CAPSTONE PROJECT

Predictive Maintenance of Industrial Machinery

Presented by:
Student Name: Sai Salunkhe
College Name: Yashwantrao Chavan Institute of Science Satara
Department of Computer Science

PROBLEME STATEMENT

Develop a predictive maintenance model for a fleet of industrial machines to anticipate failures before they occur. This project will involve analyzing sensor data from machinery to identify patterns that precede a failure. The goal is to create a classification model that can predict the type of failure (e.g., tool wear, heat dissipation, power failure) based on real-time operational data. This will enable proactive maintenance, reducing downtime and operational costs.

PROPOSED SYSTEM

1.Data Collection:
We used a Kaggle dataset containing real machine sensor readings like air temperature, process temperature, rotational speed, torque, and tool wear.

2.AutoAI Model Creation:
The dataset was uploaded into **IBM Watsonx.ai AutoAI**, which automatically:

- Preprocessed the data
- Tested multiple machine learning algorithms
- Selected the best-performing model (e.g., Random Forest)

3.Model Deployment:
The trained model was deployed as a web service using Watson Machine Learning on IBM Cloud. This allows us to input new sensor data and get predictions online.

4. Prediction Output:

When new input is provided, the system returns:

1. The predicted failure type (e.g., Tool Wear, Power Failure)
2. A confidence score (e.g., 100%)

This helps industries take action before machines break down, saving time and maintenance cost.

System Development Approach (Technology Used)

System Development Approach (Technology Used)

Platform: IBM Watsonx.ai (Auto AI)

Deployment: IBM Watson Machine Learning

Data Source: Kaggle (Predictive Maintenance Dataset)

Programming: Python (for data preprocessing)

