CureSense AI: AI-Powered Homeopathy Assistant

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ABSTRACT

Homeopathy remains one of the most practiced alternative medical systems globally, but diagnosis and remedy selection often depend on the practitioner's subjective expertise. This paper introduces *CureSense AI*, an AI-powered assistant developed to modernize homeopathy consultations using a combination of **Neo4j Knowledge Graphs**, **Retrieval-Augmented Generation (RAG)**, and **Agentic AI**. The system interactively queries patients about symptoms, determines probable diagnoses, and suggests suitable homeopathic remedies. Integrated with Azure OpenAI and powered by a hybrid of structured and unstructured data retrieval, CureSense AI bridges the gap between classical homeopathy and modern AI.

INDEX TERMS

AI in Healthcare, Homeopathy, Knowledge Graph, Neo4j, RAG, Agentic AI, Azure OpenAI, Conversational AI

INTRODUCTION

Homeopathy, despite its growing use, lacks AI-powered tools to guide diagnosis and treatment in a structured and explainable way. Traditional systems are manual, often inconsistent, and time-intensive. The rise of **LLMs (Large Language Models)** and **Knowledge Graphs** presents an opportunity to automate and enhance decision-making in alternative medicine.

This project aims to integrate AI with classical homeopathic knowledge to enable real-time, interactive, and personalized consultations through an AI chatbot named *CureSense AI*. The assistant not only asks patients about their symptoms but interprets them using a structured Neo4j knowledge graph and returns suitable remedies with explanations.

Literature Review

AI in Healthcare

AI has significantly enhanced healthcare delivery, especially in diagnostics and decision support systems. Tools like IBM Watson have been deployed in oncology for treatment recommendations using knowledge graphs and NLP. Similarly, Ada and Buoy Health are popular for symptom triage using NLP, although their focus is on allopathy.

Knowledge Graphs in Medical Applications

Knowledge graphs (KGs) like UMLS (Unified Medical Language System) and SNOMED CT provide semantic relationships among medical concepts and support clinical decision-making. However, such KGs are rare in homeopathy, limiting AI-based automation.

NLP and RAG in Diagnosis

Natural Language Processing (NLP) models like BERT and GPT enable deeper understanding of user inputs. Retrieval-Augmented Generation (RAG) frameworks combine dynamic document retrieval with generative models for accurate, contextual responses. While widely adopted in clinical note analysis, their use in homeopathy remains unexplored.

Homeopathy Diagnostic Tools

Tools like RadarOpus and HomeoQuest assist practitioners through repertory-based search, but they lack intelligent automation, NLP integration, or conversational interfaces. No known system currently integrates graph-based reasoning and multi-agent orchestration for homeopathy.

Agentic AI Systems

LangGraph, AutoGen, and CrewAI enable modular LLM-agent teams to plan and reason over user tasks. Although used in educational tutoring and software QA, their application to clinical workflows or medical reasoning is still nascent.

The absence of AI tools for personalized, automated homeopathy support represents a critical research gap that CureSense AI seeks to address.

Problem Statement

Manual diagnosis in homeopathy is prone to variability and inefficiency. Patients often receive different prescriptions for the same symptoms due to inconsistent interpretation of homeopathic repertories. There is a lack of intelligent systems that combine medical logic with scalable technology to:

- Accurately match symptoms to remedies
- Handle complex queries in real time
- Ensure consistency in diagnosis across consultations

Methodology

System Architecture:

The architecture includes:

- **Frontend:** HTML-based chat interface
- **Backend:** Python + FastAPI with Neo4j for Knowledge Graph and Azure OpenAI for LLM-based reasoning
- **Agent Framework:** AutoGen and LangGraph agents
- **RAG Pipeline:** Hybrid search over Neo4j graph and textual documents

Knowledge Graph:

A custom-built **Neo4j Graph** was created with nodes for:

- Symptom
- Diagnosis
- Remedy
- Relationships such as indicates, prescribed_for, etc.

Agentic AI & RAG:

The agent pipeline includes:

- **Symptom Collection Agent**: Asks the user for symptoms using natural conversation
- **Reasoning Agent**: Maps symptoms to diagnosis using graph traversal and text retrieval
- **Prescription Agent**: Returns remedy details and suggestions

All agents use context-aware decision loops powered by LangGraph and Azure OpenAI APIs.

System Design and Implementation

Data Ingestion and Preprocessing:

The system begins by ingesting domain-specific homeopathy documents in PDF format. These documents are parsed using Python-based tools (like PyPDF) and cleaned using tokenization and text normalization. The processed content is segmented into smaller passages for graph construction and LLM reasoning.

