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# **CAPSTONE PROJECT**

## **PREDICTIVE MAINTENANCE OF INDUSTRIAL MACHINERY**

**Presented By:**

**1. Pragathi Vaishnavi Bylam – Malla Reddy Engineering College For Women - CSE**

# 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

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.

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# PROPOSED SOLUTION

- We propose a machine learning-based predictive maintenance system that:
- Analyzes real-time sensor data (temperature, torque, speed, tool wear)
- Identifies early signs of potential machine failure
- Predicts the type of failure likely to occur
- Enables proactive maintenance, minimizing downtime and cost

# SYSTEM APPROACH

The "System Approach" section outlines the overall strategy and methodology for developing and implementing the Predictive Maintenance of Industrial Machinery. Here's a suggested structure for this section:

System requirements:

- IBM Watson Studio – For building, training, and testing models
- IBM Cloud Object Storage – To store datasets
- IBM AutoAI / Jupyter Notebooks – For automated or custom model creation
- IBM Watson Machine Learning – For model deployment

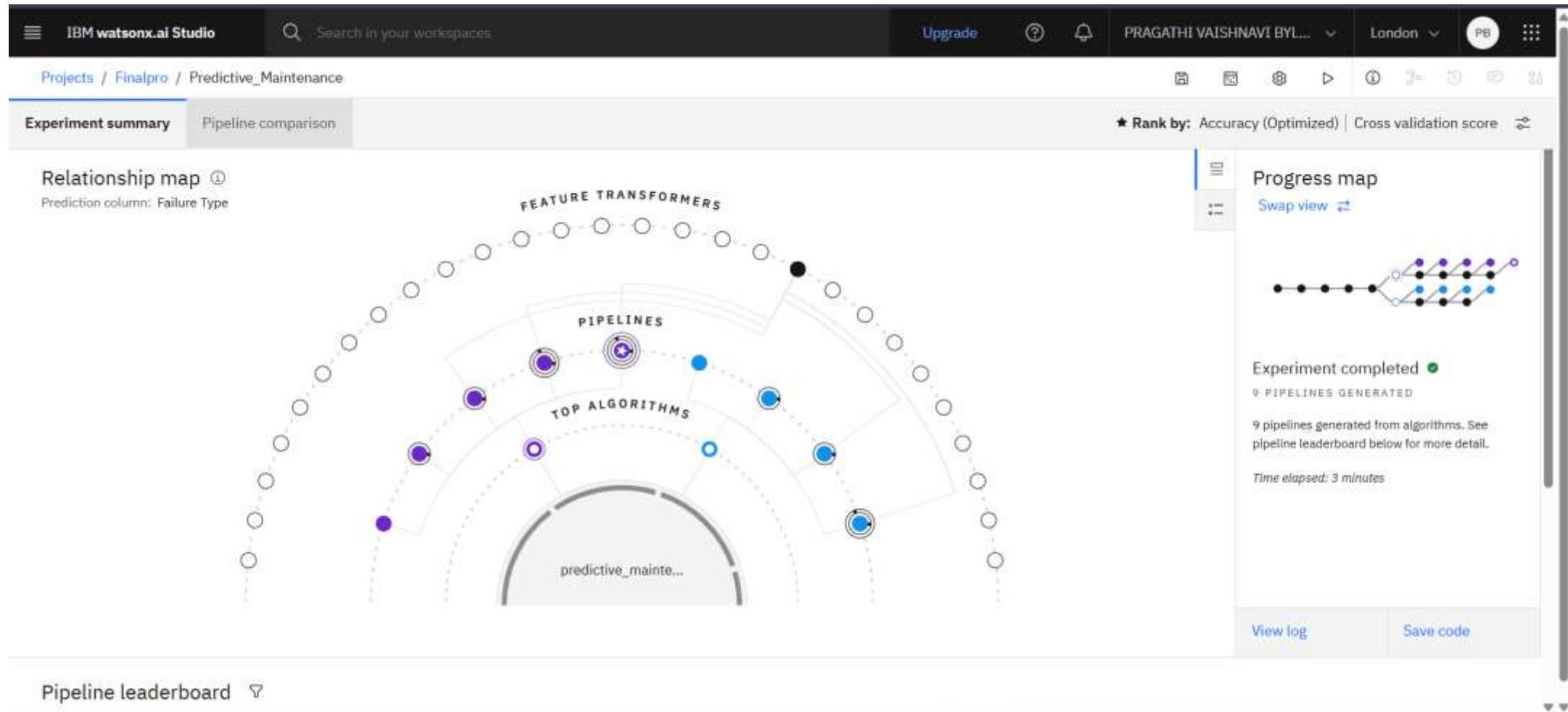
# ALGORITHM & DEPLOYMENT

- For predicting the type of failure based on sensor data, the following machine learning classification algorithms were explored:
- Random Forest Classifier: Gave high accuracy and robustness to overfitting
- XGBoost: Offered optimized performance on structured tabular data
- Logistic Regression: Used for baseline comparison
- Support Vector Machines (SVM): Evaluated for precision and generalization
- The final model was selected based on highest accuracy, F1-score, and precision-recall balance.

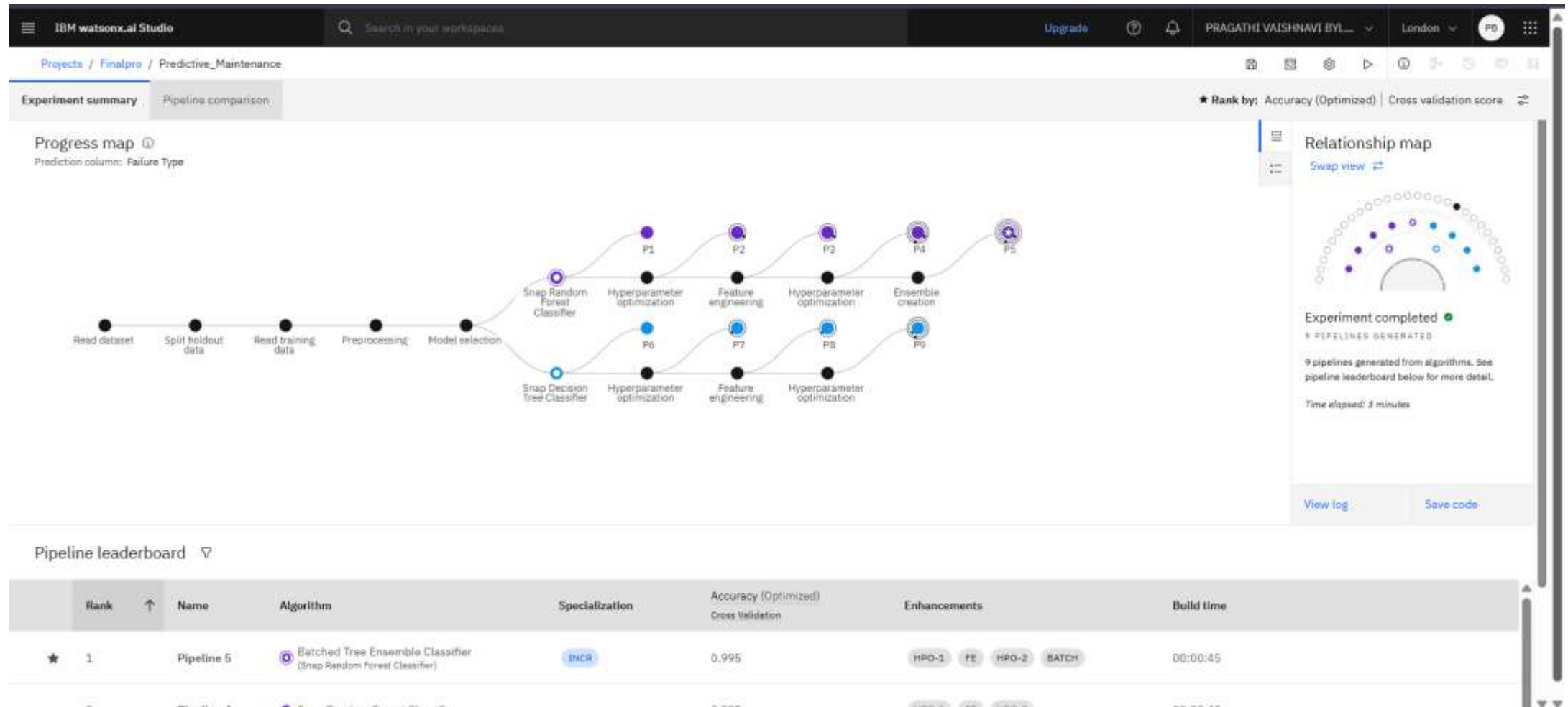
## Deployment:

