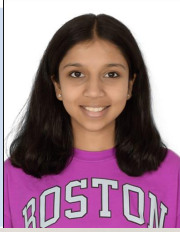




Agentic AI Hackathon: Building Intelligent Agents with IBM Granite and LangFlow

Team Name: MedAI

Team Members

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Problem Statement 6: AI-Based Chronic Disease Monitoring Assistant

- Chronic patients generate large volumes of daily health data (glucose, BP, peak flow, medication logs).
- Continuous manual monitoring by healthcare professionals is not feasible due to time and resource constraints.
- Consequently, the early warning signs are often missed without continuous trend analysis.
- Delayed detection leads to late intervention, higher complication risks and poor disease management outcomes.

Proposed solution

- We propose an **AI-based chronic disease monitoring system** built using LangFlow and IBM Granite models.
- Patient health data such as blood glucose, blood pressure, peak flow readings, and medication logs are stored in **Astra DB**.
- An **embedding model** converts stored health records into vector representations to enable semantic retrieval.
- Relevant patient history is retrieved from the database based on incoming queries.
- The retrieved data is structured and passed as contextual input to the AI model.
- The **IBM Granite instruction-tuned model** analyzes health trends against predefined clinical thresholds.
- The system generates early risk alerts and personalized lifestyle recommendations (assistive and non-diagnostic).
- Outputs are delivered through an interactive chat interface for easy interpretation by patients or caregivers.

Need of project

- Chronic disease patients generate continuous health data that cannot be manually monitored in real time by healthcare professionals.
- Lack of continuous analysis leads to missed early warning signs and delayed medical intervention.
- Existing systems are mostly reactive and do not support proactive, day-to-day disease management.
- An AI-based system is needed to analyze health trends, provide early risk awareness, and support better long-term chronic disease management.

End user of project

- **Chronic Disease Patients**

Monitor daily health trends and receive early risk alerts and lifestyle guidance.

- **Healthcare Professionals (Doctors / Nurses)**

Get summarized health insights to support timely and informed interventions.

- **Caregivers & Family Members**

Track patient health status and receive alerts for potential risks.

- **Healthcare Organizations & Clinics**

Improve remote patient monitoring efficiency and reduce avoidable complications.

