
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**

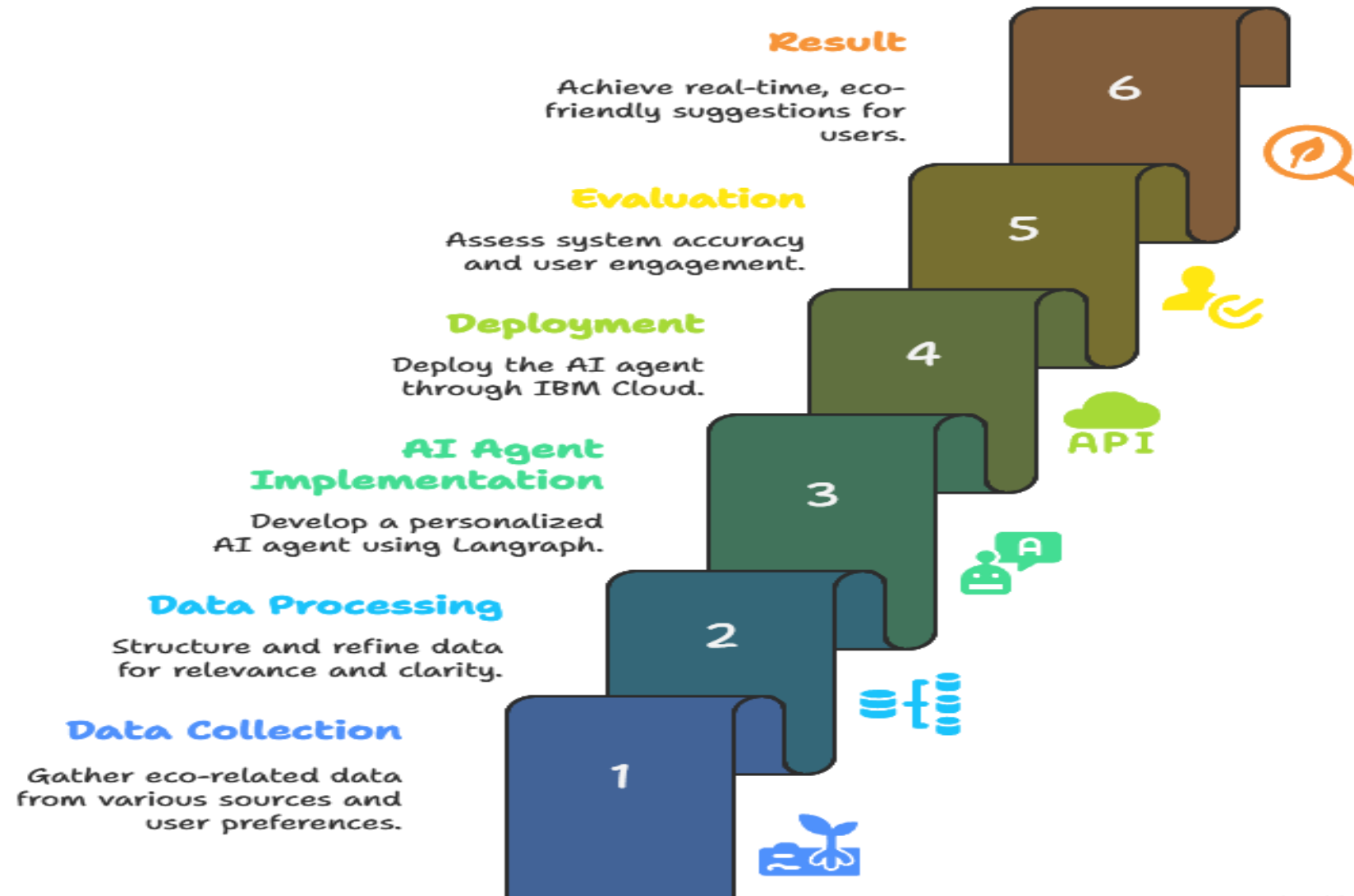
PROBLEM STATEMENT

- 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.

Implementing Sustainable Living System



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)

System Requirements for Eco Lifestyle Agent

- A device with at least **4 GB RAM** and a **modern web browser** (e.g., Chrome, Firefox).
- **Stable internet connectivity** to access IBM Cloud Lite and IBM Granite services.
- Enable essential tools: **Python Interpreter**, **Web Search**, and **Document Search** for RAG functionality.
- No need for local AI model hosting — compute is handled via **IBM watsonx.ai** on the cloud.