- Model was deployed using IBM Watson Machine Learning
- Dataset Upload: Uploaded the Kaggle dataset to IBM Cloud Object Storage
- Notebook Development: Used Jupyter Notebooks inside IBM Watson Studio

# RESULT



# RESULT





# RESULT

The screenshot displays the IBM watsonx.ai Studio interface. The top navigation bar includes the logo, a search bar, and user information (PRAGATHI VAISHNAVI BYLAM). The main content area is titled 'Deployment spaces / Maintenance\_Dep1 / P5 - Snap Random Forest Classifier: Predictive\_Maintenance'. Below this, there are tabs for 'Deployments' and 'Model details'. The 'Deployments' tab is active, showing a table with one deployment entry: 'Predictive\_Maintenance\_DE02', which is 'Online' and 'Deployed'. A 'New deployment' button is visible in the top right of the table area. The right sidebar provides details about the asset, including its name, description, type (wml-hybrid\_0.1), model ID, and software specifications. It also shows the last modified date and the user who created it.

IBM watsonx.ai Studio

Search in your workspaces

Upgrade

PRAGATHI VAISHNAVI BYLAM

London

Deployment spaces / Maintenance\_Dep1 / P5 - Snap Random Forest Classifier: Predictive\_Maintenance

Deployments Model details

Search

New deployment

Name	Type	Status	Tags	Last modified
Predictive_Maintenance_DE02	Online	Deployed		23 minutes ago PRAGATHI VAISHNAVI BYLAM (You)

Items per page: 20 1-1 of 1 items 1 of 1 pages

### About this asset

Name  
P5 - Snap Random Forest Classifier: Predictive\_Maintenance

Description  
No description provided.

Asset Details  
Type: wml-hybrid\_0.1  
Model ID: bda833be-59a4-42...  
Software specification:  
hybrid\_0.1  
Hybrid pipeline software specifications:  
autoai-kb\_r124.1-py3.11

Tags  
Add tags to make assets easier to find.

Source asset details

Last modified  
25 minutes ago by PRAGATHI VAISHNAVI BYLAM

Created on  
Aug 2, 2025 by PRAGATHI VAISHNAVI BYLAM

# RESULT

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Deployment spaces / Maintenance\_Dep1 / P5 - Snap Random Forest Classifier: Predictive\_Maintenance /

Predictive\_Maintenance\_DE02 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.

