CAPSTONE PROJECT

PREDICTIVE MAINTENANCE OF INDUSTRIAL MACHINERY

Presented By:
Student Name- Sejal Arvind Mane
College Name- Government Collage of Engineering Karad
Department- Information Technology

edunet foundation

OUTLINE

- Problem Statement
- Proposed System/Solution
- System Development Approach
- Algorithm & Deployment
- Result (Output Image)
- Conclusion
- Future Scope
- References

PROBLEM STATEMENT

Example: 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 SOLUTION

We propose a predictive maintenance system leveraging IBM Cloud services to anticipate machine failures using sensor data. The solution will involve collecting real-time operational data from industrial machines, preprocessing it using IBM Watson Studio, and training a classification model (e.g., Random Forest, XGBoost) to detect failure types like tool wear, heat dissipation, or power failure.

The trained model will be deployed using IBM Watson Machine Learning, enabling real-time predictions via API. Data will be stored and managed in IBM Cloud Object Storage, while IBM Cloud Monitoring will help track system performance. This proactive approach will minimize downtime, reduce maintenance costs, and enhance operational efficiency across the fleet.

SYSTEM APPROACH

The “System Approach” section outlines the overall strategy and methodology for developing and implementing the predective maintenance of industrial machinery. Here’s a suggested structure for this section:

System requirements:

IBM Cloud(mandatory)

IBM Watson studio for model development and deployment

IBM cloud object storage for dataset handling

ALGORITHM & DEPLOYMENT

- Algorithm Selection:

  Snap Random Forest Classifier

- Data Input:

  UDI, Product ID, Type, Air temperature [K], Process temperature [K], Rotational speed [rpm], Torque [Nm], Tool wear [min], Target, Failure Type

- Training Process:

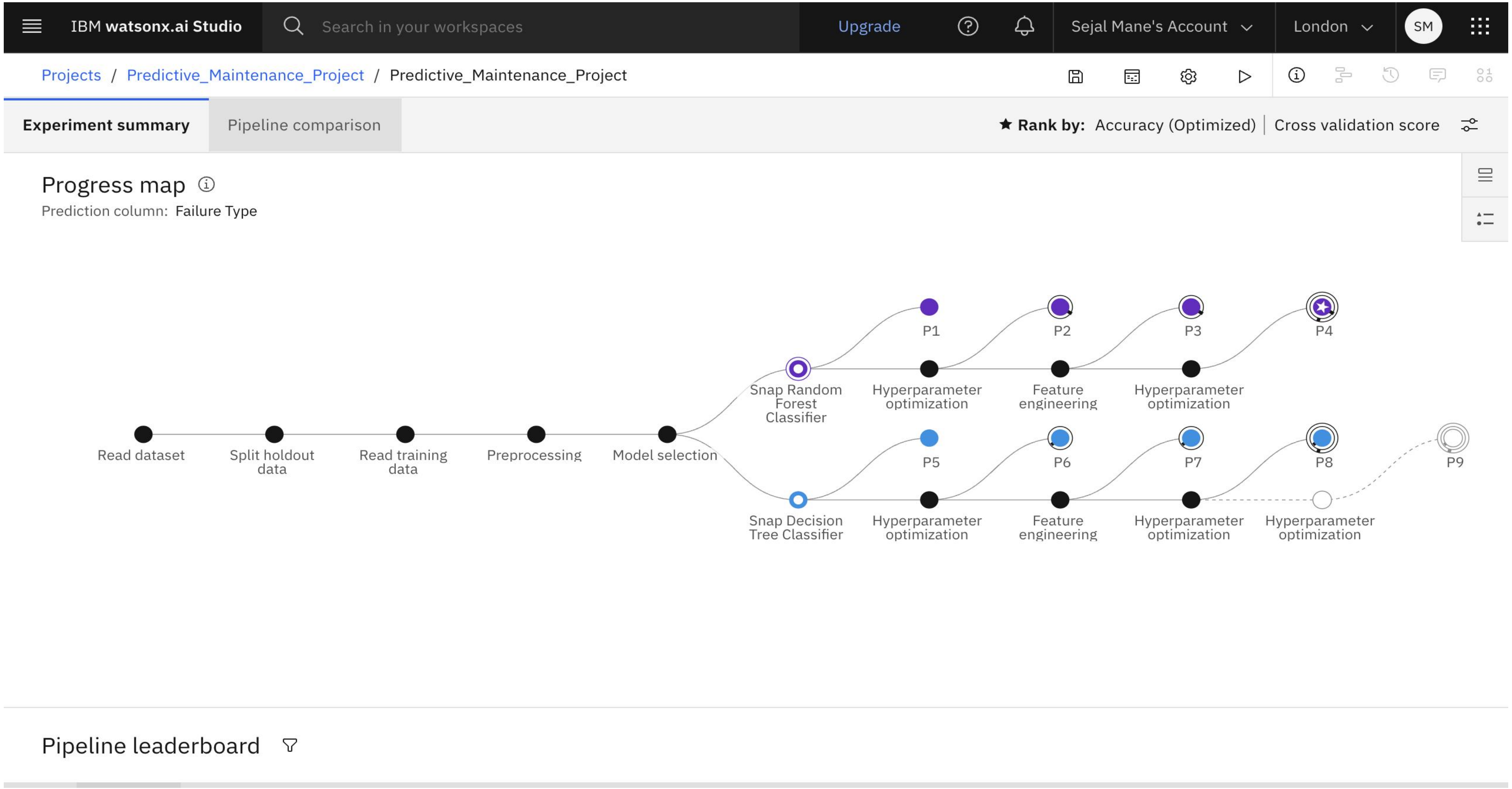
  Supervised learning using labeled fault type.

