
AGENT AI PROJECT

MACHINE FAULT DIAGNOSIS AGENT

Presented By:
1. P. SHIAMILEE

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

Example: Currently Machine has become fault while it was working fine. This agent helps detect faults in machines like lathes, mills or pumps based on vibrations, temperature, or unusual noises. It can answer: “Why is my CNC machine vibrating too much?” or “What could cause overheating in a hydraulic pump?”. It suggests basic maintenance actions and safety precautions.

PROPOSED SOLUTION

- The proposed system aims to address the challenge of detecting faults in industrial machines (lathes, mills or pumps) in real time to reduce downtime and to optimize maintenance. This involves leveraging sensor data, analytics and machine learning techniques to accurately identify fault patterns. The solution will consist of the following components:
- Data Collection:
 - Present multiple-choice options (e.g., type of machine: Lathe, Milling, CNC) using a digression list to narrow down machine type.
 - Gather historical machine data, including sensor readings (e.g., vibration, temperature, pressure), operational status, and maintenance logs.
- Data Preprocessing:
 - Design the agent to collect structured user inputs through multiple choice questions (eg. Machine-type, fault symptoms) to reduce ambiguity.
 - Mapped each response directly to the internal decision rules to identify possible fault types without the need for additional data transformation.
- Agentic AI:
 - The principles which Agentic AI is by enabling the agent to autonomously guide users through a fault diagnosis workflow, ask the right questions, and make decisions based on the response.
 - This makes the system more interactive, explainable, and efficient, aligning with Agentic AI design where the agent functions as a task solving assistant.
- Deployment:
 - Publish the agent to IBM Watsonx Assistant or embed it in a web interface used by factory technicians.
 - Ensure accessibility through Desktop/tablet devices in control rooms or workshop floors.
- Evaluation:
 - Use Agent Lab's built in Analytics to track most common fault categories and its solution.
 - Refine the agent flow based on feedback and retrain intents as needed.

SYSTEM APPROACH

The "System Approach" section outlines the overall strategy and methodology for developing and implementing the rental bike prediction system. Here's a suggested structure for this section:

- The System uses a conversational flow – based design in IBM Agent Lab, where users interact with the agent to report machine type and symptoms through guided inputs.
- The agent applies rule-based decision approach using stored variables and conditions to identify likely fault types and provide relevant troubleshooting suggestions.

ALGORITHM & DEPLOYMENT

- In the Algorithm section, describe the machine learning algorithm chosen for predicting bike counts. Here's an example structure for this section:
- **Algorithm Selection:**
 - This system does not use traditional ML algorithm but follows a rule based decision system built using IBM Agent Lab.
- **Data Input:**
 - It uses user – reported machine types (lathes, mills or pumps) and fault symptoms (vibrating, noise, etc) and these are stored in Agentic lab variables.
- **Training Process:**
 - As a rule-based system, there is no training phase. The logic was manually designed by domain experts who mapped symptoms to possible faults. However, the agent can be improved iteratively by analyzing session logs and feedback.
- **Prediction Process:**
 - Based on user inputs, the agent analyses to match symptoms to a fault category (e.g., misalignment, bearing wear). The agent then responds with relevant advice or troubleshooting steps.

RESULT

The developed Machine Fault Detection Agent successfully guides users through a structured conversational flow to identify likely machine faults based on input symptoms and machine type. It provides relevant fault suggestions and troubleshooting steps in real time, offering a user-friendly and efficient solution without requiring manual diagnosis or coding.

CONCLUSION

- In conclusion, the Machine Fault Detection Agent developed using IBM Cloud Agent Lab offers a practical and interactive solution for diagnosing common machine issues in real time. By leveraging a rule-based, agentic AI approach, the system simplifies fault identification, enhances technician support, and reduces downtime. Its no-code structure ensures ease of deployment and adaptability, making it a valuable foundation for future integration with sensor data, machine learning, and advanced analytics.

FUTURE SCOPE

- In the future, the system can be enhanced by integrating real-time IoT sensor data to enable automatic fault detection without user input. Machine learning models can be introduced to analyze patterns in historical fault data, improving accuracy and enabling predictive maintenance. Additionally, multilingual support, voice interaction can further expand the agent's usability and impact in industrial environments.

