Project - High Level Design

“Healthcare Planning Assistant Agent”

“Datagami-Skill Based Course”

Institution Name: Medicaps University – Datagami Skill Based Course

Sr no	Student Name	Enrolment Number
1.	AAKANKSH THAKUR	EN23CS3T1002
2.	KRATI PORWAL	EN22CS301515
3.	KHUSHI JAISWAL	EN22CS301502
4.	KULDEEP SINGH SISODIYA	EN22CS301530
5.	KANAK VYAS	EN22CS301478

Group Name: Group 02D5

Project Number: AAI-02

Industry Mentor Name: Aashruti Shah

University Mentor Name:Prof. Maya Yadav Baniya

Academic Year:2026

Problem Statement & Objectives

Problem Statement:

The project addresses the challenge of delivering effective, personalized healthcare recommendations for complex medical conditions such as cancer and chronic diseases (including diabetes, hypertension, and blood pressure management). Existing healthcare systems often lack the capability to provide tailored treatment and hospital options while ensuring patient data privacy, clinical accuracy, and secure handling of sensitive health information. There is a pressing need for scalable, accessible, and technically robust solutions in the healthcare sector.

2. Project Objectives:

In the healthcare domain, patients often face difficulty in understanding treatment options, selecting suitable hospitals, and making informed decisions due to complex medical information, lack of personalized guidance, and multiple constraints such as budget, location, and disease stage. There is a need for an intelligent system that can analyze user requirements, collect relevant medical details, validate inputs, and generate personalized, constraint-aware healthcare plans through a systematic and explainable process. This project aims to address these challenges by developing a Healthcare Planning Assistant Agent that uses multi-step reasoning and agent-based architecture to provide structured, validated, and optimized healthcare recommendations.

- Design an AI-driven healthcare assistant system capable of recommending personalized treatments and hospital options for patients with complex and chronic conditions.
- Ensure compliance with healthcare-specific requirements, including patient data privacy, clinical accuracy, and regulatory standards.
- Develop a solution that is accessible, scalable, and secure, suitable for handling sensitive health information and supporting diverse patient populations.

3. Scope of the Project:

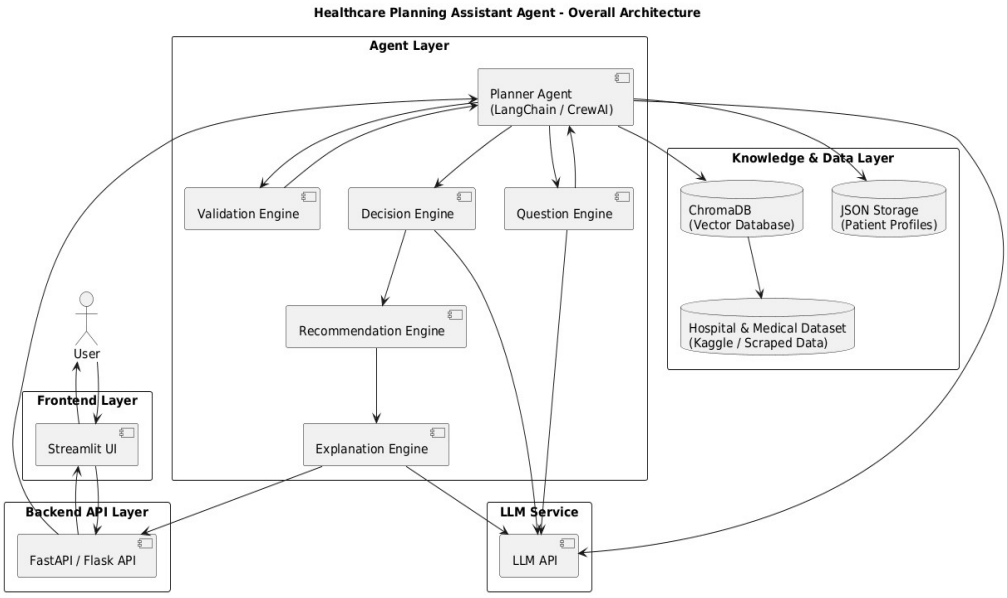
The high-level design concepts for an AI-driven healthcare assistant system. The system is engineered to recommend personalized treatments and hospital options, focusing on complex conditions like cancer and chronic diseases such as blood pressure management, Diabetes, Hypertension. The design addresses healthcare specific requirements, patient data privacy, clinical accuracy, accessibility, scalability, and secure technical architecture for sensitive health information. The design incorporates healthcare-specific requirements to ensure clinical reliability, regulatory compliance, and ethical data handling. It emphasizes robust patient data privacy mechanisms, secure data storage, and encrypted communication channels to protect sensitive health information.

