

Healthcare Content Generator Report

Course Name: Generative AI

Institution Name: Medicaps University – Datagami Skill Based Course

Student Names & Enrolment Numbers:

Sr no	Student Name	Enrolment Number
1.	Janhavi Gupta	EN22CS301454
2.	Harshita Songara	EN22CS301411
3.	Hariom Patidar	EN22CS301383
4.	Uday Dubey	EN22CS301058
5.	Hemant Mandloi	EN22CS301422

Group Name:

Project Number: D4 06

Industry Mentor Name:

University Mentor Name: Prof.Divya Kumawat

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1. Problem Statement & Objectives:

1.1 Problem Statement:

In modern healthcare systems, accurate and well-structured medical documentation plays a crucial role in patient care, diagnosis, and treatment planning. However, healthcare professionals often face heavy workloads and limited time, making it difficult to prepare detailed medical reports for every patient. Manual documentation is time-consuming, inconsistent, and may lead to errors or incomplete information, especially in high-patient-volume settings and rural healthcare environments.

Additionally, patients require clear and understandable medical summaries that explain their condition, medications, lifestyle modifications, and precautions. Traditional handwritten or unstructured reports may be difficult for patients to understand and for healthcare providers to maintain systematically.

With the rapid advancement of Artificial Intelligence, there is a growing opportunity to automate medical documentation processes. However, there is a lack of accessible, intelligent systems that can generate structured, concise, and specialist-specific medical reports based on patient symptoms and clinical inputs.

Therefore, there is a need to develop an AI-powered healthcare content generation system that assists healthcare professionals by automatically generating professional medical reports, improving efficiency, ensuring consistency, and enhancing patient understanding while supporting modern digital healthcare practices.

1.2 Project Objectives:

The primary objective of the **Healthcare Content Generator** project is to develop an AI-powered system that assists healthcare professionals in generating structured and professional medical reports quickly and efficiently.

The key objectives of the project are:

- **To automate medical documentation** by generating structured clinical reports based on patient symptoms and demographic details.
- **To reduce the documentation workload** of doctors and healthcare professionals, allowing them to focus more on patient care.
- **To ensure consistency and standardization** in medical report formatting and clinical terminology.

- **To generate patient-friendly medical summaries** that include diagnosis insights, precautions, medications, and lifestyle recommendations.
- **To provide specialist-specific reports** (e.g., General Physician, Cardiologist, Dermatologist) based on the type of consultation.
- **To maintain a digital history of reports** for easy retrieval, reference, and follow-up consultations.
- **To improve clinical efficiency** by reducing report preparation time using AI-powered content generation.
- **To build a user-friendly web application** that can be easily used by healthcare professionals with minimal technical knowledge.
- **To explore the use of Generative AI in healthcare documentation**, demonstrating its potential in modern digital healthcare systems.

1.3 Scope of the Project:

The **Healthcare Content Generator** project focuses on developing an AI-powered medical documentation assistant that helps healthcare professionals generate structured and professional clinical reports efficiently.

Project Scope Includes:

- **Medical Report Generation**
The system generates structured medical reports based on patient age, gender, symptoms, and consultation type.
- **Specialist-Based Documentation**
The application supports different consultation types such as general physician reports and specialist-specific summaries.
- **AI-Assisted Clinical Content Creation**
The system uses Generative AI to produce clinically formatted reports including observations, possible conditions, precautions, and recommendations.
- **Digital Report Storage & Retrieval**
Generated reports are stored locally and can be viewed later for reference and follow-up consultations.
- **User-Friendly Web Interface**
A simple and intuitive interface enables healthcare professionals to input patient details and generate reports quickly.

- **Structured & Standardized Output**
Reports follow a consistent medical format to ensure clarity, readability, and professional presentation.
- **Download & Record Keeping**
Doctors can download generated reports for sharing with patients or maintaining digital records.

