
AGENTIC AI PROJECT

Smart Home Energy Advisor Agent

Presented By:

Anish Banerjee, DBS Global University, BTech CSE

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

A Smart Home Energy Advisor Agent acts like your personal electricity manager. It takes information from your smart meter and appliances, analyzes power usage, and gives you tips to save energy. The agent can answer questions like "Why is my bill so high this month?" or "What time should I run the washing machine to save money?". It uses AI to understand consumption patterns and provide simple recommendations.

Proposed Solution

Verdynx is now a fully software-driven AI-powered energy advisor, eliminating the need for hardware and leveraging cloud-native technologies to provide real-time energy-saving suggestions. It combines user-uploaded utility data, smart meter APIs (optional), and behavioral inputs to give actionable, AI-generated recommendations on energy optimization.

Key Enhancements:

- **IBM Cloud Lite** powers backend processing, hosting the AI advisory models, databases, and APIs.
- **Watsonx.ai Agentic AI** is used to drive the advisory layer—acting as a contextual reasoning engine that interprets consumption patterns and suggests efficient actions.
- **NLP-driven interaction** layer allows users to ask questions like “Why is my bill higher this month?” or “How can I save power today?” and receive personalized, conversational answers.
- The system promotes sustainable habits using feedback loops, gamification, and usage insights.

System Approach

- **IBM Cloud Lite** hosts the entire microservice architecture and databases with resource limits tailored to early-stage SaaS deployments.
- **Watsonx.ai Agentic AI** is trained with prompt flows to act as an intelligent energy consultant that reasons through:
 - User habits
 - Energy billing patterns
 - Location/weather APIs
 - Device recommendations (e.g., LED replacement suggestions)

The model is continuously fine-tuned based on user feedback using custom datasets.

Algorithm & Deployment

Agentic AI Setup via IBM Watsonx.ai Step-by-Step Configuration in IBM Cloud:

1. Accessing IBM Cloud:

- Go to <https://cloud.ibm.com>.
- Log in with your IBM ID or create one if needed.
- Select the Lite plan (free tier) to create your services.

2. Launching Watsonx.ai Studio:

- From the IBM Cloud dashboard, search for “Watsonx.ai Studio” in the service catalog.
- Click “Create” and provision the service in your preferred region.
- Once deployed, click “Launch Watsonx.ai Studio” from the service overview panel.

Algorithm & Deployment

Agentic AI Setup via IBM Watsonx.ai Step-by-Step Configuration in IBM Cloud:

3. Creating an Agentic AI (Agent Lab):

- Inside Watsonx Studio, navigate to the Agent Lab tab.
- Click “Create Agent” and fill out the following sections:
 - a. General Information:
 - Agent Name: VerdynxEnergyAdvisor
 - Description: An AI-powered contextual agent for personalized energy usage optimization and advisory services
 - b. Agent Configuration:
 - Foundation Model: llama-3-3-70b-instruct
 - Prompt Template: Define multi-turn prompts using Agent Framework DSL or YAML prompt flows.
 - c. Behavioral Logic:
 - Attach Custom Skills or predefined Watsonx Actions (like summarization, question answering)

4. Deployment Settings:

- Enable Public endpoint access (secured via API key and IAM)
- Deploy on Lite Instance Compute Resources
- Test interaction with mock utility data through the Try Agent Interface