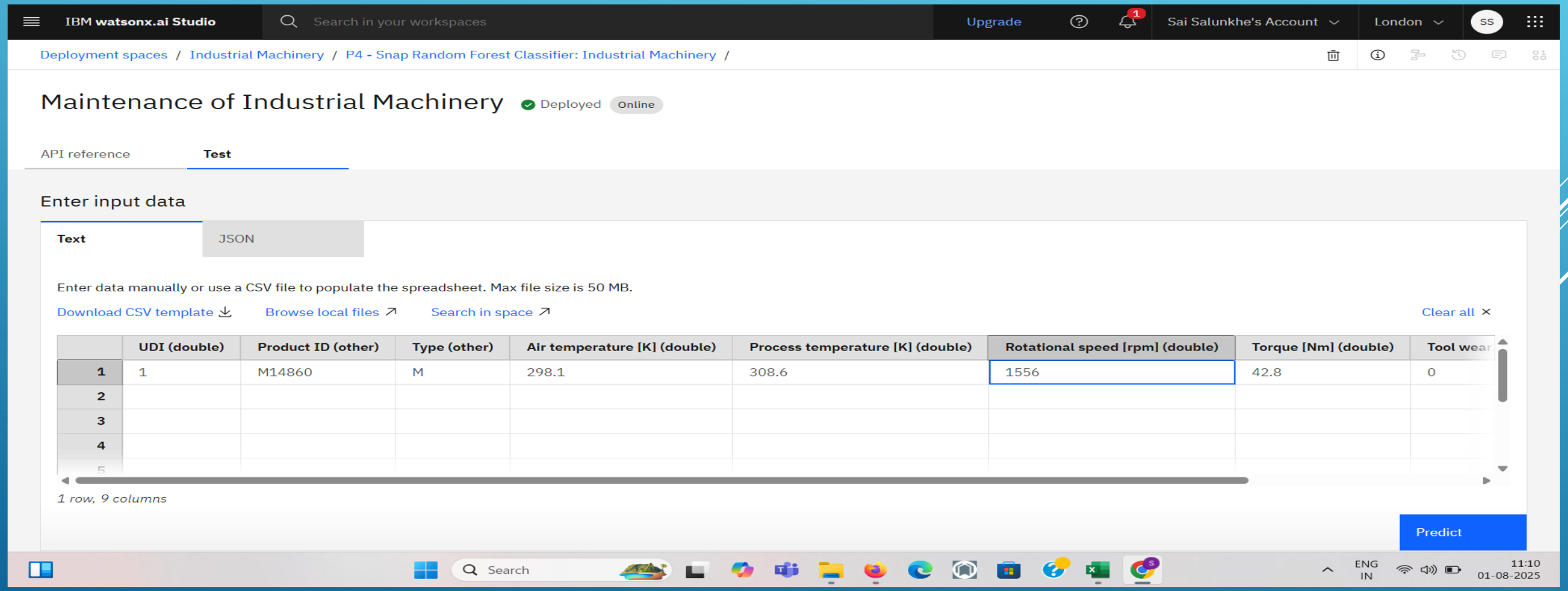
Deployment Type: Web API

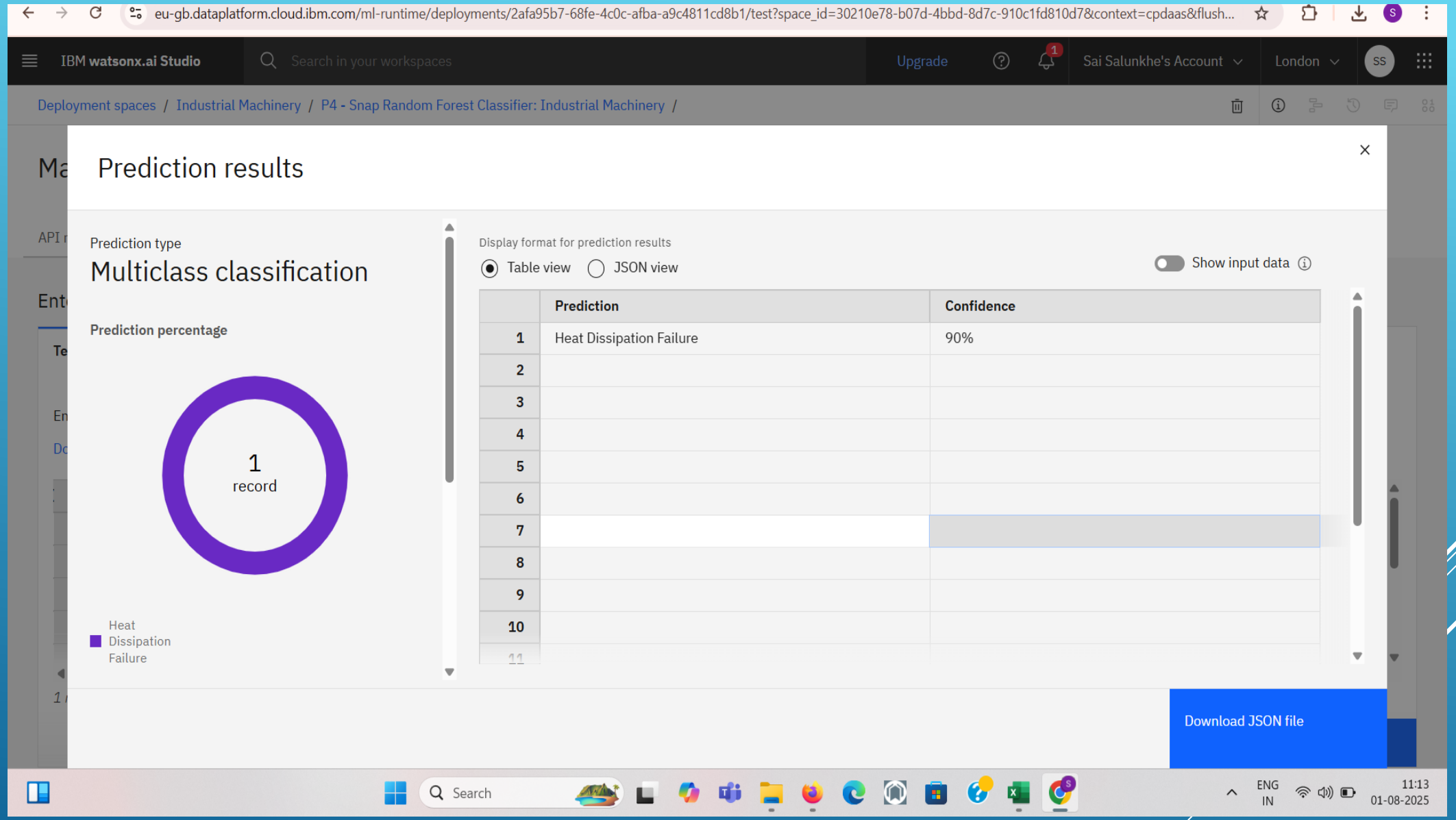
Algorithm & Deployment

