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# CAPSTONE PROJECT

## PROBLEM STATEMENT NO.6: ECO LIFESTYLE AGENT

**Presented By:**

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# OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

# PROBLEM STATEMENT

- An Eco Lifestyle Agent, powered by RAG (Retrieval-Augmented Generation), empowers users to adopt a greener lifestyle through personalized, practical suggestions. It retrieves sustainable living tips, eco-friendly product recommendations, local recycling guidelines, and government schemes from trusted environmental sources. Users can ask natural language questions such as “How can I reduce plastic use at home?” or “What are eco-friendly travel options in my city?” and receive instant, actionable guidance. The agent promotes small daily actions with big environmental impact, making sustainability easy and accessible. This AI-driven assistant fosters eco-conscious decisions, raises awareness, and helps build a more sustainable future.

# PROPOSED SOLUTION

- The proposed system aims to promote sustainable living by providing personalized eco-lifestyle suggestions through an AI-powered agent. The solution leverages Langraph (an agentic AI platform) and IBM Cloud services to offer real-time, context-aware environmental guidance. The system comprises the following components:
- **Data Collection:**
  - Retrieve eco-related data from trusted sources such as sustainability guidelines, green living blogs, environmental APIs, and governmental data. Collect user preferences and behavioral patterns to tailor the suggestions effectively.
- **Data Processing:**
  - Structure and refine the collected data using retrieval techniques to ensure relevance and clarity. Perform entity extraction and context linking to enable the AI to understand user queries more naturally.
- **AI Agent (Langraph):**
  - Implement a Retrieval-Augmented Generation (RAG) agent using Langraph to deliver personalized responses. The agent uses dynamic memory and retrieval tools to align responses with current environmental best practices, user input, and local contexts.
- **Deployment:**
  - Deploy the AI agent through IBM Cloud's Deployment Space. Use secured API endpoints for interaction, enabling integration with applications or websites. No manual frontend coding (HTML/CSS) is required, as the deployment is handled entirely through the platform.
- **Evaluation:**
  - Evaluate the system based on response accuracy, relevance of suggestions, and user engagement. Continuously monitor system behavior and fine-tune the retrieval modules to maintain the quality and personalization of recommendations.
  - Result: The deployed agent provides actionable, eco-friendly suggestions to users in real-time, encouraging sustainable lifestyle choices and contributing to environmental awareness.

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# SYSTEM APPROACH

**Tool Used:** Langraph (IBM Agentic AI tool) for creating the core AI agent

**Platform:** IBM Cloud – used for model deployment and API management

**Authentication:** IAM token generated via API key for secure access

**AI Model:** Retrieval-Augmented Generation (RAG) agent providing personalized eco-lifestyle suggestions

**Integration:** API endpoint (RESTful) connects user input to deployed agent

**Interaction:** Multi-language user queries processed and responded to via the deployed agent

**Deployment:** Handled through IBM Cloud Deployment Spaces (no manual HTML/CSS used)

# ALGORITHM & DEPLOYMENT

- In this section, we outline the AI approach used in the Eco Lifestyle Agent, which leverages Retrieval-Augmented Generation (RAG) to deliver personalized sustainability advice. Below is the structured breakdown:
- **Algorithm Selection:**
  - The RAG (Retrieval-Augmented Generation) framework is chosen as it combines document retrieval with generative models like IBM Granite. It ensures answers are grounded in reliable eco-data while maintaining flexibility in natural language responses.
  - RAG is ideal for dynamic queries related to green living, allowing access to up-to-date government schemes, recycling norms, and eco-friendly tips.
- **Data Input:**
  - The input includes user queries in natural language such as:
  - “How can I reduce plastic waste?”, “Is composting suitable for my locality?”
  - Input of prompts plays a major role.
- **Training Process:**
  - IBM Granite LLM is pre-trained on a diverse and environmentally focused corpus.
  - The RAG pipeline is enhanced by

Evaluation metrics include response relevancy, factual accuracy, and personalization success rate.

Fine-tuning with curated eco-conscious literature and environmental datasets, Retrieval index creation using vector stores optimized for low-latency.
- **Prediction Process:**
  - When a query is submitted:

Relevant eco-documents are retrieved from the indexed data store.

