Medical Chatbot for Disease Suggestions and Precautions Using LLM and RAG Models

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**Abstract**

The increasing burden on healthcare systems necessitates innovative solutions for providing accessible and accurate medical guidance. This project presents a medical chatbot leveraging Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG) models to offer disease suggestions and precautionary measures based on user-inputted symptoms. The chatbot uses relevant medical knowledge , processes it using AI, and delivers informative responses to users. By integrating AI-driven medical insights with user-friendly interfaces, this chatbot enhances healthcare accessibility and reduces dependency on overburdened medical professionals.

**1.Problem Statement:**

With the increasing burden on healthcare systems worldwide, patients often face difficulty accessing timely medical advice. Many suffer from minor ailments that do not require immediate professional intervention but still need guidance. A chatbot leveraging advanced language models (LLMs) and retrieval-augmented generation (RAG) can provide disease suggestions and precautionary measures based on symptoms, offering users quick and reliable information while reducing pressure on healthcare providers.

**2. Market/Customer/Business Need Assessment**

**Market Analysis**

* **Global Healthcare AI Market**: Estimated to grow at a CAGR of 40% over the next five years, driven by increased AI adoption in diagnostics and patient engagement.
* **Chatbot Market**: AI-driven healthcare chatbots are expected to reach a market size of $3.2 billion by 2027.
* **Competitive Landscape**: Current players include WebMD, Ada Health, and Babylon Health. Our chatbot differentiates itself by integrating LLM and RAG models for more accurate and context-aware responses.

**Customer Segmentation**

* **General Public**: Individuals seeking quick medical advice on symptoms and health concerns.
* **Healthcare Institutions**: Hospitals and clinics looking to automate patient engagement and reduce workload.
* **Pharmaceutical Companies**: Organizations interested in AI-based patient support and adherence programs.
* **Telemedicine Providers**: Companies offering remote consultations that can integrate the chatbot for preliminary diagnosis.

**3. Target Specifications and Characterization**

**Customer Characteristics**

* **Accessibility**: The chatbot should be easily accessible via mobile apps, web platforms, and voice assistants.
* **Health Awareness Levels**: Suitable for both health-conscious individuals and those unfamiliar with medical terminologies.
* **Ease of Use**: Requires an intuitive, conversational interface with minimal learning curve.

**Functional Specifications**

* **Symptom Analysis**: Users enter symptoms, and the chatbot suggests possible conditions.
* **Precautionary Measures**: Provides preventive steps for detected symptoms.
* **Emergency Alerts**: Notifies users when symptoms indicate a severe condition requiring immediate medical attention.

**Business Model:**

**User Interaction**: The chatbot receives inputs like symptoms or health concerns.

**Input Processing**: The chatbot processes the input and provides suggestions based on symptom patterns and medical guidelines.

**Return Suggestions**: The chatbot returns precautionary advice or recommendations to the user, potentially with a disclaimer that it's not a substitute for professional medical advice.

**Final Product type:**

**1. Input:**

* **Input Query**: User provides symptoms, health concerns, or other relevant information.

**2. User Inputs Symptoms/Health Details**

* User enters symptoms (e.g., headache, fever, fatigue, etc.) or general health queries.

**3. Chatbot Processes Input for Suggestions**

* **Symptom Analysis**: The chatbot uses predefined rules or AI models to analyze symptoms and understand the user's concern.
* **Cross-Referencing**: The chatbot cross-references the input with a medical database or knowledge base to provide contextually relevant information.

**4. Return Precautionary Advice/Recommendations**

* The chatbot delivers precautionary advice or suggestions:
  + **For example**: "Drink plenty of fluids", "See a doctor", "Rest and monitor symptoms".

User Inputs Symptoms/Health Details

(E.g., Fever, Headache, Fatigue)

Chatbot Processes Input for Suggestions Precautions

- Analyzes symptoms - Cross-references health data - Identifies possible precautions

Return Precautionary Advice/ Recommendations

"Drink fluids and rest"

"Monitor symptoms for 24 hours"

"Consult a doctor if symptoms worsen"