

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

AI-Based Climate Risk Assessment for Agriculture

Name of the team: Deep Minds

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Problem statement

AI-Based Climate Risk Assessment for Agriculture

The Challenge

Climate variability significantly affects agricultural productivity through extreme weather events, shifting seasons, and unpredictable rainfall. Farmers and planners often lack tools to interpret climate data in an actionable manner. There is a need for an intelligent assistive system that can analyze climate trends and assess agricultural risk at a local level.

Climate & Crop Data Analysis Agent

An agent that processes historical climate data, seasonal forecasts, and crop calendars.

Climate Risk Detection Agent

An agent that identifies potential climate-related risks such as drought stress, heat waves, or excessive rainfall using trend analysis.

Advisory & Planning Assistant

An agent that provides climate-risk insights and adaptive planning suggestions
(assistive only).

Outcome

Enhances climate resilience planning and supports informed agricultural decision-making.

Mandatory Tech Stack

Lang Flow using IBM Granite Model

Proposed solution

We propose **Climate Risk Agent**, a **multi-agent AI system** built using **LangFlow**, **IBM Granite**, and **Retrieval-Augmented Generation (RAG)** to help users understand climate-related risks in agriculture.

The system:

- Uses a **multi-agent approach** instead of a single chatbot to improve clarity, reliability, and transparency.
- A **Climate Analyst Agent** interprets the user's query and understands the climate and crop context.
- A **Climate Risk Detection Agent** identifies potential risks such as delayed monsoon, excess rainfall, heat stress, or water-related issues.
- **RAG retrieves relevant information from trusted agricultural and climate policy documents**, ensuring that insights are grounded in real-world knowledge.
- An **Advisory & Planning Assistant** combines AI reasoning with retrieved knowledge to explain risks in a **simple, farmer-friendly, and assistive manner**.
- The system focuses on **climate risk awareness and explainability**, not direct recommendations.
- This ensures responses are **factual, easy to understand, responsible, and suitable for farmers, planners, and decision-makers**.

Need of project

- To **bridge the gap between farmers and scientific agricultural knowledge** by translating complex climate information into simple, understandable insights.
- To **support climate-resilient decision-making** by helping users identify and understand potential climate risks before they impact crops.
- To **reduce reliance on unreliable or fragmented online information** by offering a structured and consistent AI-based support system.
- To **promote sustainable and productive farming practices** by using AI to enhance awareness, preparedness, and long-term agricultural planning.

End user of project

- Farmers and agricultural communities
- Agricultural extension officers
- Policy makers
- Researchers and agronomists
- Agri-tech startups

Technology Used

1. IBM watsonx.ai & Granite Model

IBM watsonx.ai with the **IBM Granite foundation model** is used to understand agricultural and climate-related queries and generate **reasoned, explainable climate-risk insights**.

2. LangFlow

LangFlow is used to **design, visualize, and manage the AI workflow** by connecting language models, multiple agents, retrieval components, and output modules in a structured manner.

3. Retrieval-Augmented Generation (RAG)

The system uses **Retrieval-Augmented Generation (RAG)** to retrieve relevant information from **trusted agricultural guidelines, climate policy documents, and government resources**.

This ensures that AI responses are **grounded in real-world agricultural knowledge** and reduces the chances of incorrect or misleading outputs.

4. Multi-Agent Architecture

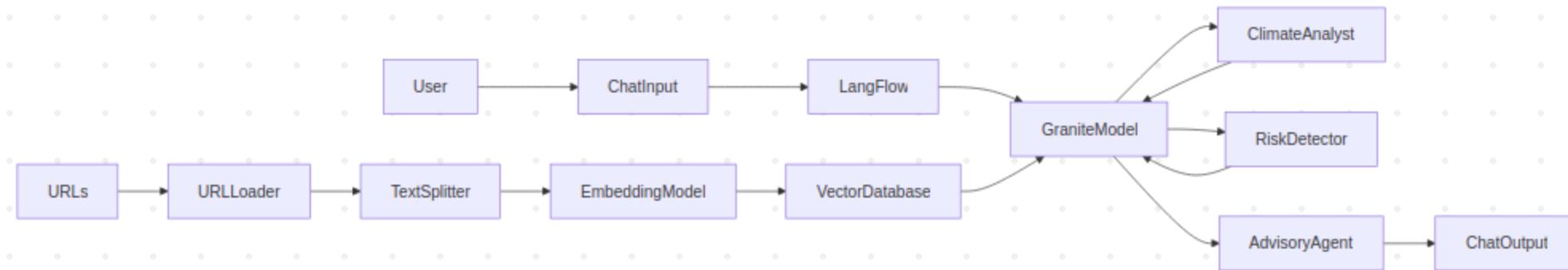
The system follows a **multi-agent approach**, where each agent has a specialized role:

- **Climate Analyst Agent** – interprets the climate context and user inputs.
- **Climate Risk Detector Agent** – identifies potential climate and crop-related risks.
- **Advisory & Planning Assistant** – combines AI reasoning with retrieved knowledge to explain risks using **climate-smart agriculture principles** in a simple, assistive way.

Novelty and Uniqueness

- Uses a **multi-agent AI architecture** to break down climate risk understanding into **clear, step-by-step and explainable stages**, rather than producing instant answers.
- Integrates **Retrieval-Augmented Generation (RAG)** to ground responses in **trusted agricultural guidelines and climate policy documents**, making insights more reliable and factual.
- Focuses on **climate risk awareness and understanding**, rather than generic question–answering or direct recommendations, making it more suitable for agriculture.
- Reduces AI hallucinations by **separating analysis, risk detection, and advisory roles** across specialized agents and supporting them with retrieved knowledge.
- Designed specifically for the **agricultural domain**, addressing crop- and climate-related challenges rather than acting as a general-purpose chatbot.
- Built using **visual AI orchestration (LangFlow)**, improving transparency, traceability, and interpretability of the system.
- Scalable to support **multiple crops, regions, languages, and policy sources** in future extensions.

Technical flow diagram - Architecture blueprint



Langflow component Used

1. User Query

- The farmer or user asks a question related to climate conditions or agricultural concerns.

2. LangFlow Chat Input

- The query enters the system through the **LangFlow interface**, which manages the interaction and routes the input to the AI agents.

3. Multi-Agent Processing

- The query is processed by specialized AI agents:

Climate Analyst Agent – interprets the climate and crop context from the user's query.

Climate Risk Detector Agent – identifies potential climate and crop-related risks.

4. IBM watsonx.ai (Granite Model)

- The **IBM Granite foundation model** powers the reasoning process by analyzing the inputs from the agents and generating **explainable climate-risk insights**.

