CAPSTONE PROJECT

PREDICTIVE MAINTENANCE OF INDUSTRIAL MACHINERY

Presented By:
1. Meet Korat - GEC Bhavnagar - IT

edunet foundation

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

Develop a predictive maintenance classification model using real-time sensor and operational data (such as air temperature, process temperature, rotational speed, torque, and tool wear) from industrial machinery. The objective is to predict the type of failure (e.g., Tool Wear, Heat Dissipation Failure, Power Failure, etc.) or detect if no failure is expected. This will enable proactive maintenance, reduce unexpected downtime, and optimize maintenance scheduling for industrial equipment.

PROPOSED SOLUTION

- Develop a machine learning model that predicts equipment failures in industrial machinery using real-time sensor data. The model will analyze parameters such as temperature, rotational speed, torque, and tool wear to predict the occurrence and type of machine failure. This classification system will enable proactive maintenance, reduce unplanned downtime, and improve operational efficiency.

- **Key Components** :
- Data Collection **:** Use the Kaggle dataset on predictive maintenance.
- Preprocessing **:** Clean and normalize the dataset.
- Model Training **:** Train a classification model (e.g., Decision Tree, Random Forest, or SVM).
- Evaluation **:** Validate the model using accuracy, precision, recall, and F1-score.

SYSTEM APPROACH

The "System Approach" section outlines the overall strategy and methodology for developing and implementing the power system fault detection and classification.

- **System requirements :**

  IBM Cloud (mandatory)
  IBM Watson Studio for model development and deployment
  IBM Cloud Object Storage for dataset handling

ALGORITHM & DEPLOYMENT

- **Algorithm Selection :**

  Random Forest Classifier (or SVM based on performance)

- **Data Input:**

  Air temperature, Process temperature, Rotational speed, Tool wear from the Dataset