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 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, the breadcrumb path is 'Projects / Final_project / watsonx Agent'. The main interface has a left sidebar with 'Build' and 'Agent preview' tabs. The 'Agent preview' tab is active, showing a chat window. The chat history includes: a user message 'Hello, How do i lead a eco lifestyle?' at 05:14 PM; an agent response providing a detailed paragraph on eco-living practices at 05:14 PM; a user message 'Give me step by step instructions' at 05:17 PM; and an agent response providing a numbered list of three steps at 05:17 PM. At the bottom of the chat window 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 ? ? Prathiksha Arutchezhian'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?

 granite-3-3-8b-instruct Granite-3.3-8b-Instruct is an IBM-trained, dense decoder-only models, which is particularly well-suited for generative... Provider: IBM Type: Provided mo...	 llama-3-2-11b-vision-in... Llama-3-2-11b-vision-instruc is an auto-regressive language model that uses an optimized transformer architecture. Provider: Meta Type: Provided mo...	 llama-3-2-90b-vision-in... Llama-3-2-90b-vision-instruct is an auto-regressive language model that uses an optimized transformer architecture. Provider: Meta Type: Provided mo...	 llama-3-3-70b-instruct This version of Llama-3.3-70b-instruct is also the FP8 quantized version of the original FP16 weights. Provider: Meta Type: Provided mo...	 mistral-large Mistral Large, the most advanced Large Language Model (LLM) developed by Mistral AI, is an exceptionally powerful... Provider: Mistral AI Type: Provided mo...
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- 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 top navigation bar includes the IBM watsonx logo, an Upgrade button, a user profile dropdown for Prathiksha Arutchezhian, and location settings for Dallas. The main interface is divided into three panels: Build, Model parameters, and Agent preview.

Build Panel: Shows the setup for the AI agent. The Framework is set to LangGraph and the Architecture is set to ReAct. The Instructions section contains a custom prompt: "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...". The Knowledge section shows a vector index named Eco_Lifestyle_Extra_Knowledge.

Model parameters Panel: Displays various parameters for the Llama-3-3-70b-instruct model. A warning message states: "You can edit parameters only when the conversation has been cleared in chat mode." The parameters shown are: Frequency penalty (0), Presence penalty (0), Temperature (0), Top P (nucleus sampling) (1), and Max tokens (2000).

Agent preview Panel: 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, the user's name 'Prathiksha Arutchezhian's ...', the location 'Dallas', and a profile icon 'PA'. Below the navigation bar, the breadcrumb trail reads 'Projects / Final_project / watsonx Agent'. The main interface is divided into two panels. The left panel, titled 'Build', shows a list of 'Added tools (6)': Google search, DuckDuckGo search, Wikipedia search, Document search - Eco_Lifestyle_Extra_Knowledge, Webcrawler, and Weather. Each tool has a description and icons for settings and deletion. The right panel, titled 'Agent preview', shows a list of steps to lead an eco lifestyle: 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. 3. Opt for energy-efficient appliances, conserve water, and choose sustainable fashion options. 4. Support green tech and innovations such as smart home systems, solar panels, electric vehicles, and bio-packaging materials. 5. Take advantage of government schemes and incentives for eco-friendly practices. 6. Contribute to global climate action by making small changes in your daily life, such as refusing plastic straws or planting a tree. Below the steps, there is a section 'Remember, every small action counts, and collective efforts can drive policy changes and inspire broader movements.' and a section 'How did I get this answer?' showing 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 right panel, there is a text input field '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 interface. At the top, a dark navigation bar includes the 'IBM watsonx' logo, an 'Upgrade' button, and user information for 'Prathiksha Arutchezhian's ...' in 'Dallas'. Below this, a breadcrumb trail shows 'Projects / Final_project'. The main content area has tabs for 'Overview', 'Assets' (which is selected), 'Deployments', 'Jobs', and 'Manage'. On the left side of the 'Assets' tab, there is a sidebar with a search bar 'Find assets', a count of '3 assets', and a list of 'Asset types': 'Data access' (1), 'Data' (1), and 'Agents' (1). The main panel, titled 'All assets', contains a table with the following data:

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

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**

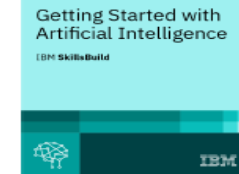
- Deploy the agent across platforms like **mobile apps, websites, smart assistants (Alexa/Google), or messaging apps (WhatsApp/Telegram)** for broader reach and accessibility.

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



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Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/fa7ac377-770f-449a-859b-55a9afd5689b>



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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

GITHUB REPOSITORY LINK

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



THANK YOU