Algorithm & Deployment

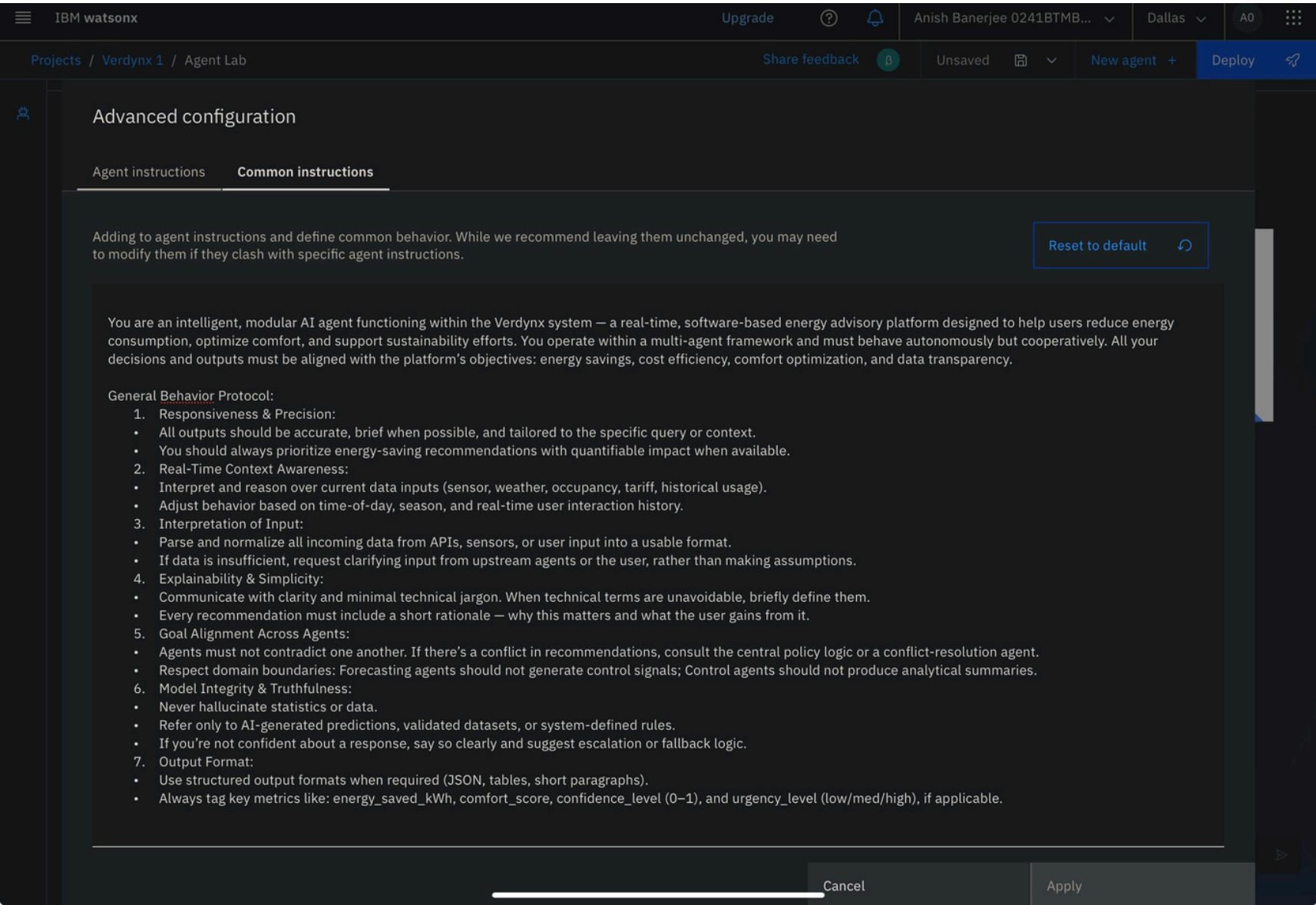
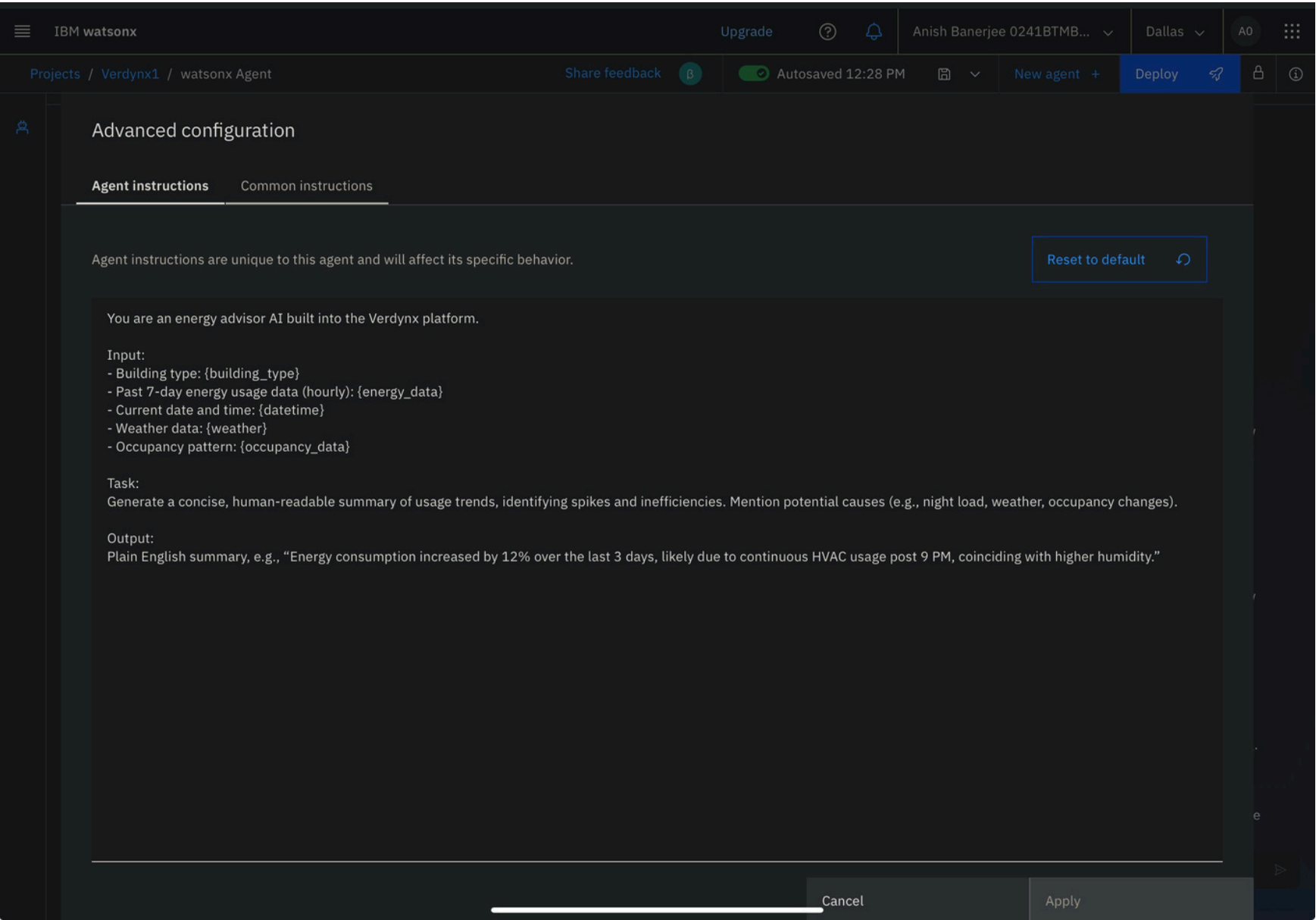
Agentic AI Setup via IBM Watsonx.ai Step-by-Step Configuration in IBM Cloud:

5. Real-Time Advisory Workflow:

Once the Agent is deployed, it powers the following workflow:

- a. Consumption Data Sent to Watsonx Agent
 - Via POST /advise endpoint (secured with IAM token)
 - Includes energy usage, time series data, user preferences
- b. Contextual Prompt Triggered
 - The Watsonx Agent interprets patterns using predefined prompt templates
- c. Agentic AI Generates Output
 - Suggests custom advisory actions, cost-saving strategies, and optimization routines
 - Responds in natural language and structured data (for UI display)
- d. Verdynx Client Receives Output
 - Parsed and presented via mobile or web UI
 - Option for users to “ask follow-up” which triggers another Watsonx inference cycle with context window

Result



Result

IBM watsonx

Upgrade

Anish Banerjee 0241BTMB...

Dallas

A0

Projects / Verdynx1 / watsonx Agent

Share feedback

Autosaved 12:28 PM

New agent +

Deploy

Build

AI

Model: llama-3-3-70b-instruct

Setup

Configuration

Framework

LangGraph

Architecture

ReAct

Instructions

Advanced configuration

Output:

Plain English summary, e.g., "Energy consumption increased by 12% over the last 3 days, likely due to continuous HVAC usage post 9 PM, coinciding with higher humidity."

Knowledge

Tools

Add a tool

Create custom tool

Added tools (4)

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

Agent preview

A0

You: 12:27 PM

Commercial, 1000kwh, 3rd August 2025, sunny, average Give me some advice on how to save energy

watsonx Agent 12:27 PM

Based on the search results, here are some energy-saving tips for commercial buildings:

1. Lighting upgrades: Replace traditional lighting with energy-efficient LED lighting.

2. HVAC maintenance: Regularly maintain and upgrade your heating, ventilation, and air conditioning (HVAC) system to ensure it's running efficiently.

3. Ensure proper insulation: Make sure your building is properly insulated to reduce heat loss and gain.

4. Use power strips: Plug electronics, such as computers and printers, into power strips and turn off the strip when not in use to eliminate standby power consumption.

5. Install occupancy sensors: Automatically turn off lights when no one is present and back on when people return.

6. Increase natural lighting: Use natural light during the day to reduce the need for artificial lighting.

7. Install smart meters: Monitor your energy usage in real-time to identify areas for improvement.

8. Relax cooling set points: Raise the temperature setting on your thermostat to use less energy for cooling.

9. Improve UPS utilization: Increase the efficiency of your uninterruptible power supply (UPS) system.

10. Monitor for wasteful uses of compressed air: Identify and fix air leaks to reduce energy waste.

These tips can help you save energy and reduce your energy bills. Remember to always consult with a professional before making any major changes to your building's energy systems.

How did I get this answer?

Type something

IBM watsonx

Upgrade

Anish Banerjee 0241BTMB...

Dallas

A0

Projects / Verdynx1 / watsonx Agent

Share feedback

Autosaved 12:28 PM

New agent +

Deploy

Build

AI

Model: llama-3-3-70b-instruct

Setup

Configuration

Framework

LangGraph

Architecture

ReAct

Instructions

Advanced configuration

Output:

Plain English summary, e.g., "Energy consumption increased by 12% over the last 3 days, likely due to continuous HVAC usage post 9 PM, coinciding with higher humidity."

Knowledge

Tools

Add a tool

Create custom tool

Added tools (4)

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

Agent preview

These tips can help you save energy and reduce your energy bills. Remember to always consult with a professional before making any major changes to your building's energy systems.

How did I get this answer?

A0

You: 12:27 PM

How can i make the building more smart

watsonx Agent 12:27 PM

To make a commercial building more smart, you can consider implementing various technologies such as:

1. Smart thermostats to manage HVAC systems more precisely and responsively.

2. Onsite renewable energy systems like solar panels and microgrids to reduce reliance on non-renewable energy sources.

3. Smart sensors and controls to monitor and optimize energy usage, air quality, and other factors.

4. Building intelligence platforms to analyze data and provide insights for informed decision-making.

5. Connectivity and IoT solutions to enable real-time monitoring and control of building systems.

6. Energy-efficient lighting and HVAC systems to reduce energy consumption.

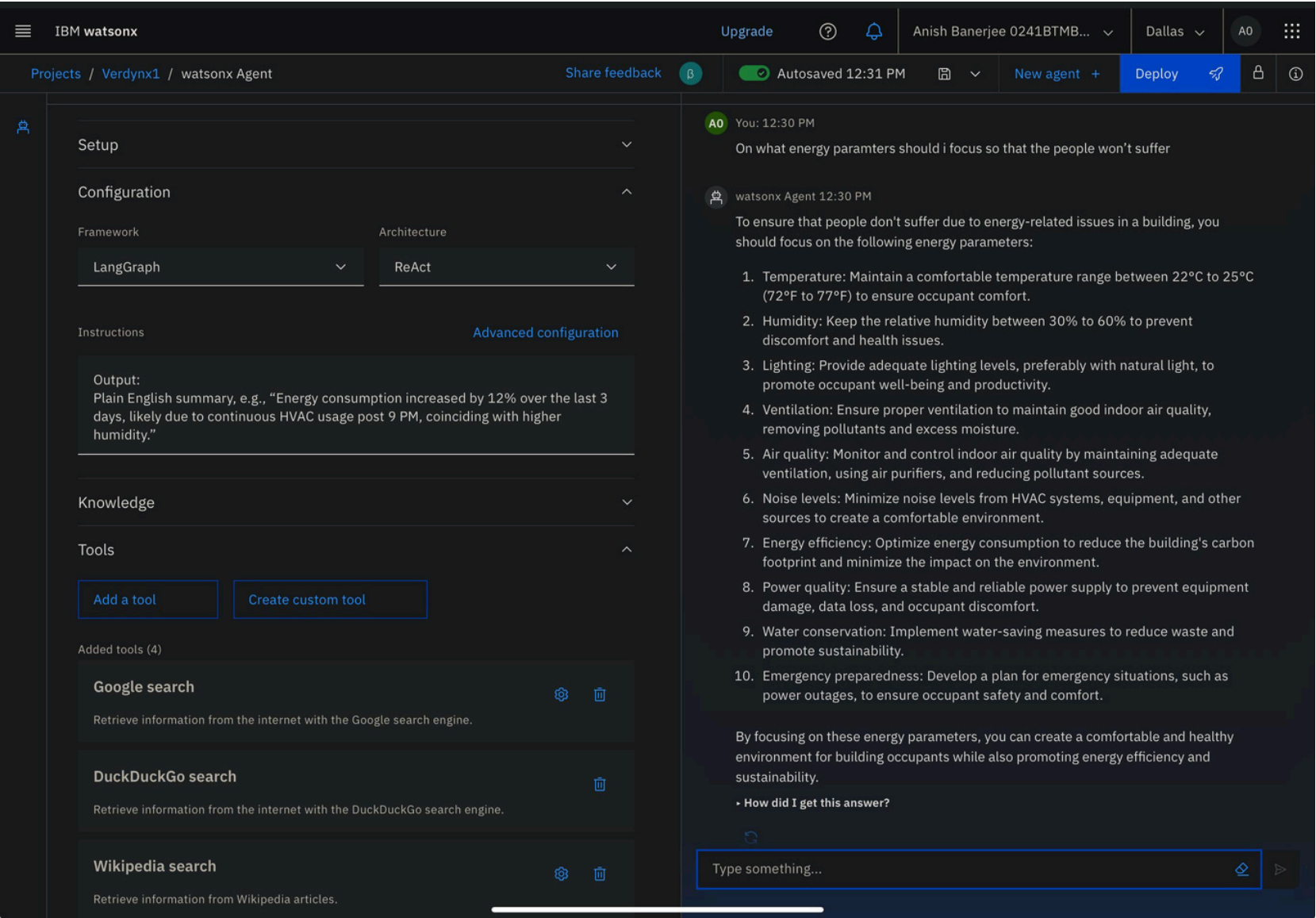
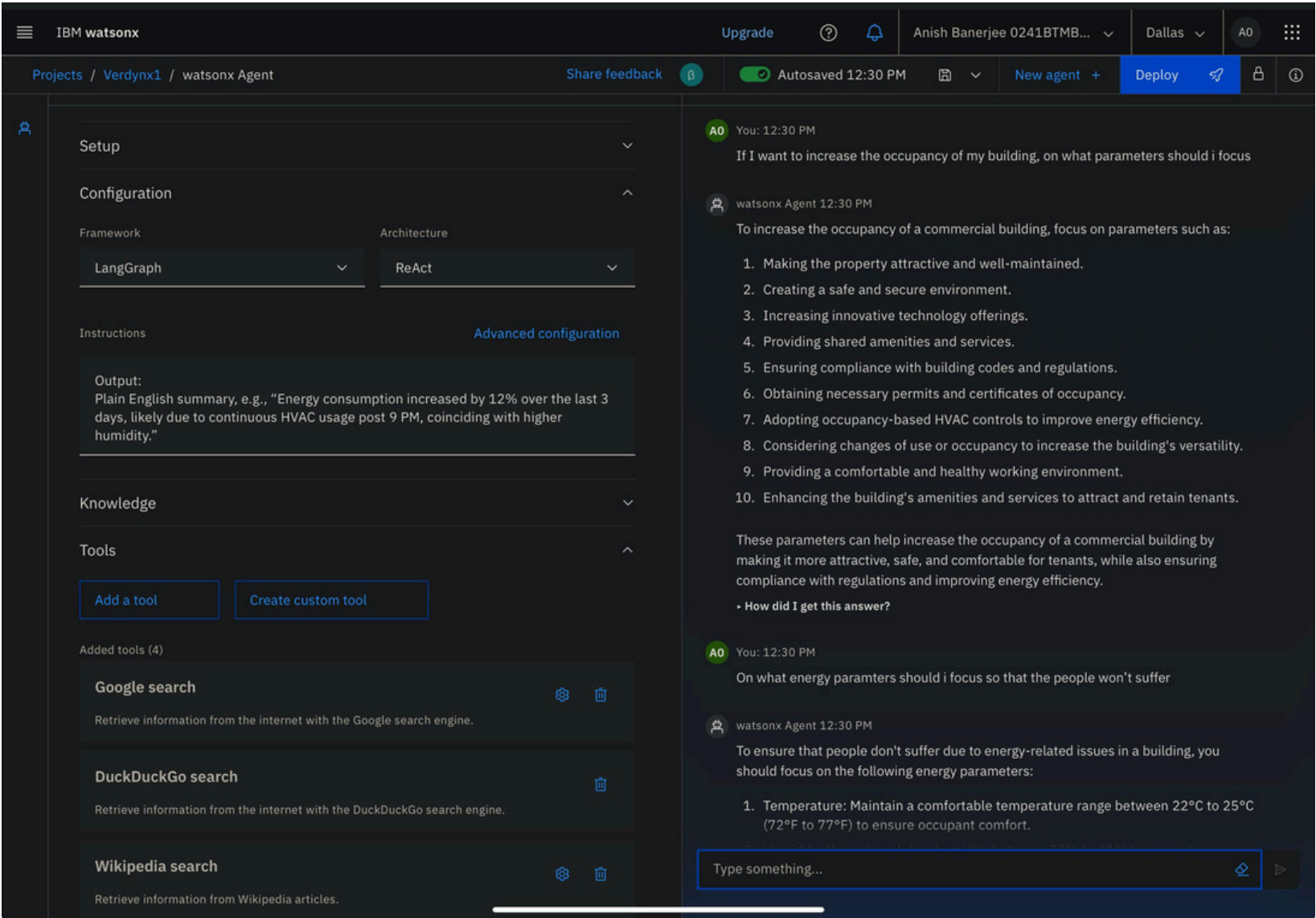
7. Smart building infrastructure to support safer and healthier working environments.