The LLM (Granite) uses these documents to generate context-aware, actionable advice.
  - The system adapts to:
    - User location (for local guidelines)
    - Repeated query history (to refine responses)
    - Real-time updates to government policies or climate alerts

# RESULT

The screenshot displays the IBM watsonx Agent web interface. At the top, the header includes the IBM watsonx logo, an 'Upgrade' button, a help icon, a notification bell, and user information for 'Prathiksha Arutchezhian's ...' in 'Dallas'. Below the header, a breadcrumb trail shows 'Projects / Final\_project / watsonx Agent'. The main interface is divided into a left sidebar with 'Build' and 'Agent preview' tabs, and a central chat area. The chat area shows a conversation where a user asks 'Hello, How do i lead a eco lifestyle?' and the agent responds with a detailed paragraph of advice on eco-living, followed by a link to 'How did I get this answer?'. The user then asks for 'step by step instructions', and the agent provides a numbered list of three steps. At the bottom, there is a text input field with the placeholder 'Type something...' and a send button.

- Successfully implemented a **chatbot/agent** that responds to user queries about sustainable living.
- The agent responds intelligently to both **general** and **specific** questions using the configured model.

# RESULT

IBM watsonx

Upgrade ? Bell Prathiksha Arutchezian's ... Dallas PA

Projects / Final\_project / watsonx Agent

Share feedback 3 Autosaved 5:17 PM New agent + Deploy

## Select a foundation model






To choose a model, review characteristics such as tasks that models perform. Compare model benchmarks with scores in the range 0–100. Higher scores are better.

All models Model benchmarks

Search for a model or task

Agents

Want to bring your own model?

|  |   |  |   |  |
|--|---|--|---|--|
| <br><b>granite-3-3-8b-instruct</b><br>Granite-3.3-8b-Instruct is an IBM-trained, dense decoder-only models, which is particularly well-suited for generative...<br>Provider: IBM Type: Provided mo... | <br><b>llama-3-2-11b-vision-in...</b><br>Llama-3-2-11b-vision-instruc is an auto-regressive language model that uses an optimized transformer architecture.<br>Provider: Meta Type: Provided mo... | <br><b>llama-3-2-90b-vision-in...</b><br>Llama-3-2-90b-vision-instruct is an auto-regressive language model that uses an optimized transformer architecture.<br>Provider: Meta Type: Provided mo... | <br><b>llama-3-3-70b-instruct</b><br>This version of Llama-3.3-70b-instruct is also the FP8 quantized version of the original FP16 weights.<br>Provider: Meta Type: Provided mo... | <br><b>mistral-large</b><br>Mistral Large, the most advanced Large Language Model (LLM) developed by Mistral AI, is an exceptionally powerful...<br>Provider: Mistral AI Type: Provided mo... |
|--|---|--|---|--|

- Accessed the Foundation Model selection screen in IBM watsonx to review and compare available models like granite-3-3-8b-instruct, mistral-large and others.
- Selected the **llama-3-3-70b instruct model**, a powerful LLaMA 3-based foundation model known for strong reasoning and language generation capabilities.
- Optimized the agent's performance and response quality by choosing a model well-suited for conversational and knowledge-intensive tasks.



# RESULT

The screenshot displays the IBM watsonx AI Agent configuration interface. The interface is divided into three main sections: Build, Model parameters, and Agent preview.

- Build:** This section on the left allows for configuring the agent. It includes a Setup section, a Configuration section with Framework (LangGraph) and Architecture (ReAct) dropdowns, and an Instructions section where a custom instruction is entered: "You are Eco, an AI-powered Eco Lifestyle Agent designed to help users adopt a sustainable lifestyle. You retrieve data using Retrieval-Augmented Generation (RAG) from trusted environmental sources such as government...". A Knowledge section at the bottom shows a Vector index named "Eco\_Lifestyle\_Extra\_Knowledge".
- Model parameters:** This central section shows various parameters for the Llama-3-3-70b-instruct model. A yellow warning box states: "You can edit parameters only when the conversation has been cleared in chat mode." Below this, parameters like Frequency penalty, Presence penalty, Temperature, Top P (nucleus sampling), and Max tokens are shown with sliders and input fields, all set to their default values.
- Agent preview:** This section on the right shows a chat conversation. The agent, named "Eco", responds to a query about eco-friendly practices with a detailed list of steps: "1. Understand what an eco lifestyle is and its benefits. 2. Adopt daily practices such as using reusable bags, bottles, and containers, walking, cycling, or using public transport, composting kitchen waste, and recycling plastic, glass, and paper."