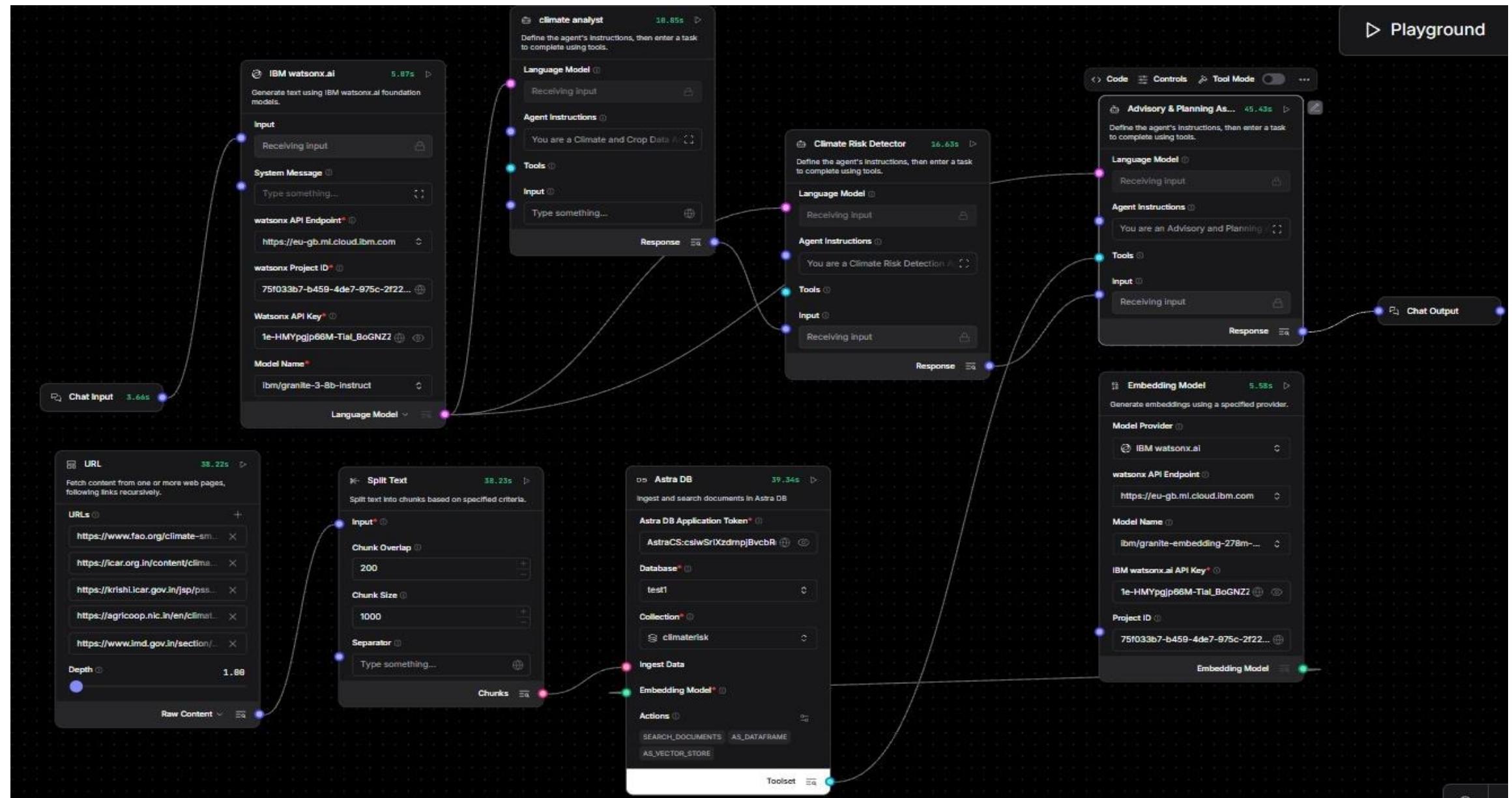
5. Advisory & Planning Assistant

- The system presents **assistive, non-prescriptive planning insights** based on climate-smart agriculture principles.

6. Chat Output

- The final, human-readable response is delivered to the user in a clear and understandable format.

Workflow Diagram



Input 1:



User

which should i grow rice or maize when 20 inch avg rain ?

Output 1:



AI Agent



✓ Finished

< 0.1s

'NoneType' object has no attribute 'embed_documents'

Adaptive Suggestions

1. **Water Management:** Implement efficient irrigation techniques such as drip irrigation to conserve water and ensure optimal moisture levels for maize plants. Consider rainwater harvesting and micro-irrigation systems to supplement water supply during dry spells.
2. **Heat-Tolerant Varieties:** Promote the use of maize varieties that exhibit higher tolerance to heat stress. Collaborate with agricultural research institutions to identify and disseminate suitable varieties adapted to local conditions.
3. **Optimal Planting Times:** Adjust planting dates based on historical weather data and seasonal forecasts to avoid the most critical heat periods, potentially shifting planting slightly earlier in the season if conditions permit.
4. **Shade Nets:** Utilize shade nets during peak summer months to reduce direct sunlight exposure and lower canopy temperature, thereby mitigating heat stress effects on maize plants.
5. **Crop Diversification:** Encourage farmers to diversify their cropping patterns by integrating drought-resistant or complementary crops that can coexist with maize, reducing overall risk exposure in case of extreme climate events impacting Mandya region specifically

Precautionary Measures:

1. **Weather Monitoring Systems:** Strengthen local weather monitoring networks and provide farmers with access to accurate, timely weather forecasts through mobile applications or SMS alerts for better decision-making regarding planting and irrigation scheduling post-monsoon transitions specifically in Mandya region
2. **Early Warning Systems (EWS):** Develop or improve existing Early Warning Systems (EWS) for droughts and heatwaves specific to Karnataka's agricultural zones, enabling proactive measures before severe climate events occur impacting Mandya region specifically
3. **Insurance Support Systems:** Enhance crop insurance schemes tailored for climate risks such as delayed monsoons and rising temperatures, ensuring financial safety nets for farmers facing yield losses due to uncontrollable climate factors impacting Mandya region specifically

Input 2:



User

The monsoon is late this year and I've already prepared my land. Should I be worried about my maize crop?



