first approach decreases paper-based medical records
- **Sustainable:** Enables more efficient healthcare delivery with smaller carbon footprint

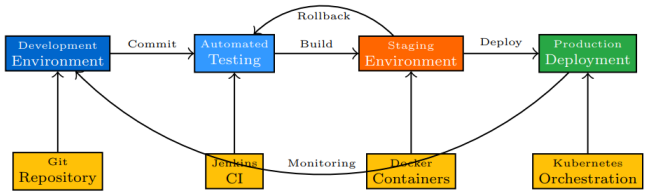

Figure 8: Agile CI/CD Pipeline

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RESEARCH AND REFERENCES

Grounded in facts, guided by evidence

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