CAPSTONE PROJECT

PREDICTIVE MAINTENANCE OF INDUSTRIAL MACHINERY

Presented By:

1. **Student Name - Manya Vasudeva**
2. **College Name - Jamia Hamdard University**
3. **Department – BTECH (CSE)**

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

To 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

Develop a machine learning model that classifies industrial machine failures using real-time sensor data. The model will analyze operational measurements to identify the type of failure quickly and accurately, enabling proactive maintenance and minimizing downtime.

Key Components:

- **Data Collection**: Gather data from the Kaggle dataset on industrial machines.
- **Preprocessing**: Clean, normalize, and engineer features from sensor data to improve model quality.
- **Model Training**: Train a classification model (e.g., Random Forest, XGBoost, or LSTM) to predict failure types.
- **Evaluation**: Validate the model using metrics like accuracy, precision, recall, and F1-score.

SYSTEM APPROACH

The "System Approach" section outlines the overall strategy and methodology for developing and deploying the predictive maintenance model for industrial machines.

- System requirements:
- **IBM Cloud :** for secure , scalable cloud infrastructure
- **IBM Watson Studio :** For building, training and deploying machine learning models.
- **IBM Cloud Storage**

ALGORITHM & DEPLOYMENT

- **Algorithm Selection:**

  Snap Random Forest Classifier

- **Data Input:**

  Sensor data such as torque, rotational speed, temperature, tool wear, and vibration readings from industrial machines