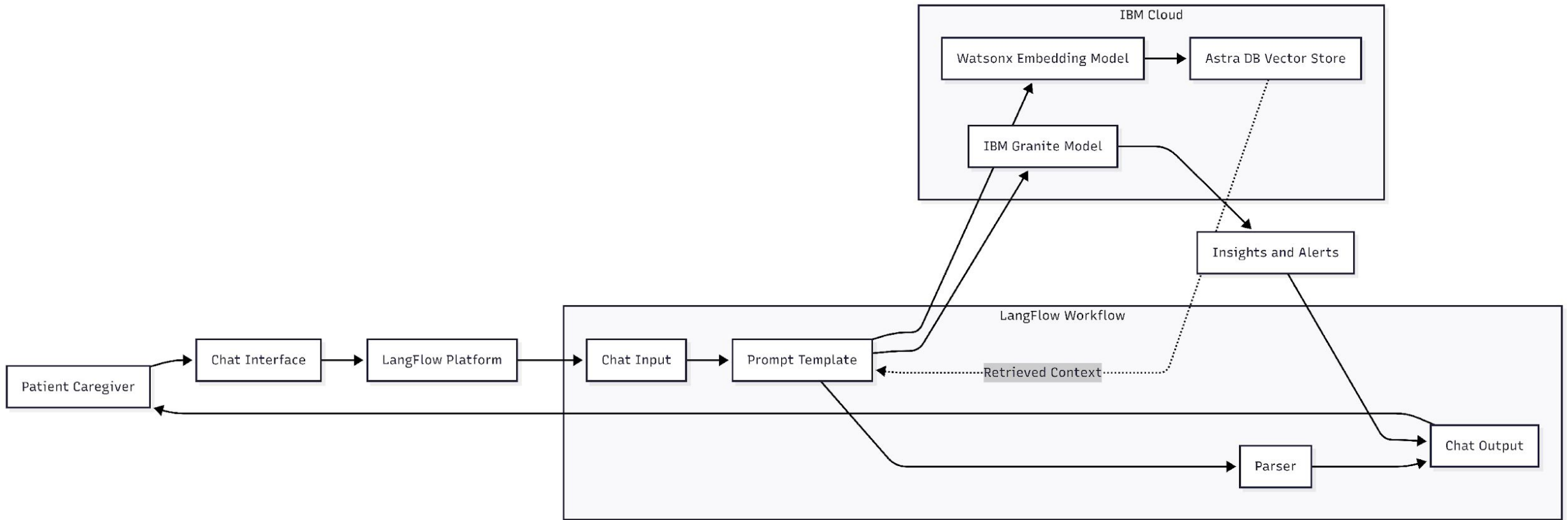
Technology Used

- **LangFlow Platform:** Used to design and orchestrate the AI workflow using components like Chat Input, Prompt Template, Parser, and Chat Output.
- **IBM [watsonx.ai](https://www.ibm.com/watsonx):** Provides foundation and embedding models for reasoning and response generation.
- **IBM Granite Model:** Instruction-tuned model - ibm/granite-3-8b-instruct
- **Retrieval-Augmented Generation (RAG):** Implemented using Astra DB and embedding-based semantic search to retrieve relevant health data as context.
- **IBM watsonx Embedding Model:** Converts patient records and medical content into vector embeddings for efficient retrieval.
- **Astra DB:** Stores vectorized health data and enables fast similarity search.
- **Text Processing Components:** URL Loader fetches external content, Split Text chunks data, and Parser structures retrieved information.
- **IBM Cloud:** Hosts watsonx services, models, and secure APIs.

Novelty and Uniqueness

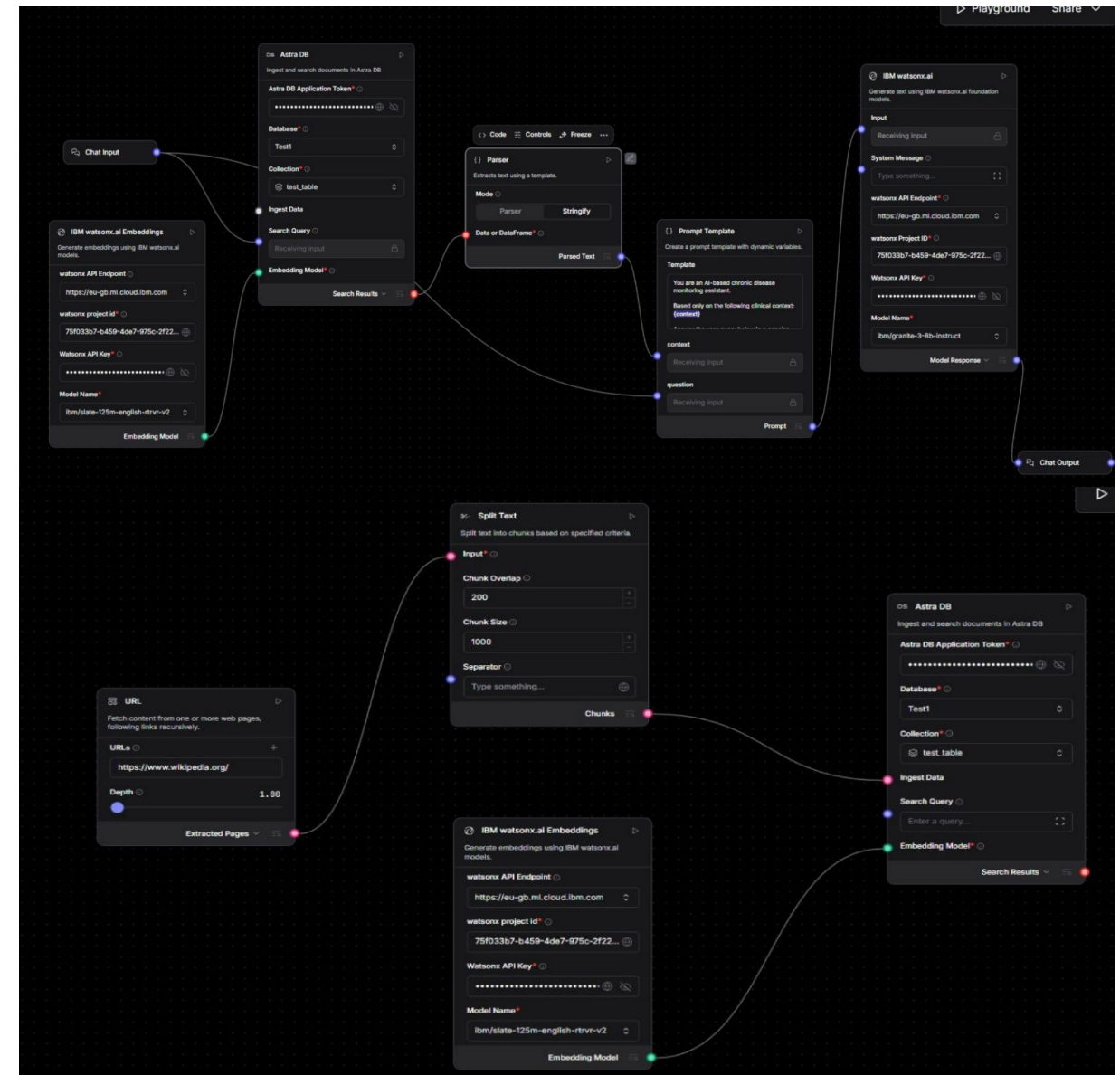
- Uses **AI-driven continuous health trend analysis** instead of one-time or manual monitoring.
- Applies **Retrieval-Augmented Generation (RAG)** to combine patient history with external medical knowledge for context-aware insights.
- Provides **early risk alerts and lifestyle recommendations** that are assistive and non-diagnostic.
- Integrates **LangFlow visual orchestration** with IBM Granite models for transparent and modular system design.
- Enables **personalized insights** based on individual patient data rather than generic health advice.

