MADHAV INSTITUTE OF TECH & SCIENCE
WORK IS WORSHIP

HACKORBIT

Digital Learning Group

HackOrbit 2025

System 32

THEME & PROBLEM STATEMENT

MediChain – Blockchain-Based Hospital Record System

- Medical data is often stored in silos across hospitals, clinics, and labs — making it hard for patients or doctors to get a full view of a patient's health.
- Patients have **little or no ownership** over their own medical data. They can't easily control who accesses their records or when.
- During critical emergencies, **accessing patient history quickly** can be the difference between life and death — yet it's often slow or unavailable.
- Verifying health records for insurance claims is **manual, time-consuming, and susceptible to fraud**.
- Traditional systems store sensitive health records on **centralized servers**, increasing the risk of hacking or data breaches.

PROPOSED SOLUTION

MediChain is a decentralized healthcare record system that puts **patients in full control** of their medical data usin **blockchain and IPFS**.

- **Patient-Owned Data**

  Patients can upload their encrypted health records
  They control who can access them via blockchain smart contracts

- **Permissioned Access via Smart Contracts**

  Doctors request access to view records
  Patients approve or deny requests through MetaMask wallet transactions
  Access logs are transparent and immutable

- **Decentralized & Secure Storage with IPFS**

  Medical files are encrypted and stored on IPFS
  Only approved users can decrypt and view the data

- **Tamper-Proof Logs for Insurance Verification**

  Every action is logged on-chain
  Insurance companies can verify claim authenticity with complete transparency

TECH STACK

🌐 Frontend: HTML, CSS, JavaScript

HTML5 for semantic, structured content (forms, tables, sections)
CSS for responsive design (media queries, Bootstrap/Tailwind)
JavaScript for dynamic UI, form validation, and API calls

🧠 Backend: Python (Flask or Django)

Flask (preferred) for lightweight RESTful API creation
Handles authentication, data routing, and blockchain integration
Connects to a **database** (e.g., SQLite or PostgreSQL)

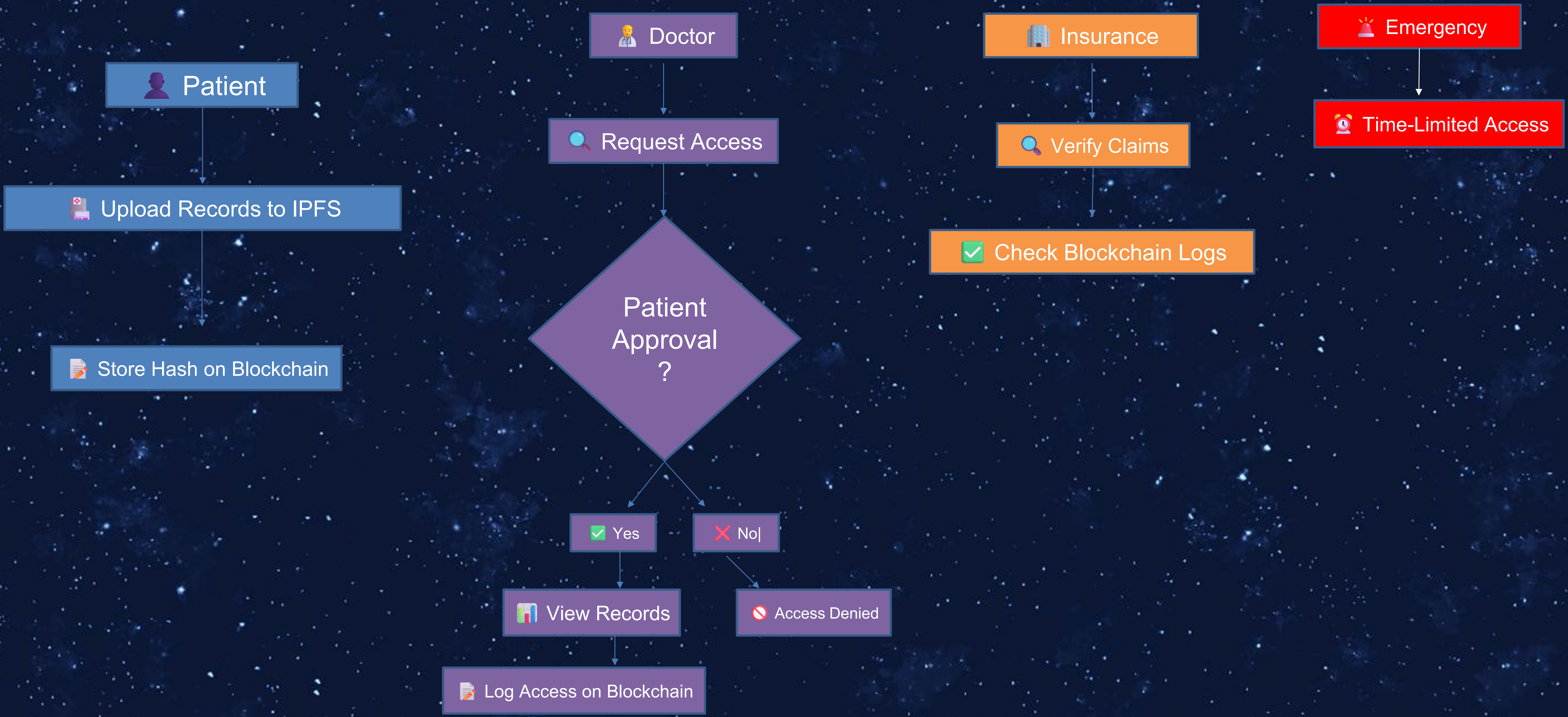
🔗 Blockchain Layer (Python-based)