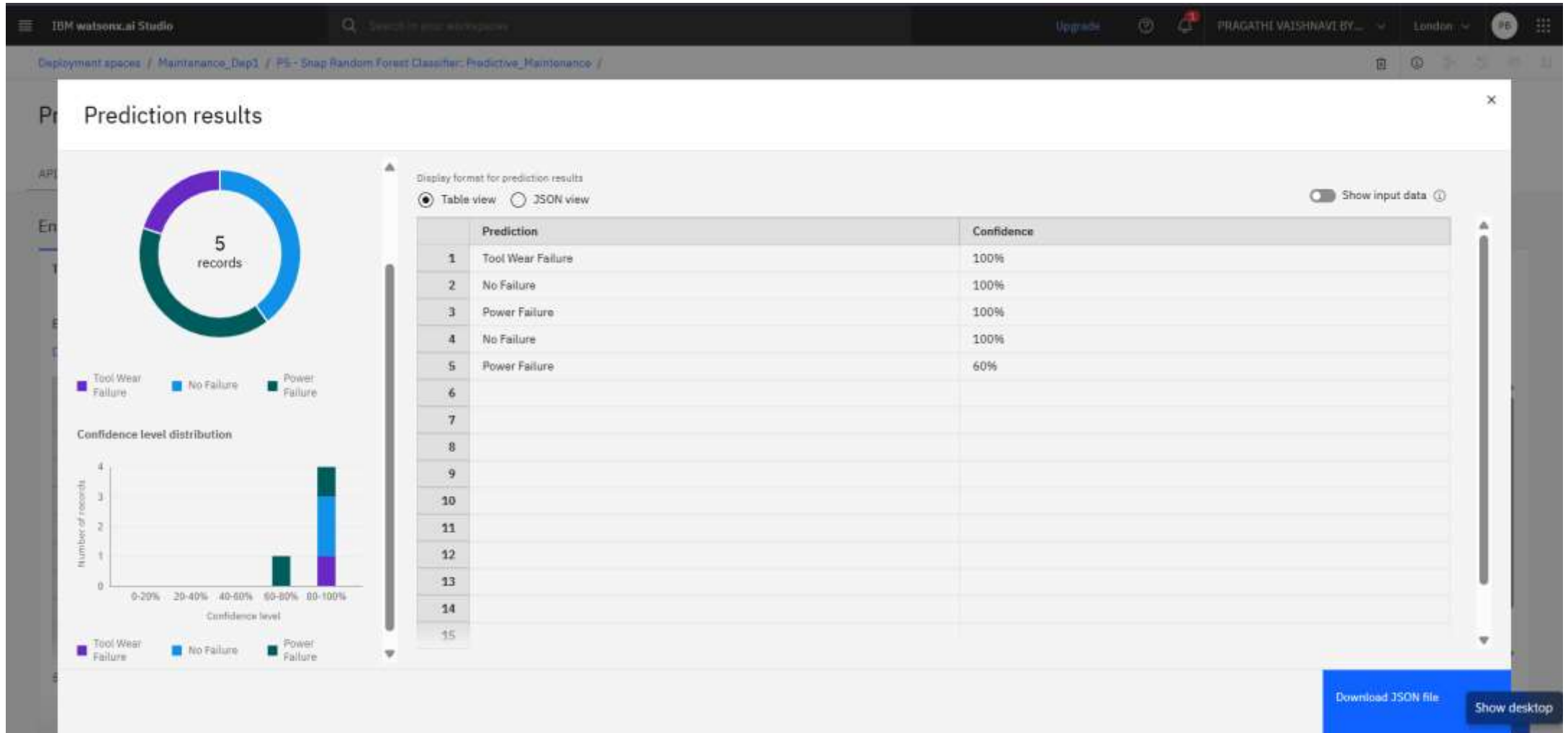
[Download CSV template](#) [Browse local files](#) [Search in space](#) [Clear all](#)

	UDI (double)	Product ID (other)	Type (other)	Air temperature [K] (double)	Process temperature [K] (double)	Rotational speed [rpm] (double)	Torque [Nm] (double)	Tool wear [min] (double)	Target (double)
1	78	L47257	L	298.8	308.9	1455	41.3	208	1
2	1	M14860	M	298.1	308.6	1551	42.8	0	0
3	70	L47249	L	298.9	309	1410	65.7	191	1
4	133	M14992	M	298.7	308.4	1441	43.2	132	0
5	904	L48083	L	295.7	306.1	2270	14.6	149	1
6									
7									
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5 rows, 9 columns

Predict

# RESULT



# CONCLUSION

- The predictive maintenance model was able to effectively anticipate different types of machinery failures using real-time sensor data. By deploying the model through IBM Watson Machine Learning, industries can now proactively detect issues such as:
- Tool Wear
- Power Failure
- Overstrain or Mechanical Failures
- This minimizes unexpected downtimes, enhances safety, and reduces maintenance costs significantly.

# FUTURE SCOPE

- Integrate the model with IoT sensors to enable real-time failure prediction and alerts
- Extend the model to support multi-class anomaly detection for early warning systems
- Apply edge computing for real-time analysis in remote/low-connectivity industrial zones
- Train the model continuously with live incoming sensor streams using IBM Cloud pipelines

# REFERENCES

- Kaggle Dataset: Predictive Maintenance Classification
- IBM Cloud Lite: <https://www.ibm.com/cloud/watson-studio>
- IBM Watson Machine Learning: <https://www.ibm.com/cloud/machine-learning>

# IBM CERTIFICATIONS



# IBM CERTIFICATIONS

In recognition of the commitment to achieve  
professional excellence



Pragathi vaishnavi

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution



Issued on: Jul 18, 2025  
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/17d69b5b-0722-44b1-b522-c2c27df5e0a9>





# IBM CERTIFICATIONS





**THANK YOU**