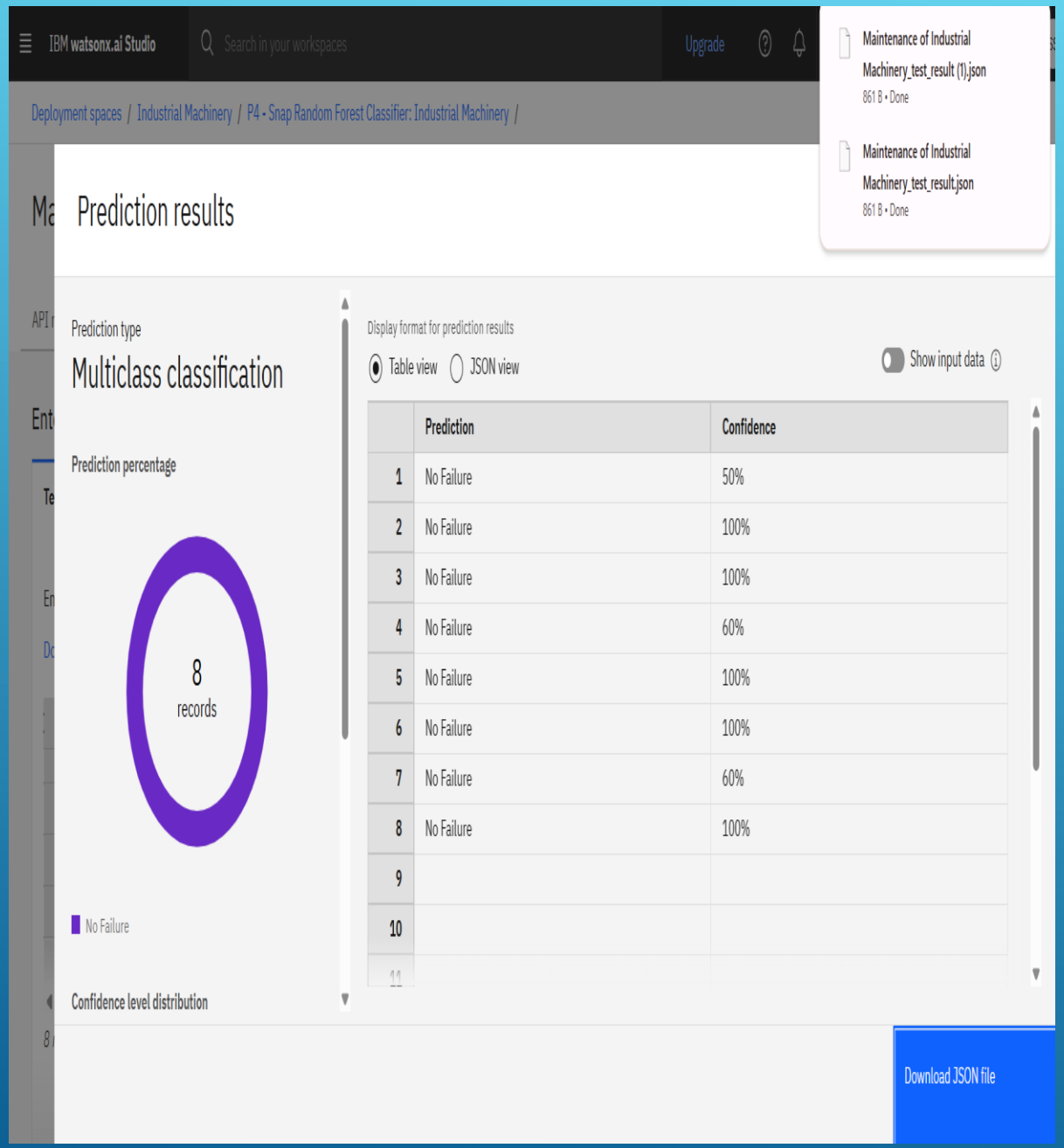
Algorithm Used: Random Forest Classifier (auto-selected by AutoAI)