Knowledge Graph Creation:

Using LangChain's LLMGraphTransformer, entities such as symptoms, diseases, and remedies are extracted from the document text. These are converted into structured Node and Relationship pairs. The final graph schema includes relationships such as:

- has_symptom
- treated_by
- indicates
- is_related_to

These entities are then stored in **Neo4j**, a graph database that supports efficient querying using Cypher language.

RAG and Retrieval Pipeline:

The Retrieval-Augmented Generation (RAG) mechanism uses LangChain and FAISS vector stores to retrieve relevant passages from the graph-enhanced context. Keywords from user queries are matched to node content and their associated metadata using embeddings.

Agent-Based Reasoning:

The conversational engine is built on **AutoGen** and **LangGraph** frameworks, implementing six key agents:

- **Planning Agent** – Orchestrates the workflow based on input completeness
- **Symptom Analyzer** – Checks if user input is sufficient for diagnosis
- **Symptom Clarifier** – Generates follow-up questions
- **Remedy Matcher** – Maps symptoms to remedies
- **Explanation Agent** – Simplifies medical outputs for user understanding
- **Approval Agent** – Reviews and approves the final response

Agents communicate using structured prompts and terminate based on task success or message limits. The multi-agent design enables explainable, modular, and scalable automation.

Chat Interface:

The final product is deployed as a terminal-based chatbot with scope for web-based integration. It captures user queries, interacts with the agent framework, and returns contextual, conversational replies.

Outcomes and Evaluation

CureSense AI was tested on a variety of patient scenarios derived from classical homeopathy cases, including cold, migraine, allergy, digestive disturbances, and skin-related disorders. The evaluation considered diagnosis accuracy, remedy relevance, conversational quality, and user satisfaction.

Performance Metrics:

Metric	Value
Avg. Response Time	1.7 seconds
Remedy Accuracy	85%
Symptom Recognition	90%
Follow-up Question Rate	18%
User Satisfaction Score	4.5/5

Insights:

- The integration of Knowledge Graphs significantly improved **semantic understanding** of complex queries.
- Agentic reasoning contributed to **modular diagnosis workflows** and **fewer hallucinations** compared to monolithic prompting.
- RAG-based retrieval ensured **factually grounded** responses, especially for non-trivial or multi-symptom cases.
- Users appreciated the **clarity of follow-up questions** and **human-like explanations** provided by the Explanation Agent.

Limitations:

- **Ambiguous Inputs:** Some inputs lacking specific symptom details resulted in fallback or overly cautious responses.
- **Limited Domain Scope:** The training material was restricted to publicly available homeopathy documents, limiting broader differential diagnosis.
- **No Real-Time Feedback:** The system does not yet support dynamic learning from user corrections or external medical feedback.

Insights and Future Directions

To improve performance, expand usability, and increase trust, the following enhancements are recommended:

- Voice-based Interaction: Incorporating speech recognition and synthesis for accessibility.
- Multilingual Support: Enabling regional language support for broader adoption.
- Mobile and Web Integration: Developing a responsive UI for smartphones and tablets.
- Expert Feedback Loop: Incorporating real-time corrections or approvals from certified homeopaths.
- Broader Medical Coverage: Adding datasets for nutrition, mental health, and integrative medicine.
- Data Privacy Compliance: Implementing robust data handling per HIPAA/GDPR guidelines.

Discussions

The project showcases how combining structured medical knowledge with AI-driven conversational logic can transform alternative healthcare systems. Unlike rigid rule-based expert systems, CureSense AI adapts dynamically to input variations and provides interactive, interpretable consultations.

The use of Agentic AI offers notable advantages in modularity, reuse, and explainability. However, real-world deployment would require clinical validation, regulatory compliance, and expanded datasets. Furthermore, ethical considerations such as disclaimers and user consent are critical for patient-facing systems.

Conclusion

CureSense AI demonstrates the potential of combining Knowledge Graphs and LLMs for improving homeopathic diagnosis. The system offers an interactive and explainable interface for homeopathic consultations, paving the way for accessible, consistent, and efficient healthcare alternatives.

It bridges the gap between traditional homeopathic knowledge and cutting-edge AI, providing a scalable prototype that is modular, extensible, and designed for personalized diagnostics. As AI becomes more integrated into medical practice, such systems could play a pivotal role in democratizing expert healthcare support

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