Technical flow diagram - Architecture blueprint



Langflow components Used

- **Chat Input:** Accepts user health queries and data.
- **IBM watsonx AI Agent / Model:** Uses Granite model to analyze data and generate responses.
- **File / Data Source Component:** Ingests patient data and reference content.
- **URL Loader:** Fetches external medical information.
- **Split Text:** Splits large documents into smaller chunks.
- **IBM watsonx Embeddings:** Converts text data into vector embeddings.
- **Astra DB:** Stores vectors and retrieves relevant health data.
- **Parser:** Structures retrieved data for model input.
- **Prompt Template:** Combines user query with retrieved context.
- **Chat Output:** Displays insights, alerts, and recommendations.



Input Screenshot 1

Playground

Chat

Default Session

Default Session

User

You are monitoring a patient with Type 2 Diabetes and Hypertension.

Here is the 14-day health log:

Fasting Blood Glucose (mg/dL):
Day 1-14:
118, 122, 128, 135, 142, 148, 152, 158, 165, 172, 178, 182, 188, 195

Blood Pressure (mmHg):
Day 1-14:
128/82, 130/84, 132/85, 134/86, 138/88, 140/90, 142/92, 145/94, 148/96, 150/98, 152/100, 155/102, 158/104, 160/106

Medication Adherence:
Missed doses on Day 5, Day 9, Day 12


Physical Activity:
Average steps declined from 7,000/day (Days 1-5) to 3,000/day (Days 10-14)





Task:

1. Identify short-term and long-term health trends
2. Detect any abnormal patterns or risk escalation
3. Generate early warning alerts if needed
4. Provide lifestyle and self-care recommendations (assistive only, non-diagnostic)
5. Reference relevant clinical thresholds or guideline logic when applicable

Send

Output Screenshot 1

 AI ibm/granite-3-8b-instruct



1. Short-term and long-term health trends:

- Fasting blood glucose levels have been gradually increasing over the 14-day period, indicating a potential worsening of diabetes control.
- Systolic blood pressure has been consistently higher than diastolic blood pressure, suggesting a possible rise in hypertension. Both systolic and diastolic blood pressure have increased over the 14 days.
- Physical activity has significantly decreased, which could contribute to worsening glycemic control and hypertension management.

2. Abnormal patterns or risk escalation:


- The patient has missed doses of medication on three occasions (Day 5, Day 9, Day 12), which may negatively impact disease management and increase the risk of complications.
- The sustained increase in fasting blood glucose levels and blood pressure readings could indicate a deteriorating condition if not addressed promptly.

3. Early warning alerts:

- Given the rising fasting blood glucose levels and blood pressure readings, it is crucial to monitor these values closely in the coming days to assess whether this trend continues or stabilizes.
- The missed medication doses should be reported to the healthcare provider for further guidance on managing adherence and potential adjustments to the treatment plan.

4. Lifestyle and self-care recommendations:

- Encourage regular monitoring of fasting blood glucose levels and blood pressure at home to track progress between clinic visits.
- Reinforce the importance of consistent medication adherence as prescribed by the healthcare provider, emphasizing that missing doses can lead to poor disease control and increased risks of complications.

 Send

on managing adherence and potential adjustments to the treatment plan


4. Lifestyle and self-care recommendations:

- Encourage regular monitoring of fasting blood glucose levels and blood pressure at home to track progress between clinic visits.
- Reinforce the importance of consistent medication adherence as prescribed by the healthcare provider, emphasizing that missing doses can lead to poor disease control and increased risks of complications.
- Recommend increasing physical activity gradually, aiming for at least 10,000 steps per day, as this can help improve glycemic control and lower blood pressure.
- Suggest incorporating regular meal planning with balanced portions focused on whole grains, lean proteins, fruits, vegetables, and healthy fats while limiting processed foods and added sugars to support better glycemic control.