- Configured the AI Agent with the Llama-3-3-70b instruct model using the LangGraph framework and ReAct architecture to enable structured and interactive reasoning
- Defined custom instructions to shape the agent's identity as "Eco," an AI guide for sustainable living, influencing its responses and personality. (Retrieved Augmented Generation) by uploading Eco lifestyle pdf file.
- Set up foundational model parameters (e.g., temperature, penalties) for controlled generation, though left at default for initial testing.

# RESULT

The screenshot displays the IBM watsonx Agent interface. The top navigation bar includes the IBM watsonx logo, an 'Upgrade' button, a help icon, a notification bell, and user information for 'Prathiksha Arutchezhian's ...' with a dropdown menu, 'Dallas', and a profile icon 'PA'. Below this, a breadcrumb trail shows 'Projects / Final\_project / watsonx Agent'. The main interface is split into two panels. The left panel, titled 'Build', shows a list of 'Added tools (6)': 'Google search' (Retrieve information from the internet with the Google search engine.), 'DuckDuckGo search' (Retrieve information from the internet with the DuckDuckGo search engine.), 'Wikipedia search' (Retrieve information from Wikipedia articles.), 'Document search - Eco\_Lifestyle\_Extra\_Knowledge' (Search documents with vector indexes.), 'Webcrawler' (Retrieve information from a website.), and 'Weather' (Retrieve the weather of a city.). Each tool has a settings gear icon and a trash icon. The right panel, titled 'Agent preview', shows a generated response for the query 'here are the steps to lead an eco lifestyle'. The response is a numbered list of 6 steps. Below the list, it says 'Remember, every small action counts, and collective efforts can drive policy changes and inspire broader movements.' and 'How did I get this answer?'. This section shows two steps: '1: {"input": "Step by step guide to lead an eco lifestyle"}' and '2: Generating final answer', both with green checkmarks. At the bottom of the preview panel is a text input field with the placeholder 'Type something...' and a send button.

- **Integrated multiple external tools** (e.g., Google, DuckDuckGo, Wikipedia, Webcrawler, Weather) to enhance the agent's knowledge and response accuracy via **Retrieval-Augmented Generation (RAG)**.
- Connected a custom vector index to allow the agent to retrieve specialized domain knowledge on sustainable living.
- **Enabled the agent to generate detailed, context-aware responses**, such as a step-by-step eco lifestyle guide, by leveraging both real-time and indexed information sources.

# RESULT

The screenshot displays the IBM watsonx web interface. At the top, a dark navigation bar contains the 'IBM watsonx' logo, an 'Upgrade' button, and user details for 'Prathiksha Arutchezhian's ...' in 'Dallas'. Below this, a breadcrumb trail shows 'Projects / Final\_project'. A secondary navigation bar includes 'Overview', 'Assets' (the active tab), 'Deployments', 'Jobs', and 'Manage'. The 'Assets' section features a search bar, 'Import assets', and a 'New asset' button. A left sidebar shows '3 assets' and a list of 'Asset types' with counts: 'Data access' (1), 'Data' (1), and 'Agents' (1). The main content area, titled 'All assets', contains a table with the following data:

| <input type="checkbox"/> | Name                              | Last modified                  |   |
|--------------------------|-----------------------------------|--------------------------------|---|
| <input type="checkbox"/> | watsonx Agent<br>Agent            | 8 hours ago<br>Modified by you | ⋮ |
| <input type="checkbox"/> | Eco lifestyle RAG<br>Vector index | 8 hours ago<br>Modified by you | ⋮ |
| <input type="checkbox"/> | Eco lifestyle RAG.pdf<br>PDF      | 8 hours ago<br>Modified by you | ⋮ |

This screen shows the assets in your Watsonx project, including the deployed watsonx Agent, a custom vector index Eco lifestyle RAG and its source Eco lifestyle RAG.pdf. Uploaded and connected these resources to enable document-based retrieval for AI agent.