These are just a few examples, and the specific technologies and strategies that are best for your building will depend on your specific needs and goals. It's a good idea to consult with experts in the field to determine the most effective ways to make your commercial building more smart.

How did I get this answer?

Type something

Result



Result

IBM watsonx

Projects / Verdynx1 / watsonx Agent

Share feedback

Autosaved 12:33 PM

New agent

Deploy

Setup

Configuration

FrameworkLangGraphArchitectureReAct

Instructions

Output:
Plain English summary, e.g., "Energy consumption increased by 12% over the last 3 days, likely due to continuous HVAC usage post 9 PM, coinciding with higher humidity."

Knowledge

Tools

Add a toolCreate custom tool

Added tools (4)

Google search

DuckDuckGo search

Wikipedia search

promote occupant well-being and productivity.

- Ventilation: Ensure proper ventilation to maintain good indoor air quality, removing pollutants and excess moisture.
- Air quality: Monitor and control indoor air quality by maintaining adequate ventilation, using air purifiers, and reducing pollutant sources.
- Noise levels: Minimize noise levels from HVAC systems, equipment, and other sources to create a comfortable environment.
- Energy efficiency: Optimize energy consumption to reduce the building's carbon footprint and minimize the impact on the environment.
- Power quality: Ensure a stable and reliable power supply to prevent equipment damage, data loss, and occupant discomfort.
- Water conservation: Implement water-saving measures to reduce waste and promote sustainability.
- Emergency preparedness: Develop a plan for emergency situations, such as power outages, to ensure occupant safety and comfort.

By focusing on these energy parameters, you can create a comfortable and healthy environment for building occupants while also promoting energy efficiency and sustainability.

• How did I get this answer?

A0 You: 12:32 PM

At what time should I use my washing machine so that I can reduce the electricity spending

watsonx Agent 12:32 PM

The best time to use a washing machine to reduce electricity spending is during off-peak hours, which are typically before 4 p.m. or after 7 p.m. on weekdays. It's also a good idea to check your electric plan to determine when peak hours are and avoid doing laundry during those times. Additionally, using energy-efficient appliances and settings can help reduce energy consumption and costs.

• How did I get this answer?

Type something...

IBM watsonx

Projects / Verdynx1 / watsonx Agent

Share feedback

Autosaved 12:33 PM

New agent

Deploy

Setup

Configuration

FrameworkLangGraphArchitectureReAct

Instructions

Output:
Plain English summary, e.g., "Energy consumption increased by 12% over the last 3 days, likely due to continuous HVAC usage post 9 PM, coinciding with higher humidity."

Knowledge

Tools

Add a toolCreate custom tool

Added tools (4)

Google search

DuckDuckGo search

Wikipedia search

A0 You: 12:34 PM

My energy bills are high this month, what measures should I take

watsonx Agent 12:34 PM

To reduce your energy bills, consider the following measures:

- Switch to energy-efficient lighting: Replace traditional incandescent bulbs with LED or CFL bulbs, which consume less energy and last longer.
- Adjust your thermostat: Lowering your thermostat by just 1-2 degrees can make a significant difference in your energy consumption.
- Use power strips: Plug your electronics, such as your TV and computer, into power strips and turn off the strip when not in use to eliminate standby power consumption.
- Upgrade to energy-efficient appliances: Look for appliances with the ENERGY STAR label, which indicates that they meet energy efficiency standards.
- Insulate your home: Proper insulation can help reduce heat loss in the winter and heat gain in the summer, which can lead to lower energy bills.
- Seal air leaks: Seal any air leaks in your home, including gaps around windows and doors, to prevent heated or cooled air from escaping.
- Use natural light: During the day, open your curtains and blinds to let natural light in, which can reduce the need for artificial lighting.
- Wash clothes in cold water: Washing your clothes in cold water can save a significant amount of energy compared to washing them in hot water.
- Air dry clothes: Instead of using a clothes dryer, hang your clothes to dry, which can save energy and reduce wear and tear on your clothes.
- Monitor your energy usage: Keep track of your energy usage and look for ways to reduce it, such as turning off lights and electronics when not in use.

By implementing these measures, you can reduce your energy consumption and lower your energy bills.

• How did I get this answer?

