

Project Progress Report: CoreChain

Project Title: CoreChain – Privacy-Preserving Federated Learning for Medical AI

Date: January 22, 2026

Status: 85% Complete (Phase: Integration & Testing)

1. Executive Summary

CoreChain is a decentralized platform designed for collaborative TB detection. It allows hospitals to train a shared AI model without sharing sensitive patient data, utilizing **Blockchain** for immutable auditing and **Federated Learning (FL)** for privacy. The core infrastructure, blockchain integration, and monitoring dashboards are 100% complete.

2. Technical Architecture Delivered

We have successfully implemented a **3-Tier System**:

- **Aggregator (AWS Cloud):** Orchestrates the global model using the Flower framework and logs all training activity to the blockchain.
- **Hospital Nodes (Local/Docker):** Local environments where CNN models are trained on private data before sending weight updates back to the aggregator via gRPC.
- **Blockchain Audit Trail:** A custom implementation that records FL rounds and model updates to ensure research integrity.

3. Key Achievements to Date

- **Dual Dashboard System:** Developed real-time web interfaces for both the Aggregator (admin view) and Hospital Nodes (client view) using WebSockets.
- **Blockchain Integration:** Successfully linked training rounds to a persistent ledger for transparency.
- **Containerization:** The entire ecosystem is Dockerized, ensuring consistent deployment across different hospital environments.
- **Cloud Deployment:** The central aggregator is live on **AWS EC2**, featuring persistent storage and swap-memory optimization.

4. Current Development Phase

Component	Status	Progress
FL Infrastructure	✔ Functional	100%
Blockchain Logic	✔ Functional	100%
Aggregator Dashboard	✔ Functional	100%
Hospital Dashboard	✔ Functional	100%

Component	Status	Progress
Cloud Deployment	✅ Live (AWS)	95%
Model Training Loop	🚧 Debugging	0%

5. Roadmap to Completion

We are currently addressing a critical bottleneck where the Flower server waits indefinitely for training rounds to start. Our focus for the final 15% of the project includes:

1. **FL Loop Optimization:** Resolving gRPC "Socket Closed" errors and memory constraints on the AWS instance.
2. **End-to-End Testing:** Validating model weight aggregation from multiple hospital nodes simultaneously.
3. **Final Documentation:** Completing the technical manual and user guides for hospital administrators.