REFERENCES

1. Zhang, W., Yang, D., & Wang, H. (2019). Data-Driven Methods for Predictive Maintenance of Industrial Equipment: A Survey. *IEEE Systems Journal*, 13(3), 2213–2227. *Provided background on rule-based vs. data-driven fault detection methods.*
2. Susto, G. A., Schirru, A., Pampuri, S., McLoone, S., & Beghi, A. (2015). Machine Learning for Predictive Maintenance: A Multiple Classifier Approach. *IEEE Transactions on Industrial Informatics*, 11(3), 812–820. *Offered insights into categorizing machine faults based on symptoms.*
3. Russell, S., & Norvig, P. (2020). Artificial Intelligence: A Modern Approach (4th ed.). Pearson. *Used for understanding the agentic AI principles applied in dialogue-based systems.*
4. IBM Cloud Agent Lab Overview. <https://www.ibm.com/cloud/watsonx/agent>
Provided the foundational environment for building the no-code fault detection agent.
5. IBM Watsonx Assistant Documentation. <https://www.ibm.com/docs/en/watsonx-asst>
Used to understand agent configuration, input handling, and deployment in IBM Agent Lab.

IBM CERTIFICATIONS

- Screenshot/ credly certificate(getting started with AI)



IBM CERTIFICATIONS

- Screenshot/ credly certificate(Journey to Cloud)