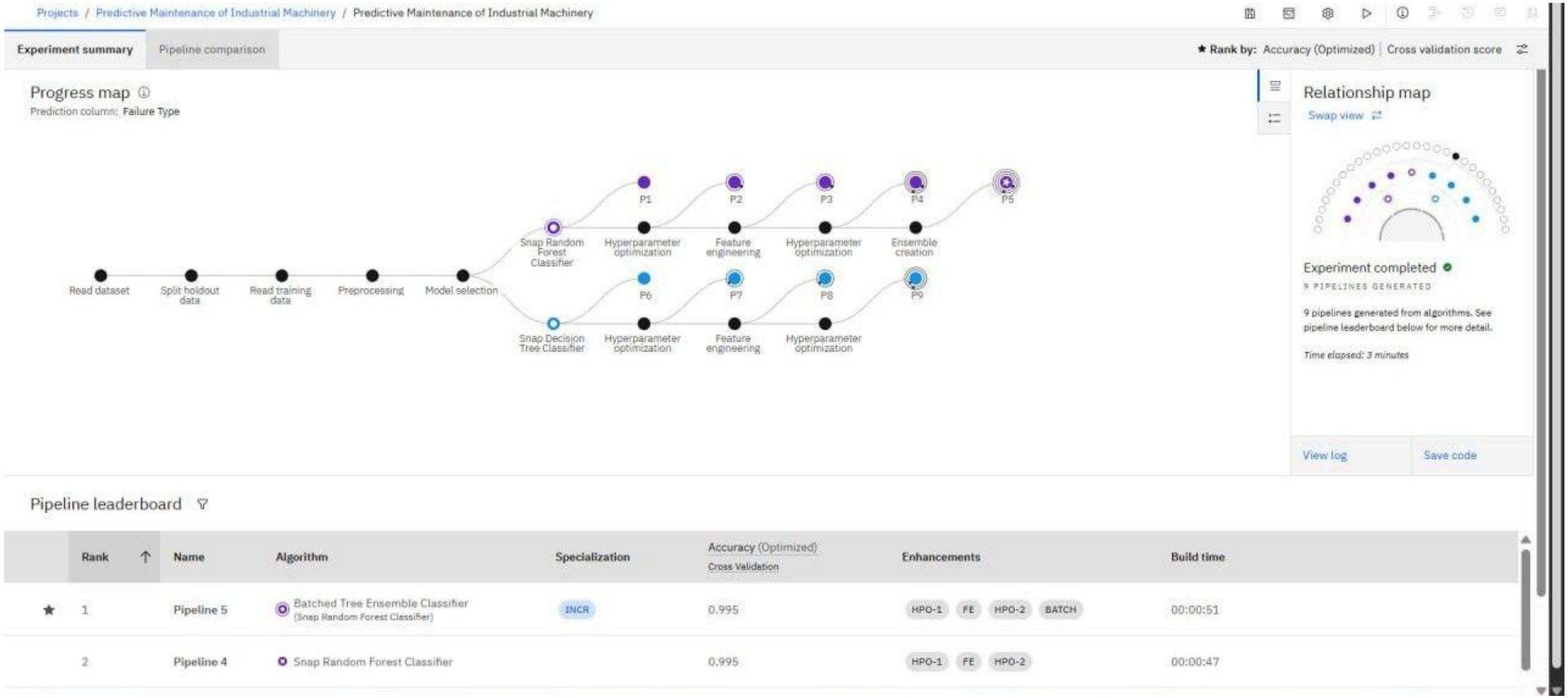
- **Training Process:**

  Supervised learning using labeled failure types

- **Prediction Process:**

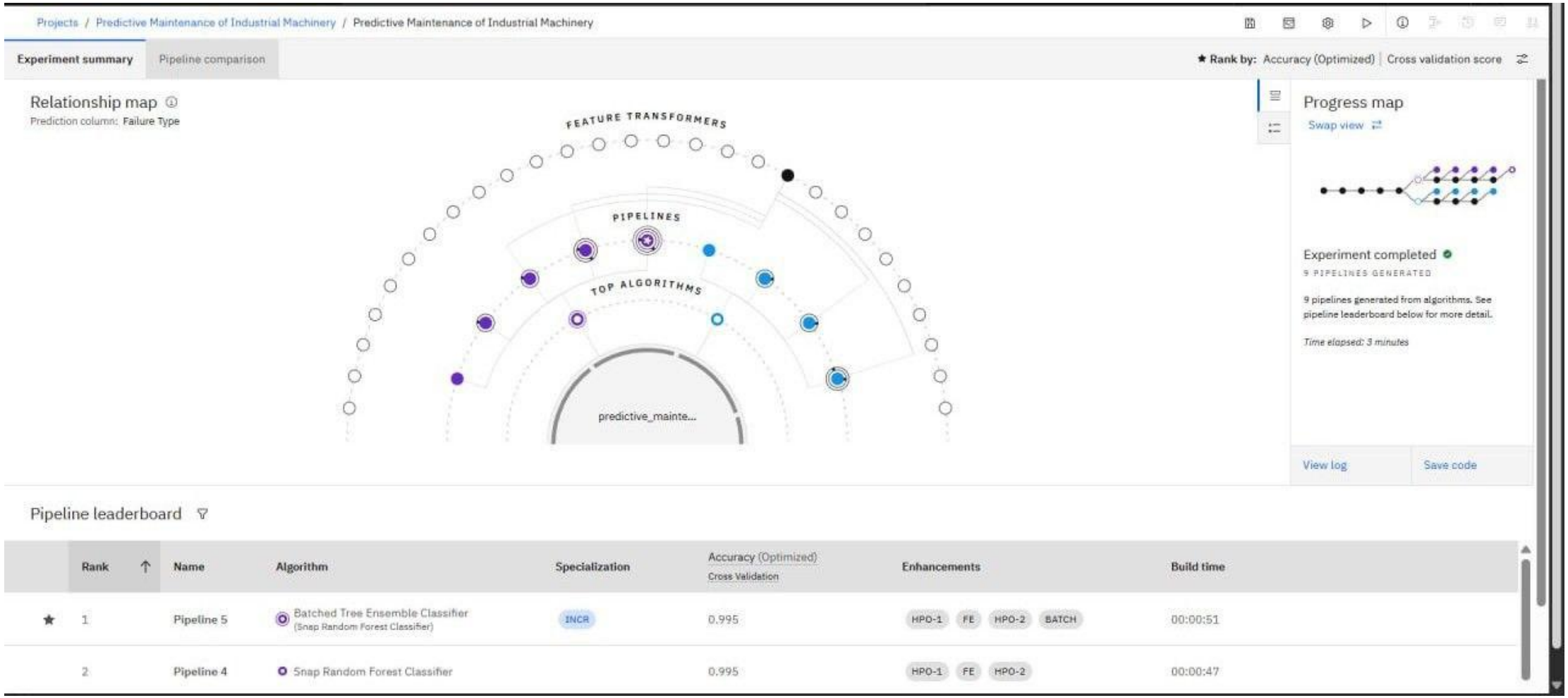
  Model deployed on IBM Watson Studio with API endpoint for real-time predictions