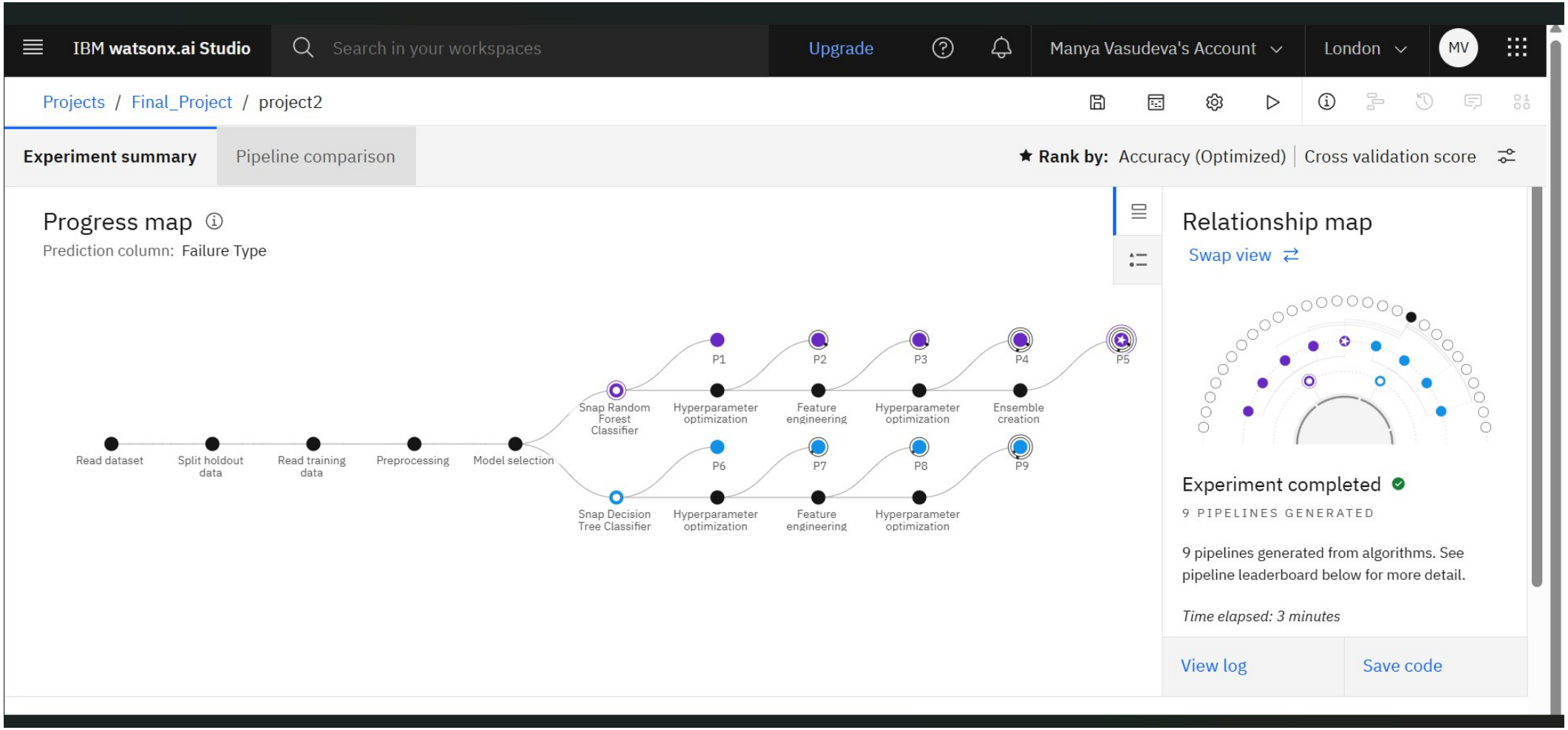
- **Training Process:**

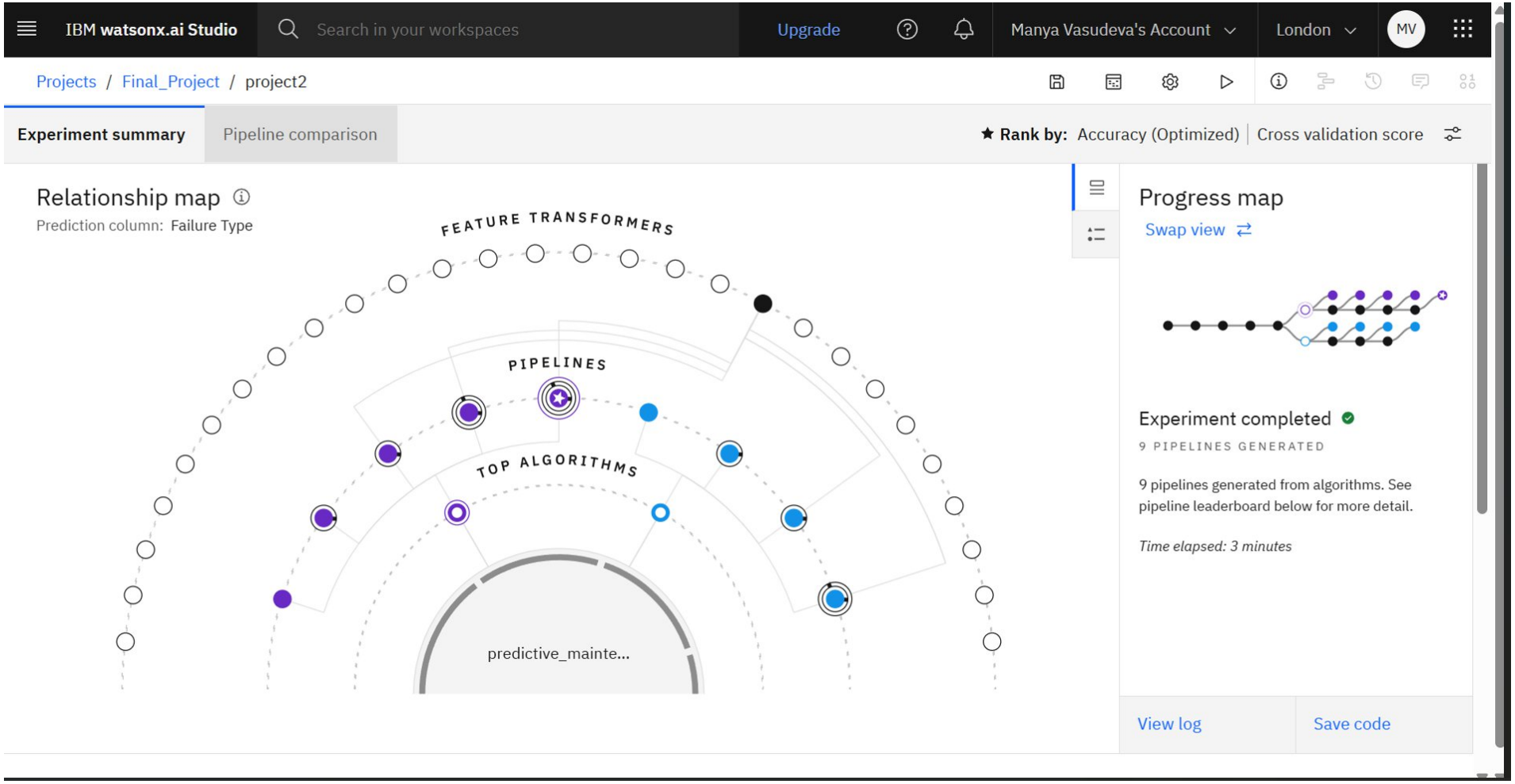
  Supervised learning using labeled data that indicates the type of machine failure .