Output 2:

The screenshot shows a dark-themed user interface for an AI Agent. At the top left is a small icon of a briefcase. Next to it, the text "AI Agent" is displayed. On the right side of the header are several small, light-colored icons: a pen, a square, a triangle, and a circle. Below the header, a green checkmark icon is followed by the word "Finished". To the right of this, the text "< 0.1s" is shown next to a downward-pointing arrowhead. The main content area contains the error message "'NoneType' object has no attribute 'embed_documents'" in white text. Below this, the section title "Adaptive Suggestions" is displayed in bold black text. A numbered list of five items follows, each starting with a bolded section title and providing a detailed explanation of a specific agricultural practice.

Adaptive Suggestions

- Delayed Planting:** Given the late monsoon, consider delaying maize planting until soil moisture conditions improve or supplement with irrigation if natural rainfall is insufficient for seed germination and early growth stages.
- Soil Moisture Monitoring:** Use simple soil moisture monitoring tools (e.g., tensiometers, soil water probes) to guide irrigation decisions, ensuring you apply water efficiently without over-saturation that could lead to root diseases or nutrient leaching.
- Water Conservation Techniques:** Implement water conservation techniques such as mulching to reduce evaporation losses and maintain soil moisture for longer periods, especially beneficial during the critical early growth stages of maize when it's most vulnerable to drought stress.
- Drought-Tolerant Varieties:** If the delay persists and irrigation resources are limited, prioritize drought-tolerant maize varieties recommended by local agricultural research institutions or extension services in Karnataka. These varieties have been bred to perform better under water-scarce conditions.
- Intercropping/Relay Cropping:** Explore intercropping or relay cropping systems where feasible, combining maize with other crops that have different water requirements or growth durations, thus optimizing land use and reducing overall risk exposure due to unpredictable monsoon patterns.

Precautionary Measures:

- 1. Weather Forecasting & Alerts:** Stay vigilant on weather forecasts and consider subscribing to localized agricultural advisories from Karnataka's Department of Agriculture for updates on monsoon progression and any potential shifts in rainfall patterns that might affect your planting timeline or irrigation needs later in the season.
- 2. Disease Management Plans:** Develop or adhere strictly to a disease management plan focusing on early detection and control of fungal diseases (like downy mildew) which can thrive in warm, humid conditions exacerbated by delayed rains; regular field inspections are crucial alongside timely application of appropriate fungicides as per Integrated Pest Management (IPM) strategies recommended by local experts.
- 3. Insurance Support Systems:** Review your crop insurance policies to ensure coverage against potential yield losses due to late monsoons; engage with insurance providers early if additional coverage is needed beyond standard policies that may not account for delayed planting due to weather anomalies like this year's situation in Mandya region specifically.
- 4. Capacity Building & Extension Services:** Engage actively with local extension services for ongoing guidance tailored to Mandya's unique climate patterns; they can provide insights into successful practices employed by other farmers facing similar delayed monsoon challenges during maize cultivation cycles

Future Scope

- Multilingual support for farmers (Kannada, Hindi, etc.)
- Integration with real-time weather APIs
- Mobile app for farmers
- Personalized crop advisory using location data
- Integration with government agricultural portals
- Autonomous AI agents for crop monitoring

Git Hub Link

<https://github.com/chandanabp14/ClimateRiskRag>

References

- IBM.

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<https://www.ibm.com/products/watsonx-ai>

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IBM Granite Foundation Models.

<https://www.ibm.com/artificial-intelligence/foundation-models>

- IBM Watsonx Documentation.

LangFlow with watsonx.ai Integration.

<https://www.ibm.com/docs/en/watsonx>

- FAO Climate-Smart Agriculture Guidelines

- Government of India Agricultural Policy Documents

- LangChain & LangFlow Documentation

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Thank You!

Thank you for your time and interest.