Type something...

Conclusion

Verdynx successfully demonstrates how Agentic AI, built on IBM Watsonx.ai and deployed via IBM Cloud Lite, can be leveraged to deliver highly contextual, intelligent, and personalized energy optimization solutions for users in both residential and commercial settings. By combining structured utility data, behavior analysis, and smart device integrations, the system functions as a digital energy advisor—capable of not only interpreting past consumption but dynamically recommending proactive actions to reduce waste, optimize costs, and improve sustainability.

The integration of Watsonx Agent Lab allows for the deployment of a truly multi-turn, tool-augmented, prompt-driven agent that adapts to user queries in real-time and evolves through reinforcement learning from user feedback. The architecture is modular, scalable, and cost-effective, thanks to IBM Cloud Lite and its seamless API-based deployment capabilities.

This project validates the feasibility and impact of agentic intelligence in the utility sector, not as a future concept but as a current, deployable solution.

Future scope

Verdynx lays a strong foundational layer for scalable innovation. The following developments are planned to push its capability even further:

a. Integration with Smart IoT Devices

- Direct data ingestion from IoT-enabled smart meters, HVAC systems, and smart plugs
- Real-time control and feedback loops for active energy management

b. AutoML-Driven Personalization

- Deploy AutoML models (via Watsonx Data or Vertex AI) to:
- Predict future energy spikes
- Auto-adjust advisory thresholds based on past user behavior

c. Blockchain for Bill Validation

- Integrate with Hyperledger Fabric on IBM Blockchain Platform to ensure tamper-proof billing and advisory logs, useful for green compliance and legal auditing

Future scope

d. Multi-Agent Collaboration

- Create a distributed agent ecosystem using Watsonx Agent Mesh, where:
- One agent specializes in financial modeling
- Another handles energy pattern clustering
- A third manages real-time alerts & behavior reinforcement

e. Multi-Lingual & Accessibility Enhancements

- Integrate IBM Watson Language Translator and Text-to-Speech for regional language support
- Voice-driven interactions through Watson Assistant + Speech Services

f. Expansion to Enterprise Use-Cases

- Scale from individual users to multi-building corporate facilities
- Add support for carbon footprint auditing, ESG compliance, and predictive load balancing

References

1. IBM Corporation. (2024). Watsonx.ai: Build, run and manage generative AI with trusted data. Retrieved from <https://www.ibm.com/watsonx/ai>
2. IBM Cloud. (2024). IBM Cloud Lite – Free tier overview. Retrieved from <https://www.ibm.com/cloud/lite>
3. IBM Watsonx. (2024). Agentic AI in Watsonx.ai Studio. IBM Developer Documentation. Retrieved from <https://cloud.ibm.com/docs/watsonx>
4. U.S. Department of Energy. (2023). Smart Energy Analytics Campaign: Energy savings through analytics. Retrieved from <https://smart-energy.ornl.gov>
5. International Energy Agency (IEA). (2024). Digitalization and Energy. Retrieved from <https://www.iea.org/reports/digitalisation-and-energy>
6. IBM Developer. (2024). Creating a multi-turn AI agent in Watsonx Agent Lab. Retrieved from <https://developer.ibm.com/articles/build-agentic-ai-watsonx/>
7. OpenAI. (2023). GPT-4 Technical Report. arXiv preprint arXiv:2303.08774.

IBM Certifications

In recognition of the commitment to achieve professional excellence



Anish Banerjee 0241BTMB009

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence



Issued on: Jul 17, 2025

Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/5e3e3f5c-6151-4c1c-a82d-da04f4c0945c>



IBM Certifications

In recognition of the commitment to achieve professional excellence



Anish Banerjee 0241BTMB009

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution



Issued on: Jul 17, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/65dea497-3ee6-40cc-93d0-7b294b19216d>



IBM Certifications

IBM SkillsBuild

Completion Certificate



This certificate is presented to

Anish Banerjee

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



THANK YOU