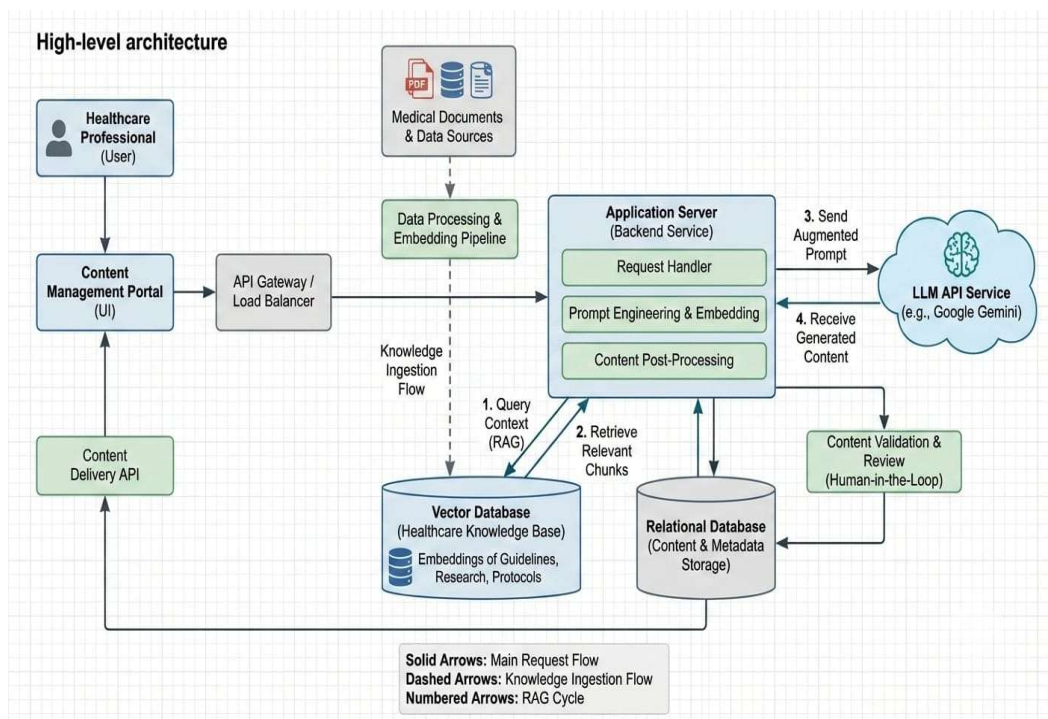
2. Proposed Solution:

2.1 Key Features:

- AI-generated structured medical reports
- Quick patient data input and report generation
- Specialty-based report customization
- Standardized clinical formatting
- Report history storage and retrieval
- Downloadable medical reports
- User-friendly interface for healthcare professionals
- Consistent and professional medical terminology

2.2 Overall Architecture / Workflow:

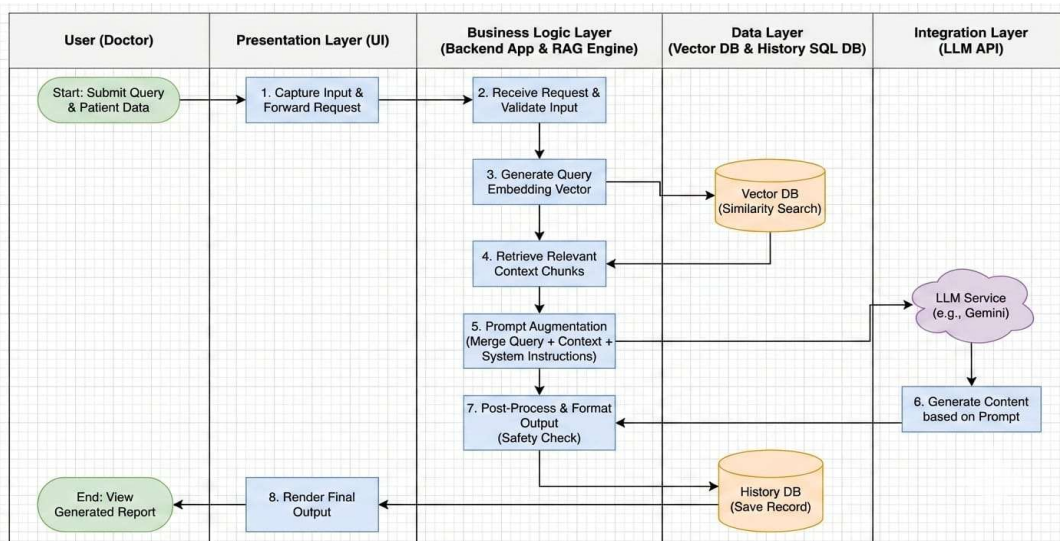
2.2.1 Project Architecture:



System Architecture Explanation:

- User Interface (Content Management Portal)**
 Healthcare professionals submit content requests and review generated medical content through a web-based portal.
- API Gateway & Request Routing**
 All user requests pass through an API gateway, which ensures secure communication, authentication, and proper routing to backend services.
- Application Server (Core Processing Unit)**
 The backend server handles request processing, manages workflow logic, and coordinates content retrieval, prompt preparation, and response handling.
- Context Retrieval from Document Repository**
 Relevant medical information is retrieved from a structured document repository using keyword search, metadata filtering, and document tagging instead of semantic vector search.
- Prompt Engineering & LLM Processing**
 The system combines the user query with retrieved medical content and sends a structured prompt to an LLM API (e.g., Google Gemini) to generate accurate healthcare content.
- Content Post-Processing & Storage**
 The generated output is cleaned, formatted, and stored in a relational database along with metadata, logs, and version history.
- Human Validation & Content Delivery**
 Medical experts review the generated content to ensure accuracy and safety before the approved content is delivered to the user.

2.2.2 Project Workflow



Medical Report Generation Workflow

- **Doctor Inputs Patient Data**
The doctor enters patient details such as symptoms, diagnosis notes, vitals, and medical history into the system.
- **Streamlit UI Validates Input Fields**
The Streamlit interface verifies that all required fields are filled and checks for valid data formats before processing.
- **generate_medical_report() Function is Triggered**
Once validation is complete, the system calls the report generation function to start the processing workflow.
- **LangChain Prompt Template is Applied**
Patient data is inserted into a predefined prompt template to structure the input for the language model and ensure consistent medical formatting.
- **Gemini LLM Generates Structured Report**
The prompt is sent to the Gemini Large Language Model, which generates a well-structured medical report including observations, diagnosis summary, and recommendations.
- **Report Returned to the User Interface**
The generated report is sent back to the Streamlit UI for display.
- **Report Saved in JSON History**
The system stores the generated report in JSON format to maintain

2.3 Tools & Technologies Used :

- **Frontend: Streamlit, HTML, CSS**
Used to create the user interface where the doctor enters patient details, views reports, and downloads them.
- **Backend: Python**
Handles application logic, processes inputs, manages report generation, and stores report history.
- **AI Framework: LangChain + Google Gemini API**
LangChain structures the prompt and manages LLM interaction, while Gemini generates the structured medical report.