# RESULT

IBM watsonx

Upgrade ⓘ 🔔 Prathiksha Arutchezian's ... Dallas PA

Deployment spaces / ⓘ 📄 ⌛ 💬 ⚙️

Online deployments

1 space

🔍 Find deployments

| Name                          | Asset type | Status     | Space               | Copies | Last updated          | Created               |    |
|-------------------------------|------------|------------|---------------------|--------|-----------------------|-----------------------|----|
| <a href="#">watsonx Agent</a> | AI service | ✅ Deployed | Eco_lifestyle_agent | 1      | Aug 3, 2025, 12:41 AM | Aug 3, 2025, 12:41 AM | 🗑️ |

Items per page: 20 1-1 of 1 items 1 1 of 1 pages ⏪ ⏩

This screen confirms that I have successfully deployed my watsonx Agent under the Eco\_lifestyle\_agent project. The deployment is active which means my agent is now live and accessible for real-world use beyond just the development environment.

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# CONCLUSION

- The Eco Lifestyle Agent makes sustainable living accessible, offering practical and customized advice. It bridges the gap between users and valuable eco-information using cutting-edge AI. By leveraging Retrieval-Augmented Generation (RAG) and IBM's powerful cloud infrastructure, the agent provides accurate, real-time responses tailored to individual preferences. It encourages daily green habits that collectively contribute to significant environmental impact. This smart, intuitive system empowers users to make informed decisions, cultivating a more eco-conscious and sustainable society.

# FUTURE SCOPE

- **Multilingual Support**

Extend the system to understand and respond in regional languages for broader user accessibility.

- **Personalized Sustainability Coaching**

- The agent can evolve to give **tailored eco-living advice** based on a user's location, lifestyle, carbon footprint, and consumption patterns.
- Integration with smart home devices could help monitor and reduce household energy or water usage.

- **Integration with Real-Time Data**

- Use **live environmental data** (e.g., air quality, weather, waste pickup schedules) to provide timely and contextual suggestions.
- Connect with sustainability APIs for product ratings, recycling guidelines, or green business directories.

- **Multi-Channel Deployment**

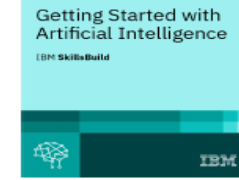
- Deploy the agent across platforms like **mobile apps, websites, smart assistants (Alexa/Google), or messaging apps (WhatsApp/Telegram)** for broader reach and accessibility.

# REFERENCES

- IBM Granite Documentation: <https://www.ibm.com/products/watsonx-granite>
- Swachh Bharat Scheme: <https://swachhbharatmission.gov.in>
- IBM Cloud Lite Plan Overview. IBM Cloud Docs.: <https://www.ibm.com/cloud/free>
- Government of India – Ministry of Environment. Plastic Waste Management Rules: <https://moef.gov.in>

# IBM CERTIFICATIONS: GETTING STARTED WITH ARTIFICIAL INTELLIGENCE

In recognition of the commitment to achieve  
professional excellence



Prathiksha Arutchezhian

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence



Issued on: Jul 15, 2025  
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### Journey to Cloud: Envisioning Your Solution

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# IBM CERTIFICATIONS: RAG WITH LANGCHAIN

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to  
**Prathiksha Arutchezhian**

for the completion of

**Lab: Retrieval Augmented Generation with  
LangChain**

(ALM-COURSE\_3824998)

According to the Adobe Learning Manager system of record

**Completion date:** 24 Jul 2025 (GMT)

**Learning hours:** 20 mins

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## GITHUB REPOSITORY LINK

- <https://github.com/prathikshaarul/IBM-EDUNET-INTERNSHIP>



**THANK YOU**