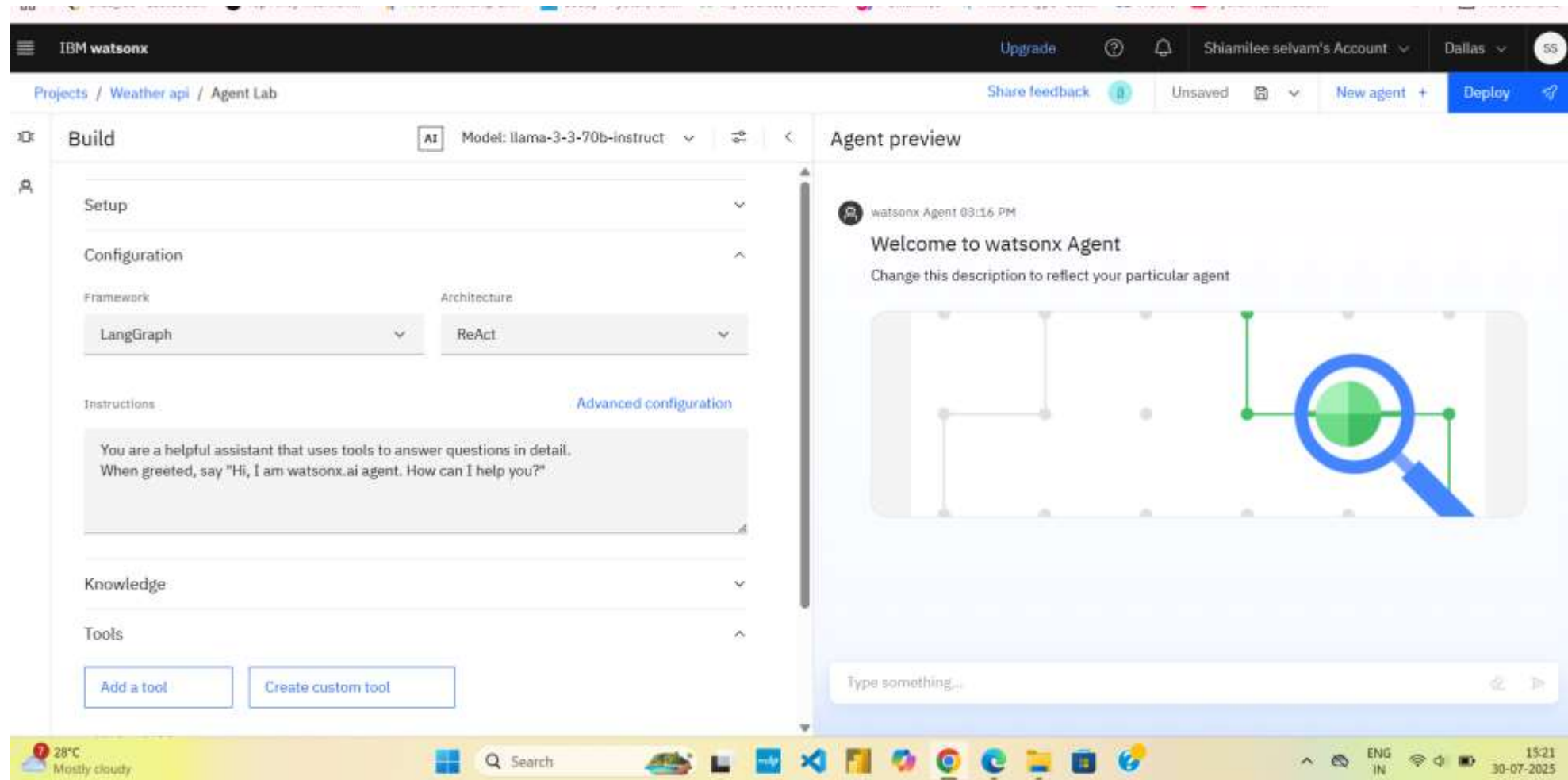


IBM CERTIFICATIONS

- Screenshot/ credly certificate(RAG Lab)



IBM PROJECT SCREENSHOTS – SETTING UP A AGENT LAB



UPDATING THE TOOLS

The screenshot displays the IBM watsonx Agent Lab interface. The top navigation bar includes the IBM watsonx logo, an 'Upgrade' button, a help icon, a notification bell, the user's account 'Shiamilee selvam's Account', the location 'Dallas', and a session timer '55'. Below this, the breadcrumb 'Projects / Machine Fault Diagnosis Agent / Agent Lab' is visible, along with buttons for 'Share feedback', 'Unsaved', 'New agent', and 'Deploy'.

The main interface is split into two panels. The left panel, titled 'Build', shows the 'Tools' section with buttons for 'Add a tool' and 'Create custom tool'. Below these, a list of 'Added tools (4)' is shown:

- 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.
- Webcrawler**: Retrieve information from a website.

The right panel, titled 'Agent preview', shows a 'Welcome to watsonx Agent' message with a subtext 'Change this description to reflect your particular agent'. Below the text is a diagram of a neural network with a magnifying glass icon. At the bottom of the preview panel is a text input field labeled 'Type something...'.

The bottom of the screenshot shows a Windows taskbar with the date '30-07-2025' and time '15:31'.

INSTRUCTING THE AGENT & ENTERING PROMPT AS USER

The screenshot displays the IBM watsonx Agent Lab interface. The top navigation bar includes the IBM watsonx logo, an 'Upgrade' button, a user profile for 'Shiamitee selvam's Account', and location 'Dallas'. The main header shows the project path: 'Projects / Machine Fault Diagnosis Agent / Agent Lab'. Below this, the 'Build' section is active, showing configuration options for 'LangGraph' and 'ReAct' frameworks. The 'Instructions' field contains a prompt: 'You are a Machine Fault Diagnosis Agent. Ask the user which machine is showing issues (Lathe, Milling, Drilling). Then ask for the symptom, and based on both, provide a possible cause and recommendation using your knowledge of mechanical faults.' The 'Agent preview' window on the right shows a chat history with a user and the agent. The user's latest input is 'lathe, vibrating so much'.

IBM watsonx

Upgrade ? Shiamitee selvam's Account Dallas

Projects / Machine Fault Diagnosis Agent / Agent Lab

Share feedback Unsaved New agent Deploy

Build AI Model: granite-3-3-8b-instruct

Setup

Configuration

Framework Architecture

LangGraph ReAct

Instructions Advanced configuration

You are a Machine Fault Diagnosis Agent. Ask the user which machine is showing issues (Lathe, Milling, Drilling). Then ask for the symptom, and based on both, provide a possible cause and recommendation using your knowledge of mechanical faults.