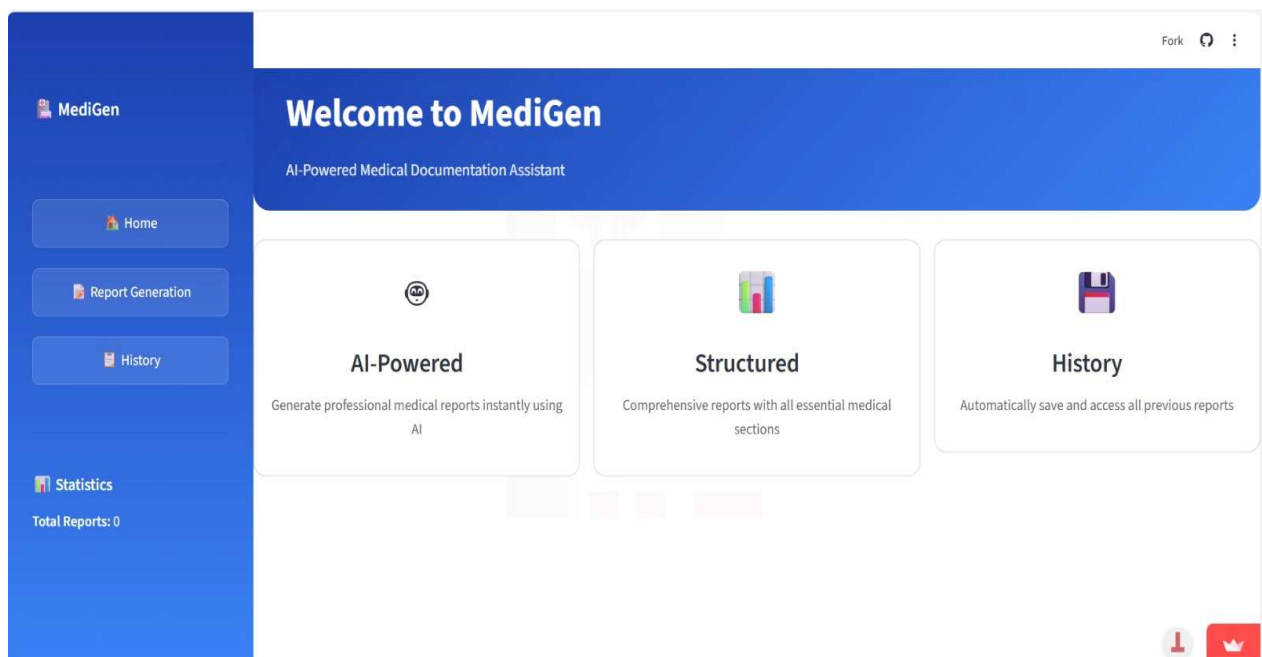
Streamlit handles the UI, Python manages logic & workflow, and LangChain with Gemini generates the AI medical report.

3.Results and Outputs:

3.1 Screenshots/Outputs

(a) Homepage


The MediGen home screen serves as the main dashboard of the AI Medical Report Generator. The left sidebar allows users to navigate between Home, Report Generation, and History, while also displaying report statistics. The top banner welcomes users and identifies the system as an AI-powered medical documentation assistant. Feature cards highlight key capabilities such as automated report generation, structured medical documentation, and report history storage. Overall, the interface is clean, professional, and designed for easy navigation and quick access to system features.



(b) Report Generation

This screen shows the Report Generation page of the MediGen system, where doctors enter patient details to create a medical report. The form collects essential information such as patient age, gender, primary symptoms, doctor specialty, and visit type. After filling in the details, the doctor clicks the Generate Report button to create a structured medical report using AI. The layout is simple and organized, ensuring quick data entry and efficient report generation.

Fork  

 **Generate New Medical Report**

Age

45

Gender

Female




Primary Symptoms

fever, cold and cough

Doctor Type / Specialty

General Physician




Report Type

Initial Consultation



 Generate Report

(c) Results

This screen displays the generated medical report after the doctor submits patient details. A success message confirms that the report has been created. The system presents a structured report including patient information, symptoms, clinical assessment, prescribed medications, lifestyle advice, precautions, and follow-up plan. The report is formatted professionally for easy reading and clinical use. At the bottom, a download option allows the doctor to save the report for records or sharing.

Report generated

Medical Report: Initial Consultation

Date of Visit: February 22, 2020 Patient Details: 45 years old, Female Specialist: General Physician Visit Type: Initial Consultation Mode of Visit: In person Referral Source: Self

Chief Complaint: Patient presents with a 5-day history of fever, cold, and cough. Fever is intermittent, peaking at 38.5°C, relieved by paracetamol. Cold symptoms include nasal congestion and clear rhinorrhea. Cough is non-productive, mild to moderate, and more frequent in the evenings. Symptoms are impacting sleep and daily activities.