RESULT



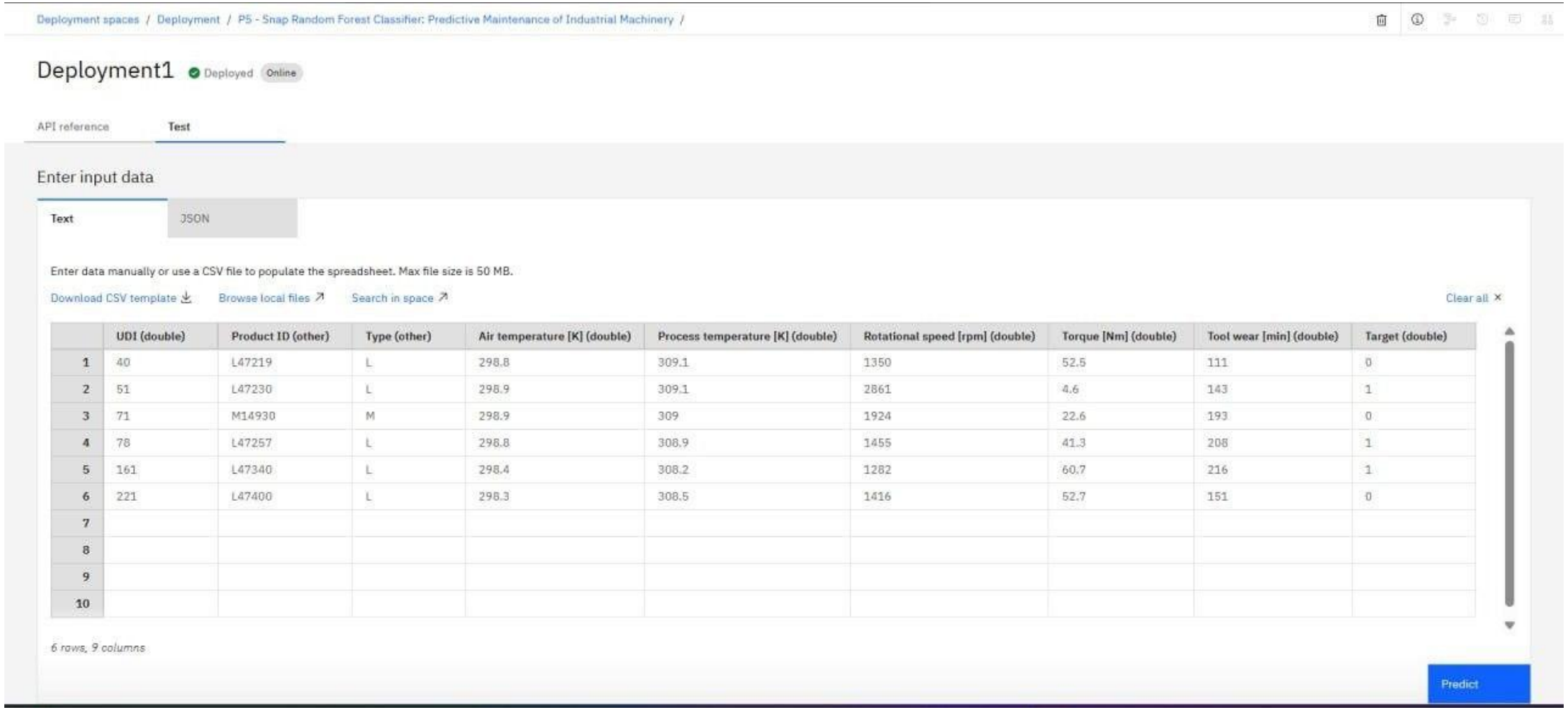
edunet foundation

RESULT



edunet foundation

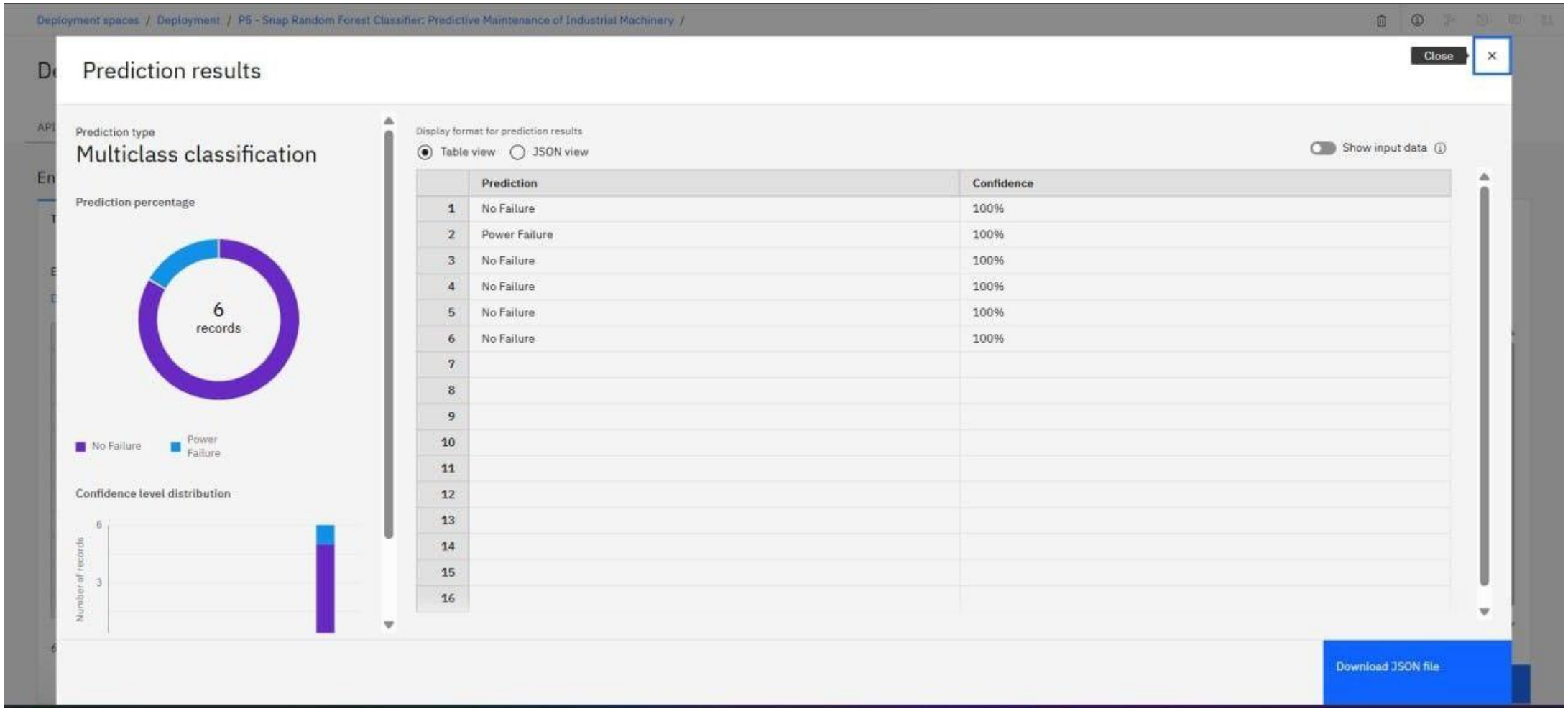
RESULT



	UDI (double)	Product ID (other)	Type (other)	Air temperature [K] (double)	Process temperature [K] (double)	Rotational speed [rpm] (double)	Torque [Nm] (double)	Tool wear [min] (double)	Target (double)
1	40	L47219	L	298.8	309.1	1350	52.5	111	0
2	51	L47230	L	298.9	309.1	2861	4.6	143	1
3	71	M14930	M	298.9	309	1924	22.6	193	0
4	78	L47257	L	298.8	308.9	1455	41.3	208	1
5	161	L47340	L	298.4	308.2	1282	60.7	216	1
6	221	L47400	L	298.3	308.5	1416	52.7	151	0
7									
8									
9									
10									

edunet foundation

RESULT



edunet foundation

CONCLUSION

- A machine learning model was successfully developed to predict machinery failures using real-time sensor data (temperature, speed, torque, tool wear, etc.).
- Random Forest classifier achieved high accuracy and proved effective for this multi-class classification task.
- The system demonstrates the potential for improving operational efficiency and reducing maintenance costs in industrial environments.