5. Clinical thresholds or guideline logic:

- Fasting blood glucose levels above 130 mg/dL are generally considered indicative of poor glycemic control (American Diabetes Association). In this case, all readings are above this threshold during the observed period.
- Systolic blood pressure above 130 mmHg or diastolic above 80 mmHg is classified as stage 1 hypertension (American College of Cardiology/American Heart Association). Both systolic and diastolic readings have exceeded these thresholds during Days 13–14 of this log period.


Send a message...



Send

Input Screenshot 1

Default Session

 **User**

You are monitoring a patient with chronic asthma.

Here is the 10-day respiratory log:

Peak Flow Readings (L/min):
Day 1-10:
420, 415, 410, 405, 395, 380, 360, 340, 310, 280

Reported Symptoms:


- Nighttime coughing increased on Days 7-10
- Rescue inhaler usage increased to twice daily on Days 8-10 (previous baseline: once every 3 days)


Environmental Exposure:

- High air pollution levels reported on Days 6-10

Task:

1. Analyze short-term and long-term respiratory trends
2. Determine risk severity level
3. Identify potential trigger factors
4. Decide if an alert should be generated
5. Provide preventive and self-management guidance (assistive only, non-diagnostic)
6. Reference relevant asthma management thresholds or guideline logic when applicable

 **AI** ibm/granite-3-8b-instruct



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Output Screenshot 2

6. Reference relevant asthma management thresholds or guideline logic when applicable



AI ibm/granite-3-8b-instruct

1. Short-term and long-term respiratory trends: Over the 10-day period, there has been a noticeable decline in peak flow readings, indicating worsening airflow obstruction. The patient's symptoms have also intensified, with increased nighttime coughing and more frequent rescue inhaler usage.
2. Risk severity level: Given the significant decrease in peak flow readings and increased symptoms along with environmental triggers, this situation could be considered a moderate to high risk for asthma exacerbation.
3. Potential trigger factors: The primary triggers identified are increased air pollution levels and worsening symptoms, which may suggest an interaction between these environmental factors and the patient's underlying asthma condition.
4. Alert generation: Based on these observations, it would be prudent to generate an alert to inform the healthcare provider of the patient's deteriorating condition and potential exacerbation risk due to environmental factors.
5. Preventive and self-management guidance:
 - Encourage the patient to minimize exposure to high air pollution levels by staying indoors when possible or using an air purifier if available.
 - Advise adherence to their prescribed asthma action plan, including regular use of reliever medication as needed (more than twice daily) and taking controller medications consistently as directed by their healthcare provider.
 - Suggest maintaining a daily diary of symptoms, peak flow readings, rescue inhaler usage, and any potential triggers or exposures to share with their healthcare provider during follow-up appointments.



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5. Preventive and self-management guidance:
 - Encourage the patient to minimize exposure to high air pollution levels by staying indoors when possible or using an air purifier if available.
 - Advise adherence to their prescribed asthma action plan, including regular use of reliever medication as needed (more than twice daily) and taking controller medications consistently as directed by their healthcare provider.
 - Suggest maintaining a daily diary of symptoms, peak flow readings, rescue inhaler usage, and any potential triggers or exposures to share with their healthcare provider during follow-up appointments.
 - Remind the patient of proper inhaler technique to ensure optimal medication delivery and effectiveness.
 - Encourage regular physical activity within recommended guidelines but avoid strenuous exercise during periods of poor air quality or heightened symptoms without consulting their healthcare provider first.
6. Relevant asthma management thresholds or guideline logic: According to Global Initiative for Asthma (GINA) guidelines, a decrease in peak expiratory flow (PEF) by more than 20% from personal best indicates a need for increased treatment or intervention; however, since we only have relative values here, it is essential to consider other factors such as symptom severity and rescue inhaler usage frequency when assessing risk level and determining appropriate management strategies.



Send

Future Scope

- Integration with **real-time wearable and IoT devices** for continuous health monitoring.
- Support for **additional chronic conditions** beyond diabetes, hypertension, and asthma.
- Enhanced **predictive analytics** to forecast health risks before threshold breaches. Multilingual and voice-based interfaces for improved accessibility.
- Integration with **electronic health records (EHRs)** and hospital systems.
- Advanced personalization using long-term patient history and behavior patterns.
- Deployment of **mobile applications** for on-the-go monitoring and alerts.

GitHub Link

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Thank You!