Proposed Solution:

1. **Key features:**

- Planner-based agent architecture.
- Multi-step reasoning and task decomposition.
- Automated patient data collection (medical history, disease stage, budget, location).
- Constraint-aware treatment planning.
- Disease-specific recommendations (Cancer, BP, Diabetes, etc.).
- Stage-specific treatment plans.
- Budget-friendly hospital suggestions.
- Input validation and revalidation mechanism.
- Semantic search for medical knowledge retrieval.
- Fact-checking and validation of recommendations.
- Session memory for conversation continuity.
- Structured, explainable outputs with disclaimers.
- JSON-based structured knowledge storage.
- Scalable and modular design.
- Secure API-based communication.

2. Overall Architecture / Workflow:



3. Tools & Technologies Used:

- Python
- Backend API development (FastAPI / Flask)
- Agent workflow implementation
- Integration with LangChain / CrewAI
- LLM API calls handling
- Data preprocessing and validation
- JSON-based storage management
- ChromaDB integration
- Constraint filtering

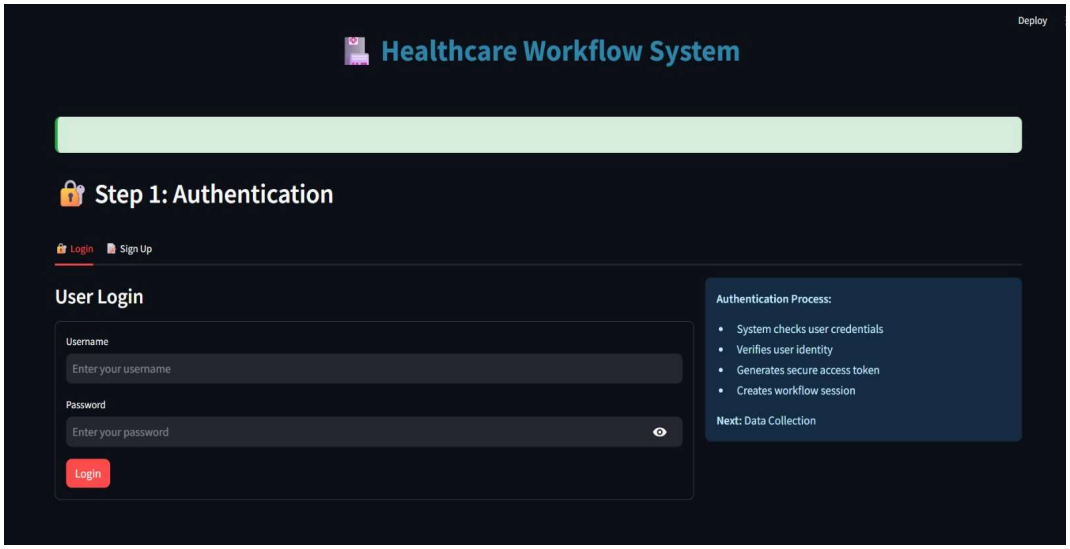
4. Results & Output:

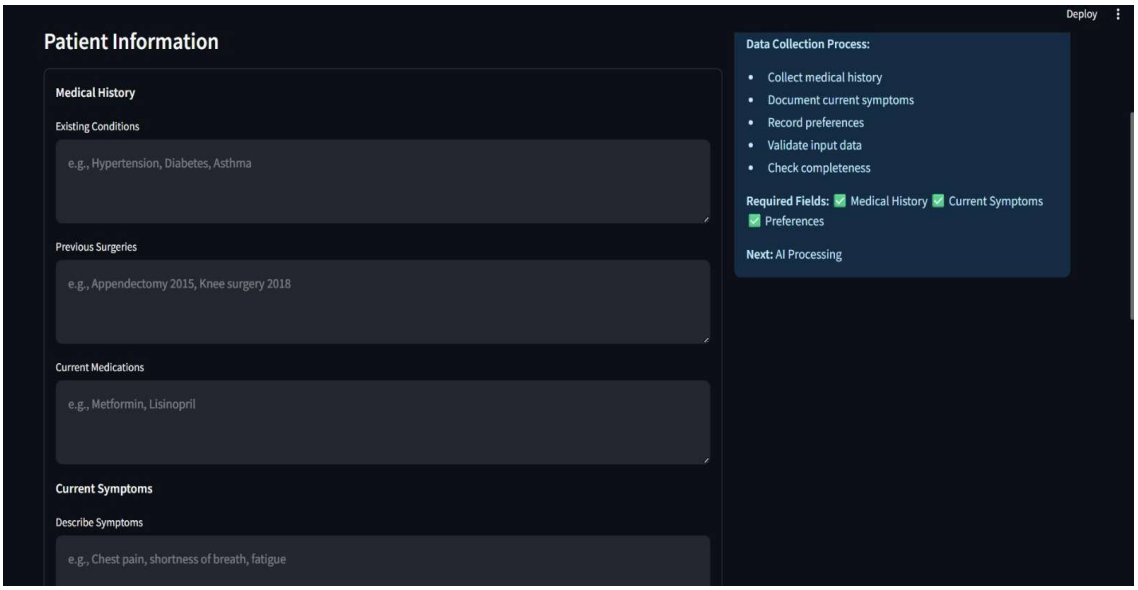
- Accurate multi-step healthcare planning.
- Structured patient data collection and validation.
- Constraint-aware treatment recommendations.
- Budget-based and location-based hospital filtering.
- Stage-specific treatment guidance.
- Explainable and structured output generation.

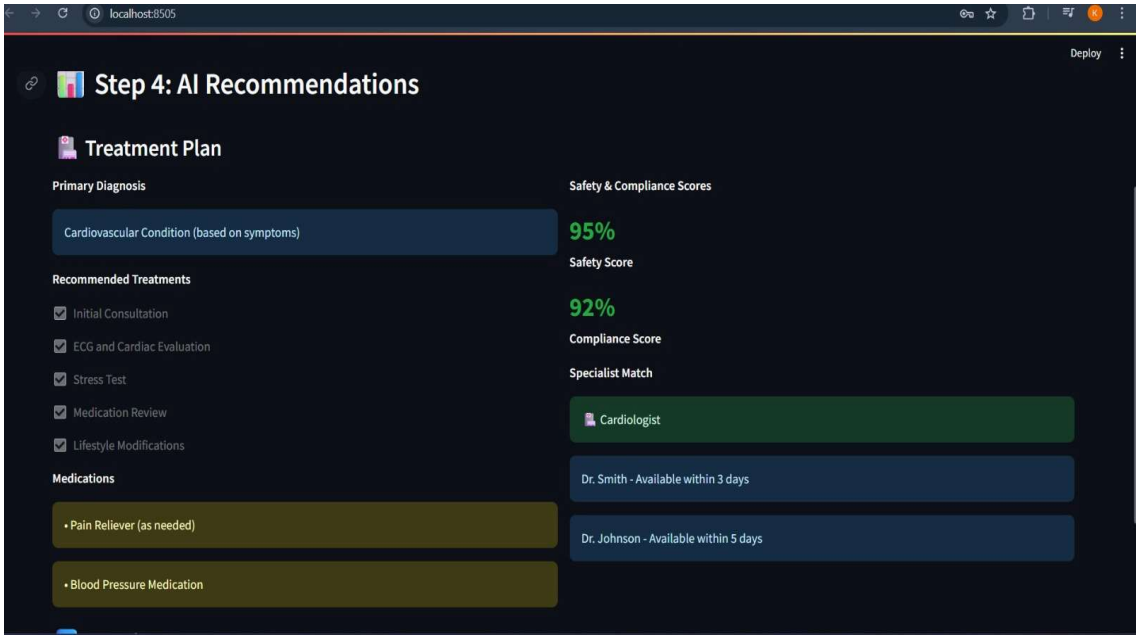
1. Screenshots / outputs

The system produces interactive and structured outputs through its web-based interface:

- **User Login and Dashboard Screen:** Displays secure authentication and access to healthcare services.
- **Goal Input Interface:** Allows users to enter healthcare-related goals such as treatment planning or hospital selection.
- **Questionnaire Module:** Dynamically asks medical and personal questions related to disease stage, medical history, budget, and location.
- **Validation Screen:** Shows validation results for user inputs based on medical guidelines.
- **Recommendation Screen:** Displays personalized treatment plans and hospital suggestions.
- **Explanation View:** Provides step-by-step reasoning and disclaimers for transparency.