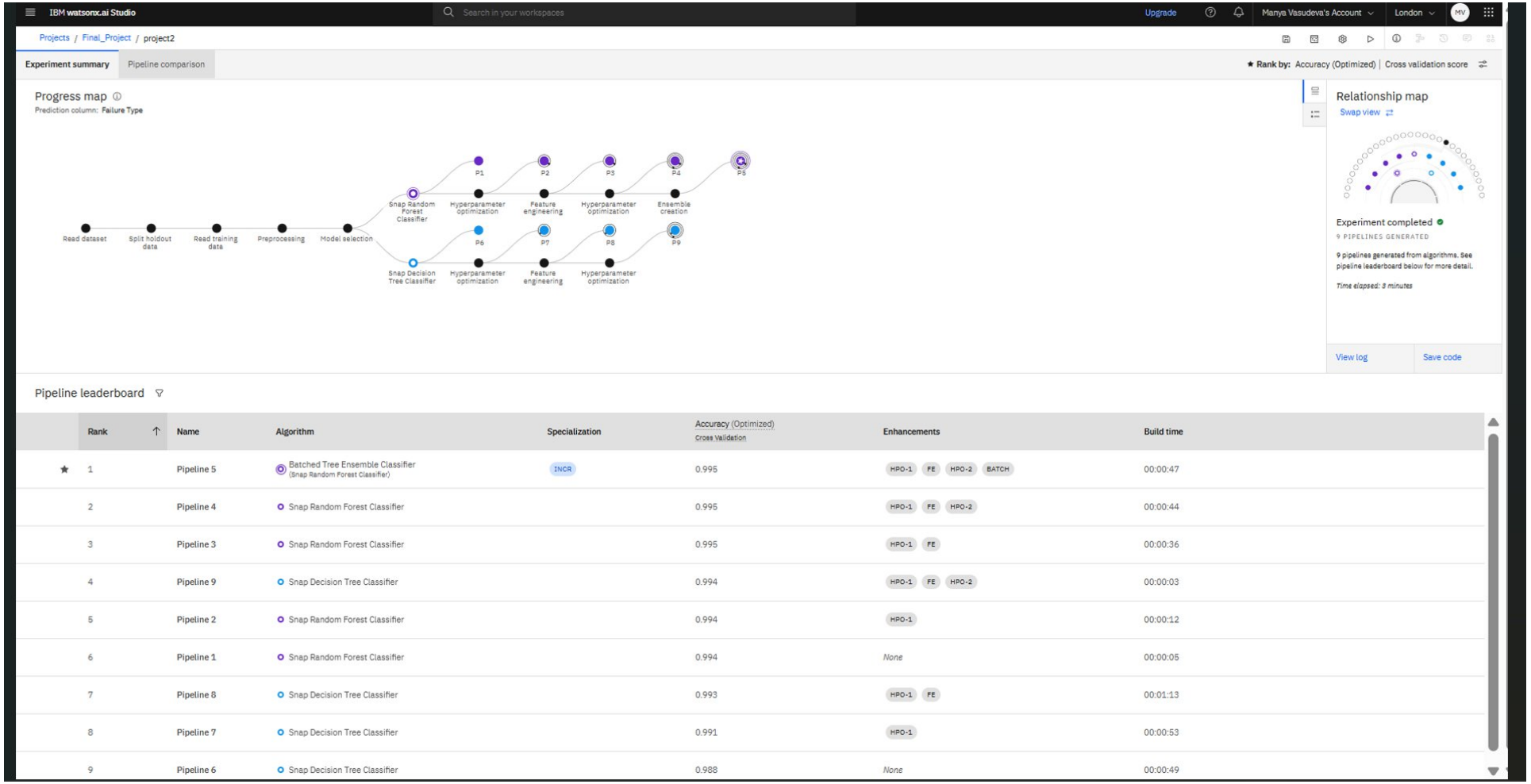
- **Prediction Process:**

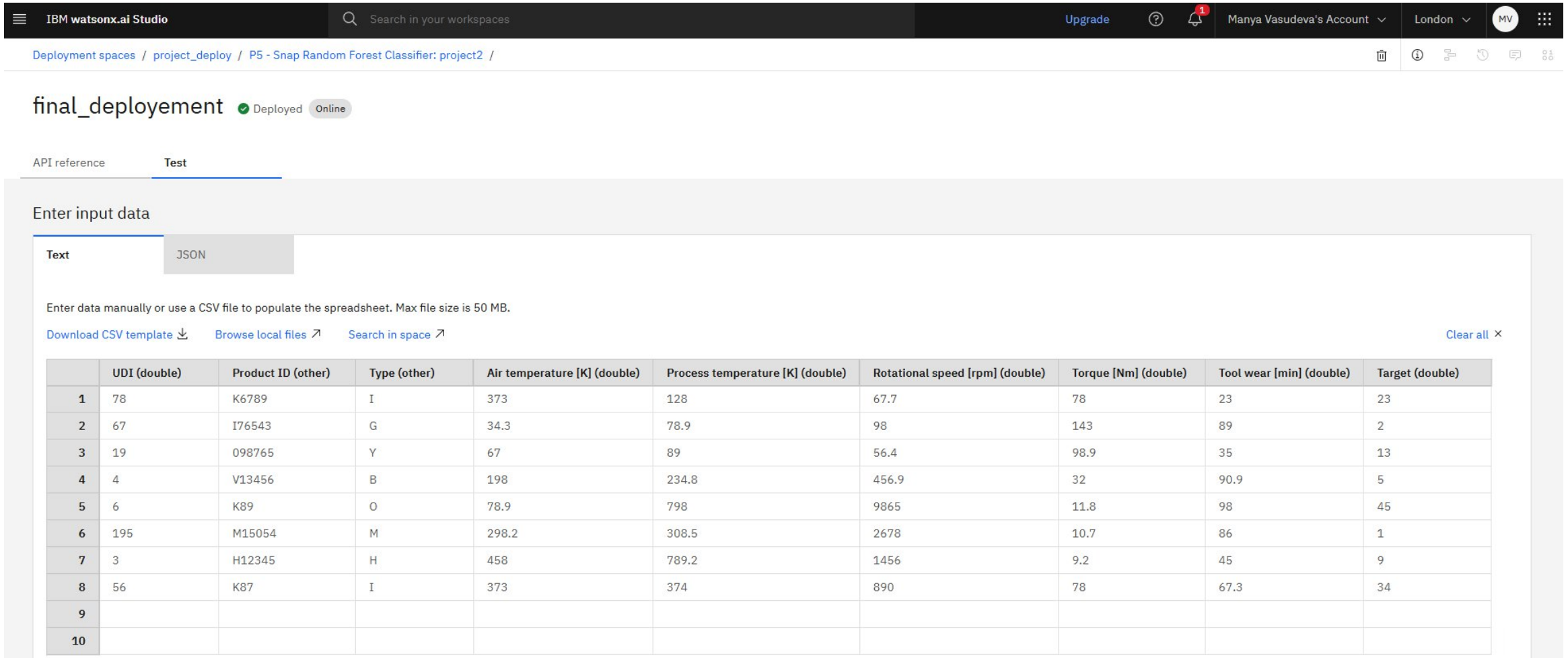
  Model deployed on IBM Watson Studio with a REST API endpoint to enable real-time failure prediction and proactive maintenance.