- Prediction Process:

  Model deployed on IBM Watson Studio with API endpoint for real-time predictions.

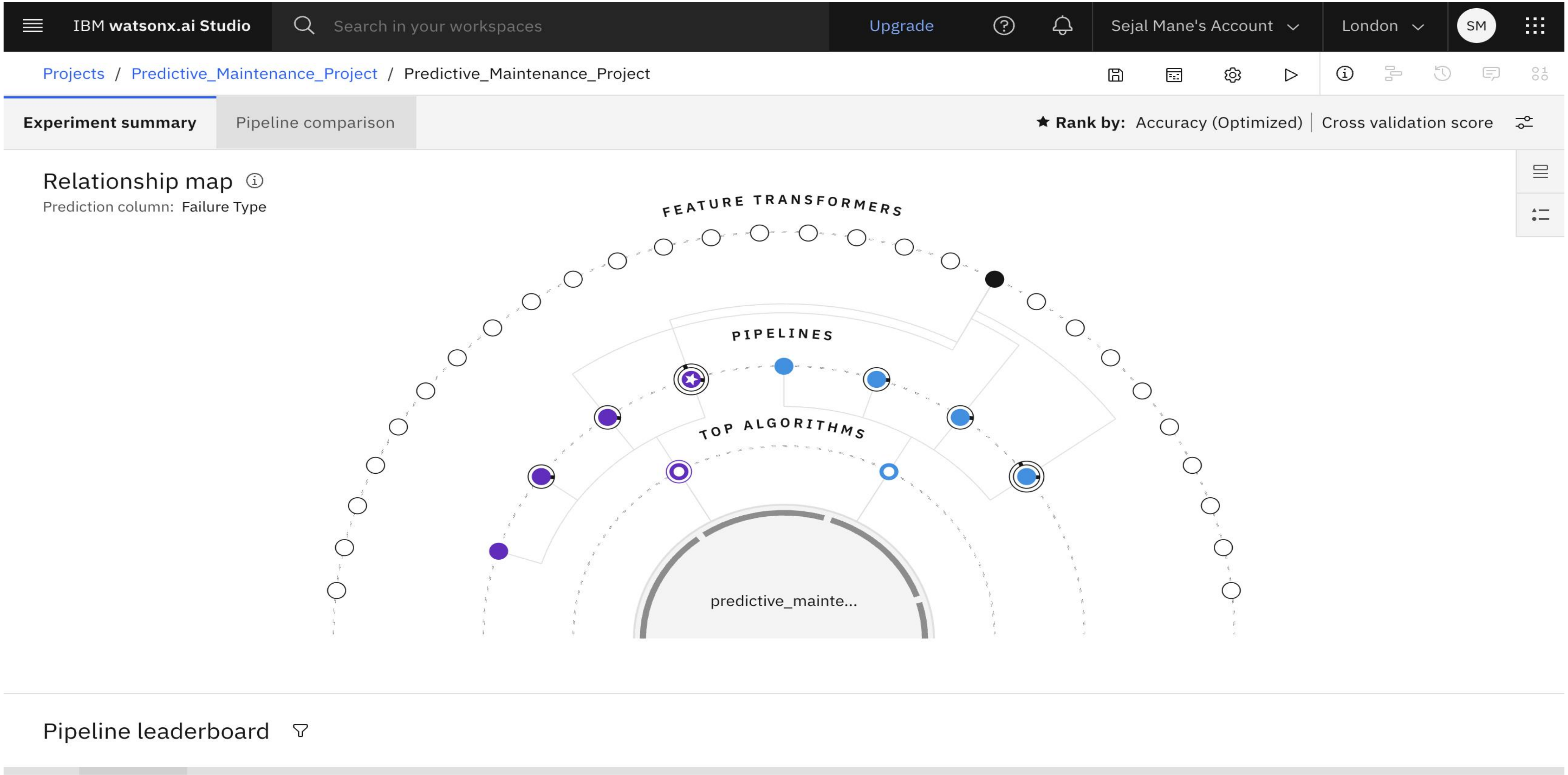
edunet foundation

RESULT



edunet foundation

RESULT

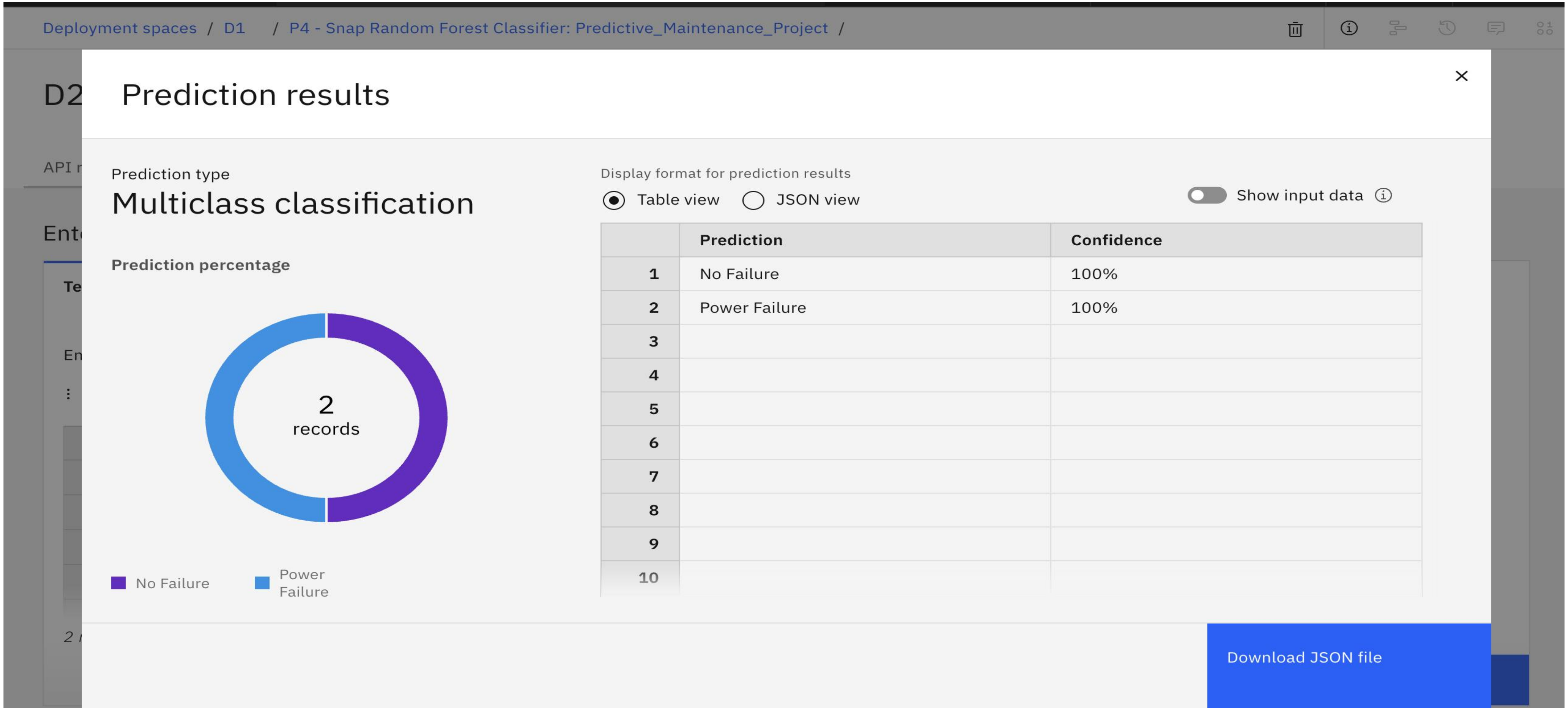

IBM watsonx.ai Studio
Search in your workspaces
Upgrade
Sejal Mane's Account
London
SM
Projects / Predictive_Maintenance_Project / Predictive_Maintenance_Project
Experiment summary
Pipeline comparison
Rank by: Accuracy (Optimized)
Cross validation score
Relationship map
Prediction column: Failure Type
FEATURE TRANSFORMERS
PIPELINES
TOP ALGORITHMS
predictive_mainte...
Pipeline leaderboard

RESULT

Pipeline leaderboard

	Rank	Name	Algorithm	Specialization	Accuracy (Optimized) Cross Validation	Enhancements	Build time
★	1	**Pipeline 4**	Snap Random Forest Classifier		0.995	HPO-1 FE HPO-2	00:00:39
	2	**Pipeline 3**	Snap Random Forest Classifier		0.995	HPO-1 FE	00:00:29
	3	**Pipeline 8**	Snap Decision Tree Classifier		0.994	HPO-1 FE HPO-2	00:00:26
	4	**Pipeline 2**	Snap Random Forest Classifier		0.994	HPO-1	00:00:07

RESULT


Deployment spaces / D1 / P4 - Snap Random Forest Classifier: Predictive_Maintenance_Project /
Prediction results
Prediction type
Multiclass classification
Prediction percentage
2
records
No Failure
Power Failure