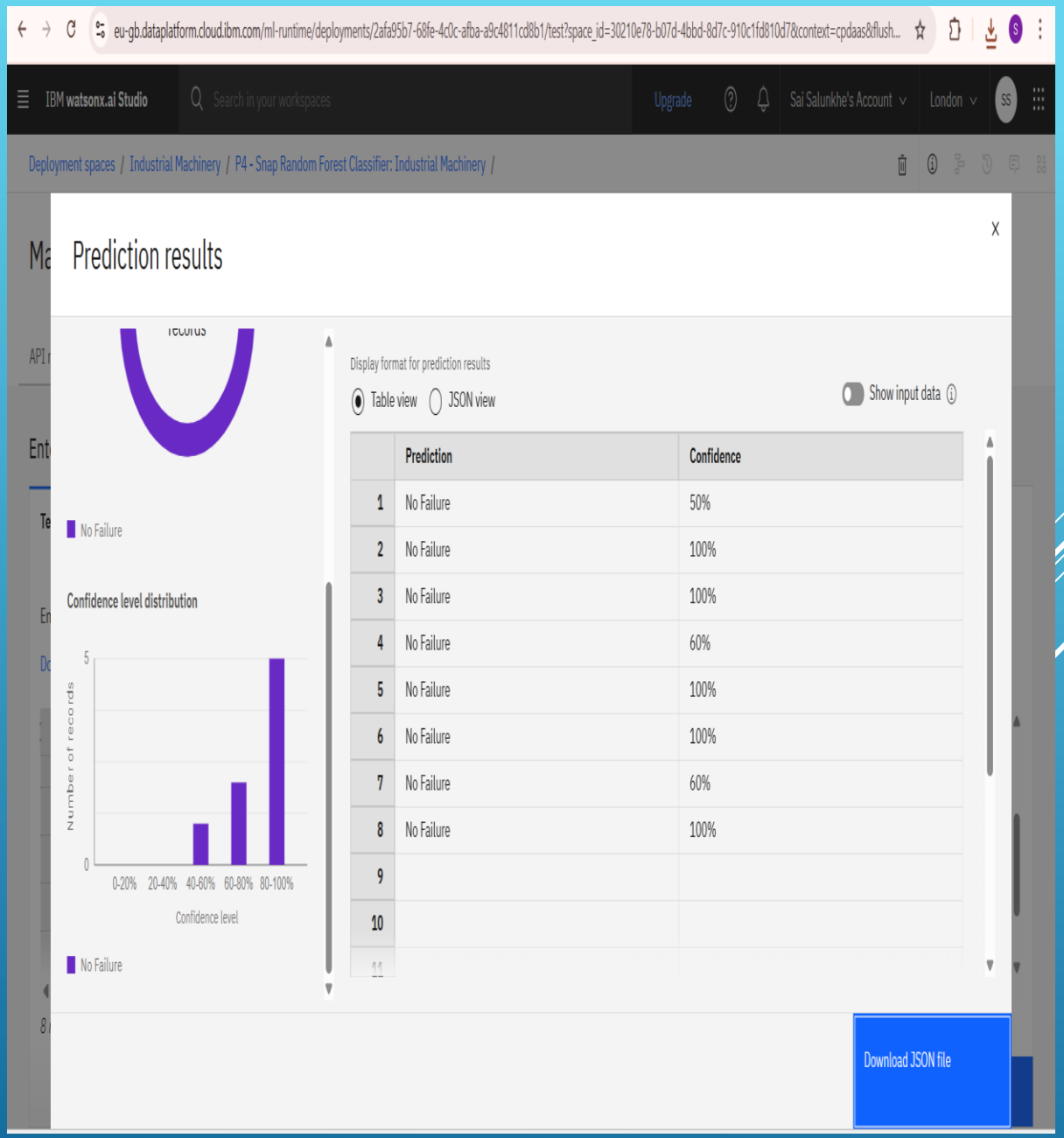
- AutoAI tested multiple models and selected the best based on accuracy.
- The model was deployed as a REST API on IBM Cloud.
- It accepts new sensor data and returns the predicted failure type with a confidence score.