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	78	K6789	I	373	128	67.7	78	23	23
2	67	I76543	G	34.3	78.9	98	143	89	2
3	19	098765	Y	67	89	56.4	98.9	35	13
4	4	V13456	B	198	234.8	456.9	32	90.9	5
5	6	K89	O	78.9	798	9865	11.8	98	45
6	195	M15054	M	298.2	308.5	2678	10.7	86	1
7	3	H12345	H	458	789.2	1456	9.2	45	9
8	56	K87	I	373	374	890	78	67.3	34
9									
10									

Prediction results

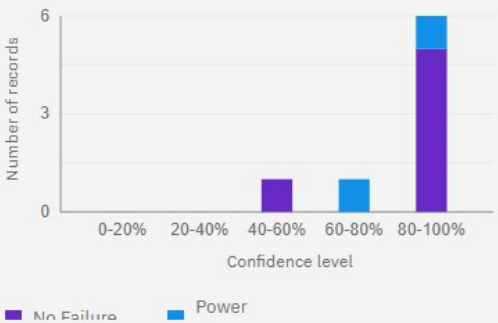
Prediction type

Multiclass classification

Prediction percentage

No Failure Power Failure

Confidence level distribution



No Failure Power

Display format for prediction results

(•) Table view ( ) JSON view

Show input data

	Prediction	Confidence
1	No Failure	90%
2	No Failure	90%
3	No Failure	100%
4	No Failure	50%
5	Power Failure	60%
6	Power Failure	100%
7	No Failure	80%
8	No Failure	90%
9		
10		
11		
12		
13		
14		
15		
16		

Download JSON file

CONCLUSION

The proposed predictive maintenance solution effectively utilizes machine learning to anticipate failures in industrial machines based on real-time sensor data. By classifying different failure types (e.g., tool wear, power failure, overstrain) with high accuracy, the model enables proactive maintenance, reducing unexpected downtime and operational costs.

Accurate failure prediction not only enhances machine reliability but also significantly optimizes maintenance schedules, leading to improved productivity and cost savings in industrial operations.