Display format for prediction results
Table view
JSON view
Show input data
Prediction
Confidence
1
No Failure
100%
2
Power Failure
100%
3
4
5
6
7
8
9
10
Download JSON file

CONCLUSION

The predictive maintenance system developed in this project successfully leverages machine learning to anticipate failures in industrial machines using real-time sensor data. By implementing classification models such as Random Forest and XGBoost, the system can accurately detect potential issues like tool wear, heat dissipation, and power failure before they occur.

Deployment on IBM Cloud, using Watson Studio and Watson Machine Learning, ensures scalability, accessibility, and real-time monitoring. This proactive approach reduces unplanned downtime, improves maintenance scheduling, and lowers operational costs, ultimately leading to increased equipment reliability and productivity.

FUTURE SCOPE

The predictive maintenance system can be enhanced by integrating deep learning models like LSTM for time-series prediction and anomaly detection. It can also be expanded to support multiple machine types and larger datasets in real-time using edge computing. Integration with IoT dashboards and automated maintenance scheduling systems will further improve decision-making, scalability, and efficiency in industrial operations.

REFERENCES

- IBM Cloud Documentation – https://cloud.ibm.com/docs
- IBM Watson Studio – https://www.ibm.com/cloud/watson-studio
- IBM Watson Machine Learning – https://www.ibm.com/cloud/machine-learning
- Scikit-learn: Machine Learning in Python – https://scikit-learn.org/
- Predictive Maintenance using Machine Learning – IBM Blog

  https://www.ibm.com/blogs/internet-of-things/predictive-maintenance/
- Kaggle Datasets – Predictive Maintenance Dataset
  https://www.kaggle.com/datasets

IBM CERTIFICATIONS

In recognition of the commitment to achieve professional excellence

Getting Started with Artificial Intelligence
IBM SkillsBuild

Sejal Mane

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence

Issued on: Jul 16, 2025
Issued by: IBM SkillsBuild

Verify: https://www.credly.com/badges/5c75c2ab-4cd3-4f99-91ae-6ba2b32326fc

IBM

IBM CERTIFICATIONS

In recognition of the commitment to achieve professional excellence

Journey to Cloud: Envisioning Your Solution

IBM SkillsBuild

IBM

Sejal Mane

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/cdb72c6a-143d-42ff-a44e-df3c0cf65031

IBM

IBM CERTIFICATIONS

IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Sejal Mane

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 25 Jul 2025 (GMT)

Learning hours: 20 mins

THANK YOU