Deploy
Patient Information
Medical History
Existing Conditions
e.g., Hypertension, Diabetes, Asthma
Previous Surgeries
e.g., Appendectomy 2015, Knee surgery 2018
Current Medications
e.g., Metformin, Lisinopril
Current Symptoms
Describe Symptoms
e.g., Chest pain, shortness of breath, fatigue
Data Collection Process:
Collect medical history
Document current symptoms
Record preferences
Validate input data
Check completeness
Required Fields: Medical History Current Symptoms
Preferences
Next: AI Processing


localhost:8505
Deploy
Step 4: AI Recommendations
Treatment Plan
Primary Diagnosis
Cardiovascular Condition (based on symptoms)
Recommended Treatments
Initial Consultation
ECG and Cardiac Evaluation
Stress Test
Medication Review
Lifestyle Modifications
Medications
• Pain Reliever (as needed)
• Blood Pressure Medication
Safety & Compliance Scores
95%
Safety Score
92%
Compliance Score
Specialist Match
Cardiologist
Dr. Smith - Available within 3 days
Dr. Johnson - Available within 5 days

2. Reports / Dashboards / Models

a) System Reports

The system generates multiple internal reports, including:

- **User Profile Report:** Contains medical history, disease details, and constraints.
- **Validation Report:** Displays verified medical inputs and rejected/incomplete data.
- **Recommendation Report:** Summarizes treatment plans and hospital rankings**.**
- **Session Report:** Stores user interaction history and conversation context.

b) Dashboards

The administrative dashboard provides:

- User activity monitoring
- Session management status
- System performance metrics
- API usage analytics
- Error and security logs

c) AI and Planning Models:

The project uses multiple intelligent components:

- **Planner Agent Model:** Breaks high-level goals into subtasks.
- **Decision Engine:** Applies medical logic and constraints.
- **Recommendation Engine:** Ranks hospitals and treatments.
- **Semantic Search Model:** Retrieves medical information using ChromaDB.
- **LLM-based Reasoning Model:** Supports multi-step reasoning and explanation.

3. Key Outcomes:

The major outcomes achieved through the project include:

1. **Personalized Healthcare Planning:**
    - Generated customized treatment pathways based on individual profiles.
    - Considered medical, financial, and geographical constraints.
2. **Structured Decision-Making:**
    - Implemented planner-based architecture for systematic reasoning.
    - Reduced random or unvalidated recommendations.
3. **Improved User Awareness:**
    - Provided explainable outputs and medical disclaimers.
    - Enhanced patient understanding of treatment options.
4. **Secure Data Handling:**
    - Implemented encrypted storage and secure sessions.
    - Ensured regulatory and ethical compliance.
5. **Scalable System Design:**
    - Used modular microservices and APIs.
    - Enabled future integration with hospital systems.
6. **Efficient Performance:**
    - Reduced response time through caching.
    - Supported concurrent users without degradation**.**

3. Key outcomes:

Conclusion:

This aim of the project to develops an intelligent Healthcare Planner Agent that assists users in making informed treatment decisions through structured and

personalized planning. It follows a planner-based architecture that breaks highlevel health goals into smaller tasks, collects relevant medical information, validates data, and applies decision logic. The system analyzes user profiles, medical history, and constraints such as budget and location to generate suitable treatment plans and hospital recommendations. It provides explainable, step-by-step outputs through an interactive interface, ensuring clarity, reliability, and responsible use as a healthcare support tool.

Future Scope & Enhancements:

1. Integration with Real Hospital Systems

- Connect with hospital databases and Electronic Health Records (EHR).
- Enable real-time appointment booking and referrals.

2. Advanced AI Models

- Use fine-tuned medical LLMs for higher accuracy.
- Implement predictive analytics for disease progression.

3. Mobile Application Development

- Develop Android and iOS apps for better accessibility.
- Support offline data entry for rural users.

4. Real-Time Monitoring

- Integrate wearable and IoT health devices.
- Enable continuous health monitoring.

5. Multilingual and Regional Support

- Expand language support for regional users.
- Include voice-based interaction.

6. Enhanced Security Framework

- Implement blockchain for medical record security.
- Improve biometric authentication methods.

7. Clinical Decision Support Expansion

- Add drug interaction checking.
- Include personalized lifestyle and diet planning.

8. Data Analytics and Research

- Provide analytics dashboards for medical researchers.
- Enable anonymized data analysis for public health studies.