RESULT


IBM watsonx.ai Studio
Search in your workspaces
Upgrade
Sai Salunkhe's Account
London
SS
Deployment spaces / Industrial Machinery / P4 - Snap Random Forest Classifier: Industrial Machinery /
Maintenance of Industrial Machinery
Deployed
Online
API reference
Test
Enter input data
Text
JSON
Enter data manually or use a CSV file to populate the spreadsheet. Max file size is 50 MB.
Download CSV template
Browse local files
Search in space
Clear all
UDI (double)
Product ID (other)
Type (other)
Air temperature [K] (double)
Process temperature [K] (double)
Rotational speed [rpm] (double)
Torque [Nm] (double)
Tool wear
1
1
M14860
M
298.1
308.6
1556
42.8
0
2
3
4
5
1 row, 9 columns
Predict
Search
ENG
IN
11:10
01-08-2025


eu-gb.dataplatform.cloud.ibm.com/ml-runtime/deployments/2afa95b7-68fe-4c0c-afba-a9c4811cd8b1/test?space_id=30210e78-b07d-4bbd-8d7c-910c1fd810d7&context=cpdaas&flush...
IBM watsonx.ai Studio
Search in your workspaces
Upgrade
Sai Salunkhe's Account
London
Deployment spaces / Industrial Machinery / P4 - Snap Random Forest Classifier: Industrial Machinery /
Prediction results
Prediction type
Multiclass classification
Prediction percentage
1
record
Heat Dissipation Failure
Display format for prediction results
Table view
JSON view
Show input data
Prediction
Confidence
1
Heat Dissipation Failure
90%
2
3
4
5
6
7
8
9
10
Download JSON file
Search
ENG
IN
11:13
01-08-2025


IBM watsonx.ai Studio
Search in your workspaces
Upgrade
Deployment spaces / Industrial Machinery / P4 - Snap Random Forest Classifier: Industrial Machinery /
Maintenance of Industrial Machinery_test_result (1).json
861 B • Done
Maintenance of Industrial Machinery_test_result.json
861 B • Done
Prediction results
Prediction type
Multiclass classification
Prediction percentage
8
records
No Failure
Confidence level distribution
Display format for prediction results
Table view
JSON view
Show input data
Prediction
Confidence
1 No Failure 50%
2 No Failure 100%
3 No Failure 100%
4 No Failure 60%
5 No Failure 100%
6 No Failure 100%
7 No Failure 60%
8 No Failure 100%
9
10
Download JSON file


eu-gb.dataplatform.cloud.ibm.com/ml-runtime/deployments/2afa95b7-68fe-4c0c-afba-a9c4811cd8b1/test?space_id=30210e78-b07d-4bbd-8d7c-910c1fd810d7&context=cpdaas&flush...
IBM watsonx.ai Studio
Search in your workspaces
Upgrade
Sai Salunkhe's Account
London
Deployment spaces / Industrial Machinery / P4 - Snap Random Forest Classifier: Industrial Machinery /
Prediction results
No Failure
Confidence level distribution
Number of records
5
0
0-20%
20-40%
40-60%
60-80%
80-100%
Confidence level
Display format for prediction results
Table view
JSON view
Show input data
Prediction
Confidence
1 No Failure 50%
2 No Failure 100%
3 No Failure 100%
4 No Failure 60%
5 No Failure 100%
6 No Failure 100%
7 No Failure 60%
8 No Failure 100%
9
10
Download JSON file

The model successfully predicts machine failures using real-time input data.
It helps prevent breakdowns, improves safety, and reduces cost and downtime.
AutoAI made the development easy and effective for industrial use.

FUTURE SCOPE

- Integrate real-time IoT sensor feeds
- Predict time-to-failure using time-series models
- Create alert systems (SMS/email)
- Deploy for multiple machine types or factories

REFERENCES

- Kaggle Dataset: Machine Predictive Maintenance
- IBM Watsonx.ai Documentation
- IBM Cloud Lite Platform

In recognition of the commitment to achieve professional excellence

Sai Salunkhe

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/e4a61766-d1c2-4b33-8024-6bffa7350494

IBM

In recognition of the commitment to achieve professional excellence

Sai Salunkhe

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution

Issued on: Jul 19, 2025
Issued by: IBM SkillsBuild

Verify: https://www.credly.com/badges/b10a0c52-6735-46e3-841f-4ea3caf68840

IBM

IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Sai Salunkhe

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 🙏