Custom blockchain built in Python
Blocks contain medical record hashes and permissions
Implements SHA-256 hashing, Proof-of-Work, and chain validation

📦 Storage & Data Handling

Database (SQLite/PostgreSQL) for users and record metadata
Off-chain record storage (IPFS or local storage) with hash linking on blockchain
Implements basic access control logic (similar to smart contracts)

FLOWCHART / DIAGRAM



👤 Patient

🏥 Upload Records to IPFS

📝 Store Hash on Blockchain

🧑‍⚕️ Doctor

🔍 Request Access

Patient Approval ?

✅ Yes

❌ No|

📊 View Records

📝 Log Access on Blockchain

🚫 Access Denied

🏢 Insurance

🔍 Verify Claims

✅ Check Blockchain Logs

🚨 Emergency

⏰ Time-Limited Access

FLOWCHART / DIAGRAM

Explainer text

How MediChain Works: A Complete Workflow

- **Patient Data Upload (Blue):** Patients upload encrypted records to IPFS; only the hash is stored on the blockchain for privacy and security.

- **Doctor Access Request (Purple):** Doctors request access; patients approve via MetaMask. All actions are logged on-chain for transparency.

- **Insurance Verification (Orange):** Insurers verify claims by checking tamper-proof blockchain logs, reducing fraud and speeding up approvals.

- **Emergency Access (Red):** Time-limited emergency access allows personnel to view vital data; access expires automatically to maintain security.

🎯 Key Benefits Demonstrated

For Patients:

Complete ownership and control over medical data
Transparent access logs - know exactly who access what and when
Secure, encrypted storage with global accessibility

For Healthcare Providers:

Instant access to complete patient history (with permission)
Reduced paperwork and administrative overhead
Emergency access capabilities for critical care

For Insurance Companies:

Fraud prevention through immutable records
Faster claim verification and processing
Reduced operational costs

FEATURES AND NOVELTY

Core Features:

- **Patient-Controlled Access:** Patients grant/revoke record access via blockchain.
- **Encrypted Storage:** Medical files are encrypted and stored on IPFS, not centralized servers.
- **Tamper-Proof Logs:** Every action recorded immutably on-chain; verifiable by all parties.
- **Doctor Workflow:** Doctors request via smart contracts; patients approve with MetaMask.
- **Insurance Support:** Insurers validate claims using transparent on-chain logs.

Novelty & Uniqueness:

- **Working Prototype:** Built real solution using Ethereum + IPFS + React/Flutter.
- **Patient-First Design:** Empowers patients with real control over their data.
- **Cross-Platform Ready:** Works on web (React) and mobile (Flutter).
- **Emergency & QR Access:** Optional features fo critical situations with secure, fast QR-based permissions.
- **Privacy & Auditability:** Data encrypted and off-chain; only logs/hashes on-chain — privacy intact.

DRAWBACK AND SHOWSTOPPERS

Drawbacks & Limitations:

- **Scalability:** High costs and slower speeds on public Ethereum networks.
- **User Complexity:** Patients/doctors need MetaMask; may be hard for non-technical users.
- **Privacy vs. Transparency:** On-chain logs need careful design to protect sensitive info.
- **Key Management:** Losing encryption keys can lead to permanent data loss.
- **Regulatory:** Meeting HIPAA/GDPR standards in decentralized apps is still evolving.

Showstoppers – What Sets Us Apart:

- **Working Prototype:** We built a real app with smart contracts, IPFS, and wallet-based approvals.
- **True Data Ownership:** Patients fully control their records; not just a blockchain label.
- **Tamper-Proof Logs:** On-chain, transparent logs build trust.
- **Secure & Private:** Data is encrypted and not stored on-chain.
- **Scalable:** Off-chain IPFS storage keeps the system lightweight and cost-effective.

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Thank you