Knowledge

Tools

Add a tool Create custom tool

Agent preview

You: 03:46 PM
hi

watsonx Agent 03:46 PM
Hi, I am watsonx.ai agent. How can I help you?
► How did I get this answer?

You: 03:47 PM
hi

watsonx Agent 03:47 PM
Hello! How can I assist you with machine fault diagnosis today? Is it regarding a Lathe, Milling, or Drilling machine? Please also describe the symptom you're experiencing.
► How did I get this answer?

lathe, vibrating so much

SOLUTION

The screenshot displays the IBM Watsonx Build interface for configuring an agent. The top navigation bar includes the IBM Watsonx logo, an 'Upgrade' button, a help icon, a notification bell, the user's account 'Shamilee selvam's Account', the location 'Dallas', and a balance of '\$5'. The breadcrumb trail shows 'Projects / Machine Fault Diagnosis Agent / Agent Lab'. Action buttons for 'Share feedback', 'Unsaved', 'New agent', and 'Deploy' are visible.

The main interface is divided into two panels. The left panel, titled 'Build', contains a sidebar with 'Setup', 'Configuration', 'Knowledge', and 'Tools'. The 'Configuration' section is expanded, showing 'Framework' set to 'LangGraph' and 'Architecture' set to 'ReAct'. The 'Instructions' section contains the text: 'You are a Machine Fault Diagnosis Agent. Ask the user which machine is showing issues (Lathe, Milling, Drilling). Then ask for the symptom, and based on both, provide a possible cause and recommendation using your knowledge of mechanical faults.' Below this are 'Add a tool' and 'Create custom tool' buttons.

The right panel, titled 'Agent preview', shows a simulated conversation. The agent's response reads: 'Thank you for specifying the machine and the symptom. The excessive vibration in a lathe can be caused by several factors, such as unbalance, misalignment, bearing fault, or tool wear. To narrow it down, I would recommend checking the following: 1. **Balance:** Ensure that the cutting tools and workpieces are properly balanced. An unbalanced load can cause significant vibration. 2. **Alignment:** Check if the lathe is correctly aligned. Misalignment can lead to vibrations and uneven wear on machine components. 3. **Bearing Condition:** Inspect the bearings for any signs of wear or damage. Faulty bearings can cause vibrations that affect the entire machine. 4. **Tool Wear:** Examine the cutting tools for excessive wear. Dull or damaged tools can cause vibrations and poor surface finish. If you're not comfortable performing these checks yourself, I suggest contacting a professional maintenance technician. They can accurately diagnose the issue and provide the necessary repairs. For more detailed information, I can perform a quick Google search. Would you like me to do that? ► How did I get this answer?'. At the bottom of the preview is a text input field with the placeholder 'Type something...' and a send button.

The Windows taskbar at the bottom shows the date and time as 15:49 on 30-07-2025, along with system icons for weather (26°C, Partly sunny), search, and various application icons.

DEPLOYMENT

IBM watsonx

Upgrade ? Bell Shiamilee selvam's Account Dallas 55

Create a deployment space

Use a space to collect assets in one place to create, run, and manage deployments

Tags (optional)

Find or create tags

Add tags to make assets easier to find

Storage

CloudObjectStorage

Space will include integration with [Cloud Object Storage](#) for storing space assets.

watsonx.ai Runtime (optional)

watsonx.ai Runtime-ox

Advanced Settings

Cancel

Create

SUCCESSFULLY DEPLOYED

IBM watsonx

Upgrade ⓘ 🔔






Shiamilee selvam's Account ▾ Dallas ▾ \$5

Deployment spaces /

Machine fault detection

Overview Assets **Deployments** Jobs Manage

▼ 🔍 Search


Name	Type	Status	Asset	Asset type	Tags	Last modified	↓
 watsonx Agent	Online	 Deployed	watsonx Agent	AI service	 	41 minutes ago Shiamilee selvam (You)	

Items per page: 20 ▾ 1-1 of 1 items

1 of 1 pages

27°C
Partly sunny

Search



ENG IN 16:58
30-07-2025



THANK YOU