**HealthAI: Intelligent Healthcare Assistant Using IBM Granite**

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| Team ID | LTVIP2025TMID34448 |
| Project Name | HealthAI: Intelligent Healthcare Assistant Using IBM Granite |
| Maximum Marks | 4 Marks |

# ****HealthAI: Intelligent Healthcare Assistant Using IBM Granite****

**Overview:**  
HealthAI is an AI-powered healthcare assistant system designed to support remote and intelligent health diagnostics, monitoring, and communication during public health emergencies. Leveraging IBM’s Watson and Granite foundation models, HealthAI interacts with users via multiple interfaces, processes voice/text inputs, provides intelligent responses, accesses external APIs (e.g., Aadhar, drug databases), and integrates with backend healthcare data systems.

## ✅ ****Architectural Diagram****

(An architectural diagram can be designed using tools like Lucidchart, Draw.io, or C4 model representation. Let me know if you'd like me to create one.)

The architecture follows a **multi-tier design** with modular integration of IBM Watson, IBM Granite, cloud storage, and APIs for data enrichment.

## 🧩 ****Table-1: Components & Technologies****

| **S.No** | **Component** | **Description** | **Technology** |
| --- | --- | --- | --- |
| 1 | User Interface | Interaction layer for users: patients, doctors, and caregivers | HTML, CSS, React.js, Mobile App (React Native), Chatbot (Watson Assistant) |
| 2 | Application Logic-1 | Core logic for appointment, health history, triage | Python (Flask / FastAPI), Java (Spring Boot) |
| 3 | Application Logic-2 | Speech-to-text for dictation, reporting | IBM Watson Speech to Text (STT) |
| 4 | Application Logic-3 | NLP-based chatbot and health Q&A | IBM Watson Assistant + IBM Granite LLM |
| 5 | Database | Stores structured data: user profiles, appointments, logs | MySQL, PostgreSQL |
| 6 | Cloud Database | Cloud-based database services | IBM Cloudant, IBM Db2 |
| 7 | File Storage | Storage of medical records, prescriptions, imaging | IBM Cloud Object Storage / IBM Block Storage |
| 8 | External API-1 | Health data: drug database, symptoms checker | National Drug Code (NDC) API, OpenFDA API |
| 9 | External API-2 | Patient identity verification | Aadhar API |
| 10 | Machine Learning Model | Diagnosis support model, triage automation | IBM Granite foundation model fine-tuned for medical domain |
| 11 | Infrastructure (Cloud) | Hosting and deployment | IBM Cloud (Cloud Foundry, Kubernetes), CI/CD via Tekton, Red Hat OpenShift |

## ⚙️ ****Table-2: Application Characteristics****

| **S.No** | **Characteristics** | **Description** | **Technology** |
| --- | --- | --- | --- |
| 1 | Open-Source Frameworks | Frontend/backend frameworks and libraries | React.js, Flask, TensorFlow, Kubernetes, Docker |
| 2 | Security Implementations | Secure communication, access control, encryption | JWT, HTTPS, OAuth2, IAM Policies, TLS 1.3, IBM Cloud Identity Services |
| 3 | Scalable Architecture | Modular and scalable design using microservices | Kubernetes, Docker, REST APIs, Event-driven services |
| 4 | Availability | Redundancy and failover using distributed deployments | Load Balancer, IBM Cloud Regions, Auto-Scaling, Blue-Green Deployment |
| 5 | Performance | Fast response via caching and edge delivery | Redis Cache, IBM CDN, Cloudflare CDN, API Throttling |

## 🧠 Additional Notes:

* **Watson Assistant + Granite** enhances contextual responses with medical accuracy.
* **IBM Granite Models** are used for:
  + Health document summarization
  + Medical term translation
  + Diagnosis recommendation (with appropriate clinical safety checks)
* **Offline Mode Support:** Pre-trained models can provide limited service offline with periodic cloud sync.

## 🔗 References:

1. [IBM Cloud Architecture Center](https://www.ibm.com/cloud/architecture)
2. [IBM Developer: Healthcare AI System](https://developer.ibm.com/patterns/ai-powered-backend-system-for-order-processing-during-pandemics/)
3. IBM Watson & Granite Models
4. [C4 Model](https://c4model.com/)
5. [Open Source Tools & Security Standards](https://owasp.org/)