FUTURE SCOPE

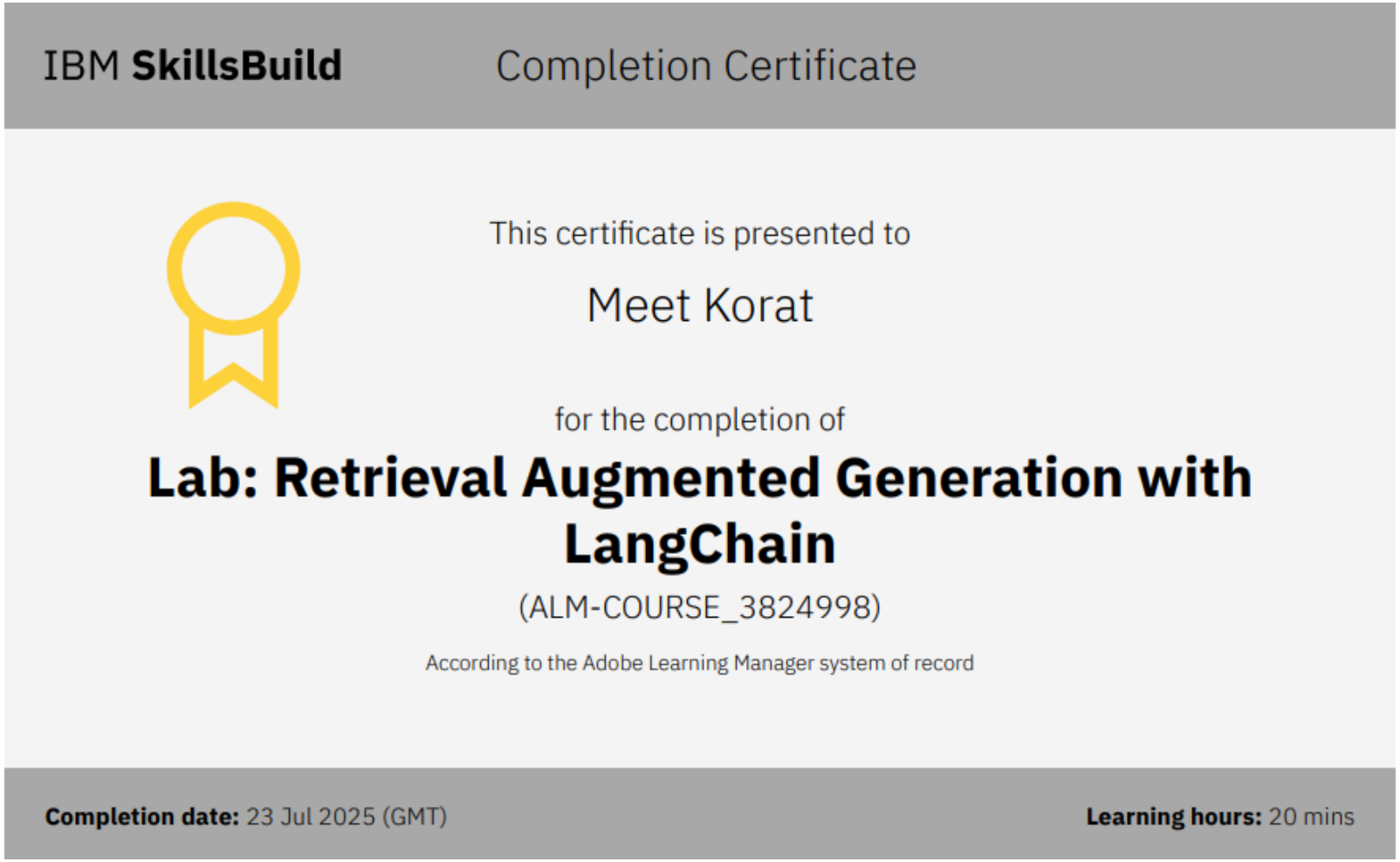
- Integrate the model into a real-time monitoring system for live failure predictions.
- Use deep learning techniques (e.g., LSTM, CNN) for better temporal pattern recognition.
- Expand the dataset with more machine types and environmental variables for greater generalizability.

IBM CERTIFICATIONS

IBM CERTIFICATIONS

edunet foundation

IBM CERTIFICATIONS



IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Meet Korat

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 23 Jul 2025 (GMT) **Learning hours:** 20 mins

THANK YOU

edunet foundation