Present Condition: Clinical assessment reveals a generally well-appearing female, no acute respiratory distress. Vital signs are stable. Oropharynx is mildly erythematous. Lungs are clear to auscultation bilaterally. No lymphadenopathy noted. Symptoms are consistent with a common viral upper respiratory infection (URI). Current severity is moderate.

Medication Prescribed:

- Paracetamol 500mg: 1 tablet orally every 6-8 hours as needed for fever/body aches.
- Dextromethorphan HBr 15mg/5ml Syrup: 10ml orally 3 times daily for cough.
- Saline Nasal Spray: 2 sprays in each nostril 3 times daily for congestion.

Lifestyle Modifications for Recovery:

- Dietary:** Maintain good hydration with warm fluids (water, herbal teas, broth). Avoid cold or sugary drinks.
- Physical Activity:** Ensure adequate rest. Avoid strenuous activities.
- Sleep:** Aim for 7-9 hours of sleep. Elevate head slightly to ease congestion.
- Stress Management:** Practice relaxation techniques.
- Habit Modifications:** Avoid smoking and minimize exposure to irritants like strong perfumes.

Future Precautions:

- Immediate:** Avoid close contact with others to prevent spread. Practice frequent hand hygiene.
- Warning Signs:** Seek immediate medical attention if experiencing difficulty breathing, chest pain, persistent high fever (>39°C), or worsening cough/symptoms.
- Prevention:** Continue good hand hygiene. Consider annual influenza vaccination.

Required Tests/Investigations:

No immediate investigations are required at this time, as symptoms are consistent with a common viral illness.

Follow-up Plan:

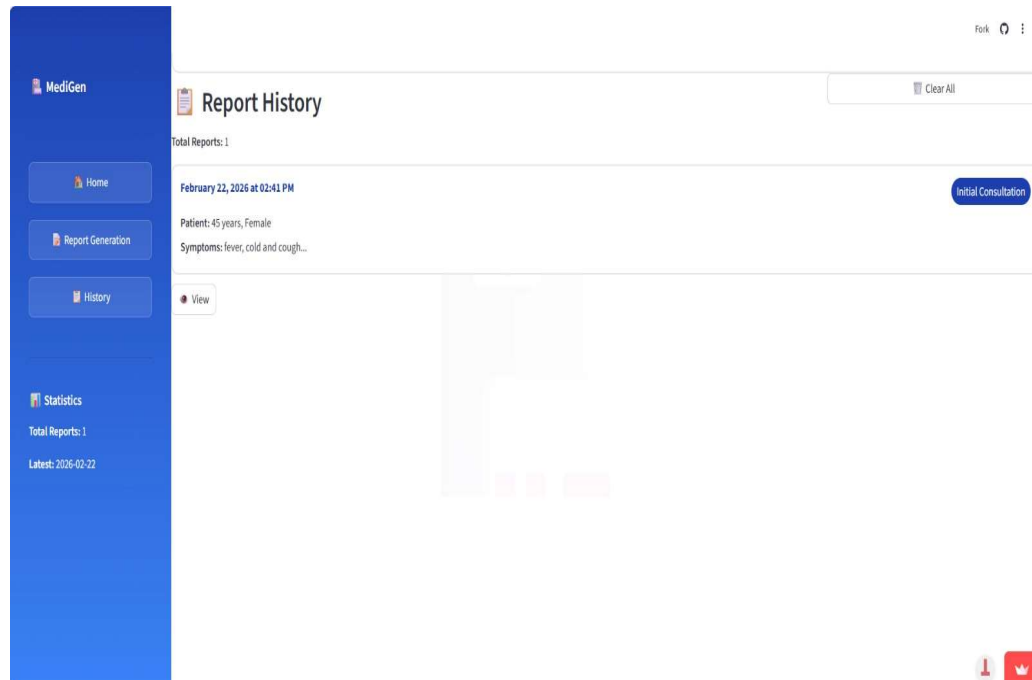
- Next Visit:** Return for follow-up in 3-5 days if symptoms do not improve or worsen.
- Emergency Contact:** Contact the clinic during office hours for urgent concerns.