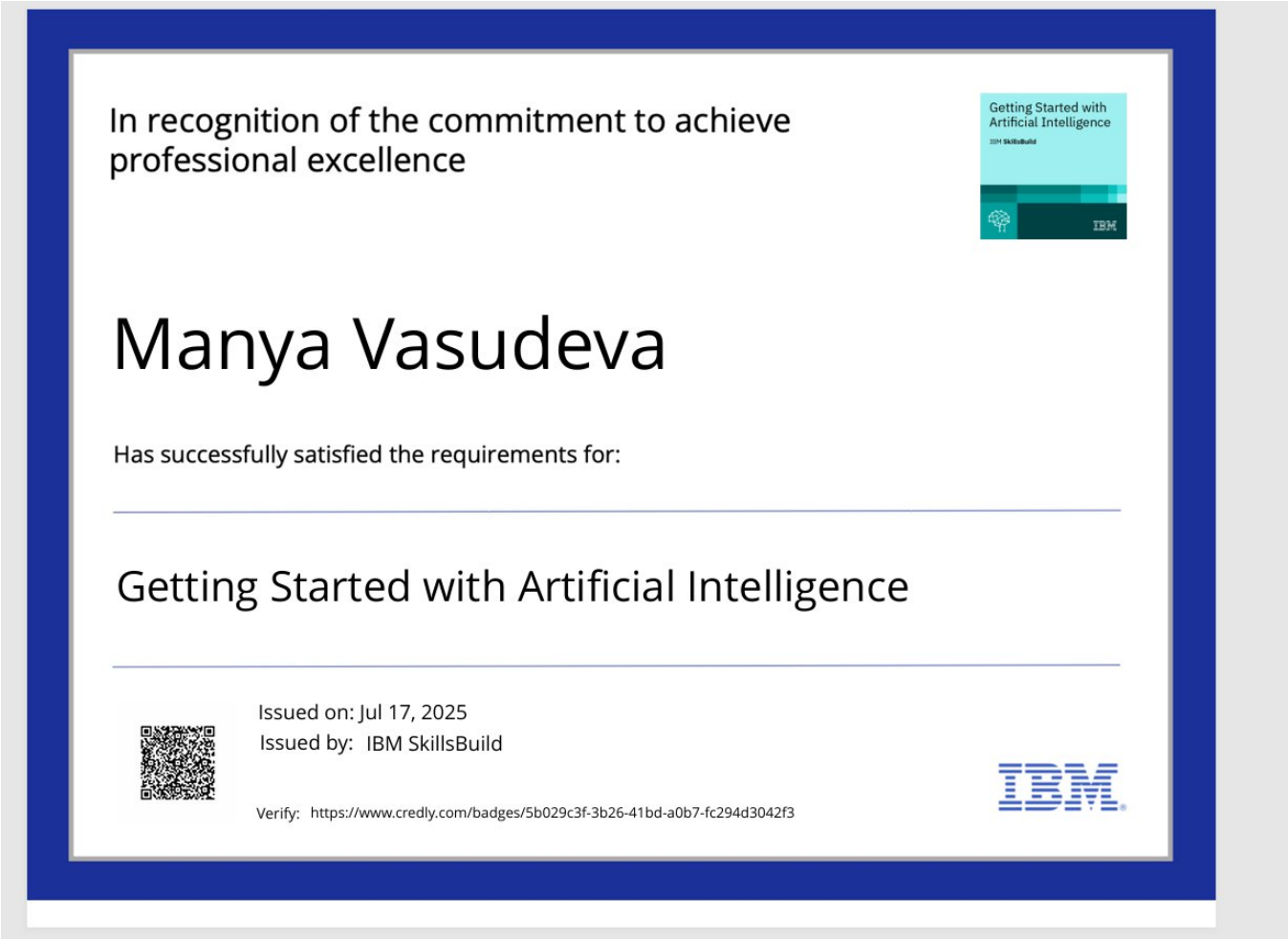
FUTURE SCOPE

- Integrate additional sensor and operational data
- Optimize algorithm for faster, more accurate predictions
- Scale system across multiple machines or sites
- Leverage edge computing for real-time decision-making
- Explore deep learning for complex failure patterns

REFERENCES

- https://www.ibm.com/cloud/watson-studio
- https://www.kaggle.com

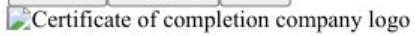
IBM CERTIFICATIONS



IBM CERTIFICATIONS

IBM CERTIFICATIONS

Print Share



Completion Certificate

This certificate is presented to

Manya Vasudeva

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

Navigated to: Completion Certificate

edunet foundation

IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Manya Vasudeva

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

edunet foundation

THANK YOU

edunet
foundation