Additional Notes: This appears to be a self-limiting viral infection. Symptomatic relief and rest are key to recovery. Please complete the prescribed medications and follow lifestyle advice.

Download

3. 2 History Dashboards

This screen shows the Report History section of the MediGen system. It stores previously generated medical reports for easy access and record keeping. Each entry displays the date and time, patient details, and primary symptoms, along with a label indicating the consultation type. Users can click View to open the full report. The sidebar also provides quick navigation and basic statistics such as total reports and latest activity, helping doctors track past consultations efficiently.



3.3 Key Outcomes:

- **Automated Medical Report Generation**
The system successfully generates structured medical reports automatically from patient symptoms and basic details, reducing manual documentation effort.
- **Time Efficiency for Healthcare Professionals**
Doctors can create professional reports within seconds, significantly reducing paperwork time and improving workflow efficiency.
- **Standardized Medical Documentation**
Reports follow a consistent format including patient details, clinical observations, medications, precautions, and follow-up plans, ensuring uniform documentation.
- **Specialty-Based Report Customization**
Reports are generated from the perspective of different medical specialists (e.g., cardiologist, dermatologist), improving clinical relevance.
- **Improved Patient Understanding**
Reports include clear language, lifestyle guidance, and precautions, helping patients better understand their condition and care instructions.

- **Report History & Record Management**

The system stores generated reports in JSON format, allowing easy retrieval, review, and record keeping.

- **User-Friendly Interface**

The Streamlit-based interface enables easy data entry, report viewing, and downloading without technical expertise.

- **Scalable AI-Powered Solution**

The integration of LangChain and Gemini LLM demonstrates how AI can be used to automate healthcare documentation and can be extended for hospital systems.

4.Conclusion:

The **MediGen AI Medical Report Generator** successfully demonstrates how artificial intelligence can streamline healthcare documentation by automatically converting basic patient inputs into structured, professional medical reports. The system reduces the time doctors spend on manual writing while ensuring clarity, completeness, and consistency in clinical documentation. By capturing symptoms, patient details, and consultation type, the application generates well-organized reports that are easy for both healthcare professionals and patients to understand, thereby improving communication and overall care quality.

The project integrates a user-friendly **Streamlit** interface with a Python-based backend, leveraging **LangChain** and the **Google Gemini LLM** to generate accurate and specialty-specific reports. Additionally, the report history feature enables secure storage and retrieval of past consultations, supporting effective record management and continuity of care. The standardized report format enhances accuracy and organization, while the scalable architecture highlights the practical potential of AI-driven solutions in modern healthcare workflows, making the system a valuable tool for improving efficiency and documentation standards.

5.Future Scope and Enhancements:

- **Integration with Hospital Management Systems (HMS)**

The system can be integrated with hospital databases to automatically retrieve patient records and store generated reports, reducing manual data entry.

- **Voice Input & Speech Recognition**

Adding speech-to-text functionality would allow doctors to dictate symptoms and notes, making the system faster and hands-free.

- **Multi-language Report Generation**

Future versions can support multiple languages such as Hindi and other regional languages to improve patient understanding and accessibility.

- **Cloud Storage & Secure Authentication**

Implementing cloud-based storage with user authentication will enable secure access, backup, and sharing of reports across devices and locations.

- **AI-Based Clinical Decision Support**

The system can be enhanced to provide risk alerts, possible diagnosis suggestions, and early disease detection support based on symptoms and history.

- **Electronic Prescription & Digital Signature**

Integration of e-prescriptions with digital signatures would allow doctors to generate legally valid prescriptions.

- **Mobile App Version**

Developing an Android/iOS mobile application would improve accessibility and usability in remote or emergency healthcare settings.