



PREVENTIVE MAINTANENCE

N A S A W A T E R P U M P



APRIL 2024

Canva



Objective

Showcase how such models can accurately predict failures, leading to proactive maintenance interventions aimed at reducing downtime and optimizing maintenance schedules.



Business Understanding

Goal

**DEVELOP AND IMPLEMENT MODELS TO
ENABLE ACCURATE FAILURE
PREDICTIONS**

Goal

- **REDUCED BREAKDOWNS**
- **EXTEND EQUIPMENT LIFE**
- **OPTIMIZE MAINTENANCE SCHEDULE**
- **ENHANCE OPERATONS EFFICIENCY**



Data Set

- Data from Kaggle
- Analyzed sensor data from NASA water pumps
- Identified key sensors with significant readings variability
- Detected patterns linked to machine health and potential faults



Data Insight

ATTRIBUTES

- Total Entries: 220,320
- Total Columns: 55
- Unnamed: 0 Column: ID/Index
- Sensor 15 column: Removing

DISTRIBUTION

- Normal: 205,836
- Recovering: 14,477
- Broken: 7

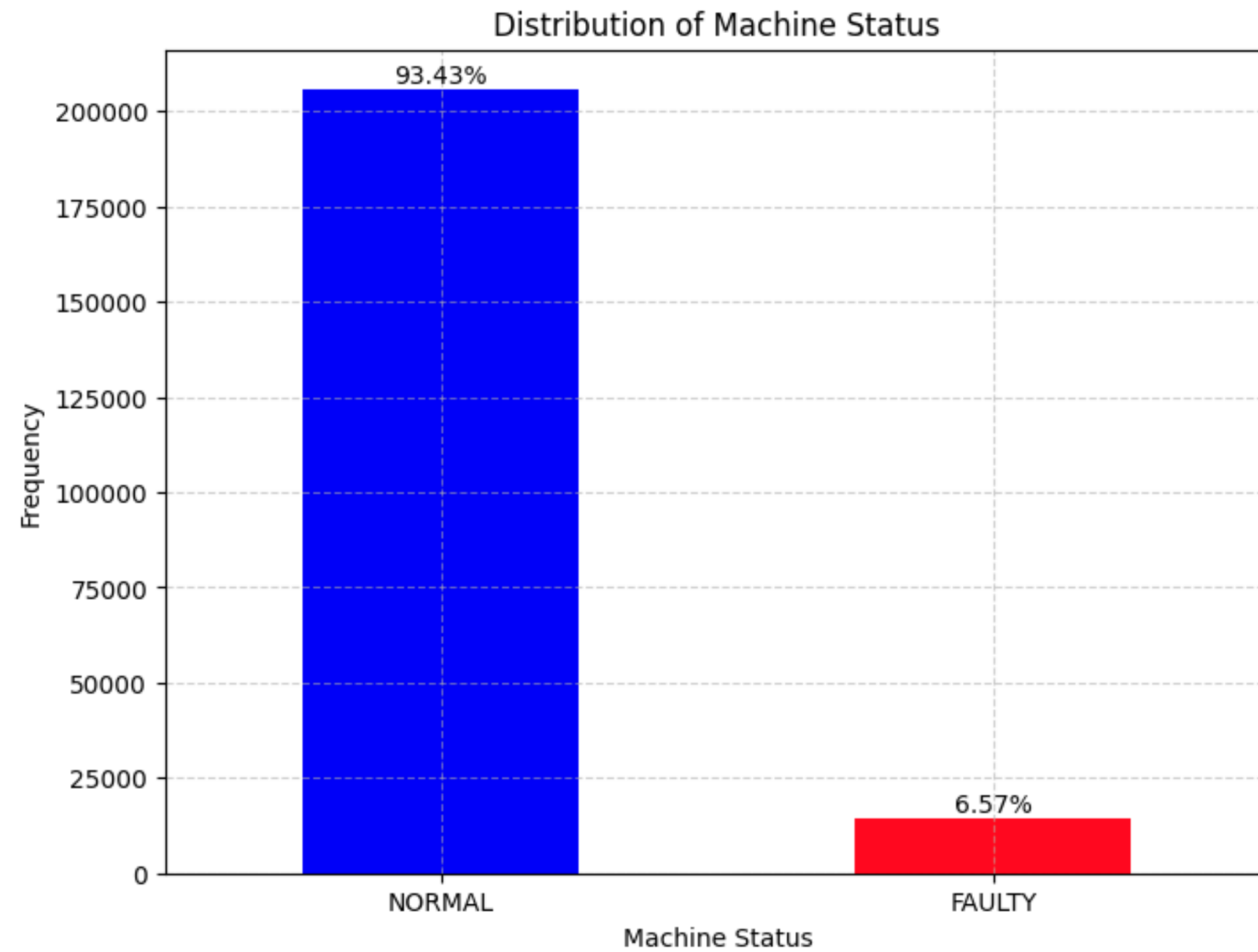
MISSING VALUES

- 77,017 and 220,320 missing
- Checked for duplicates
- Used median to fill in N/A.

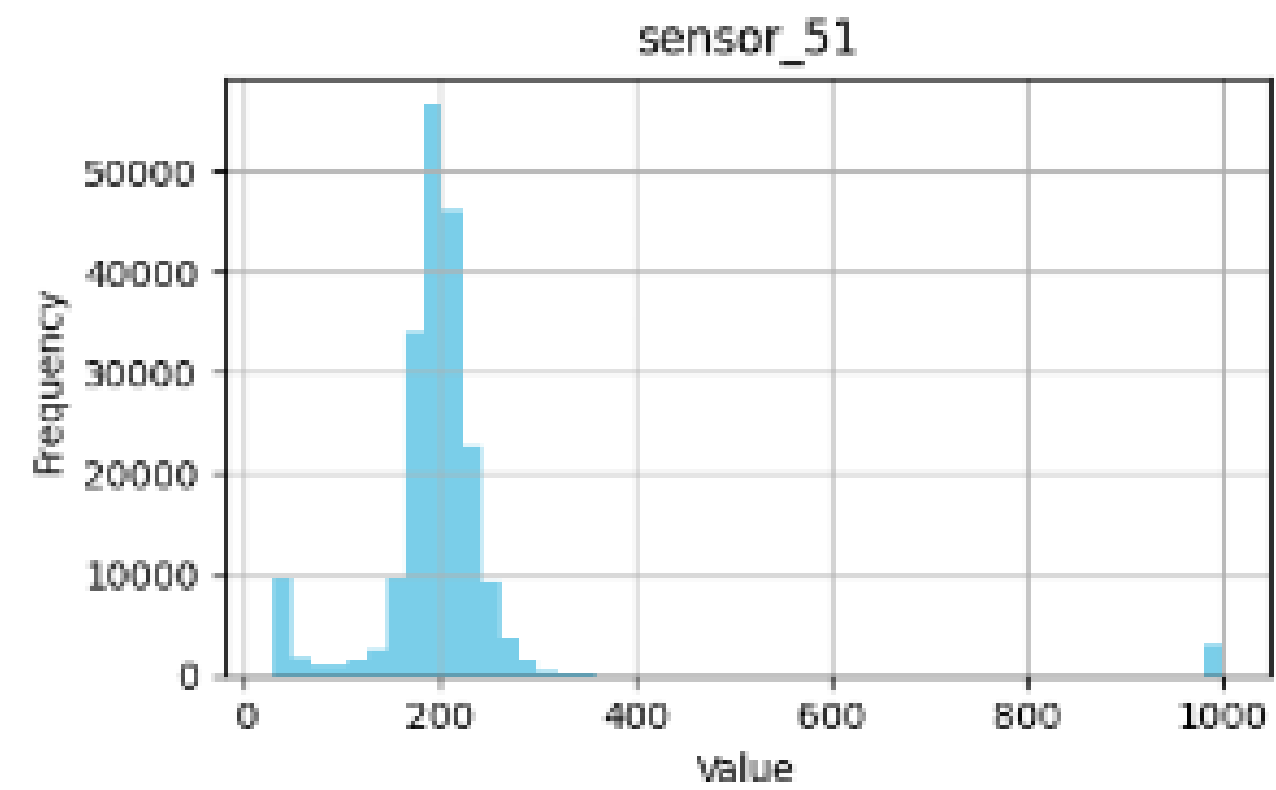
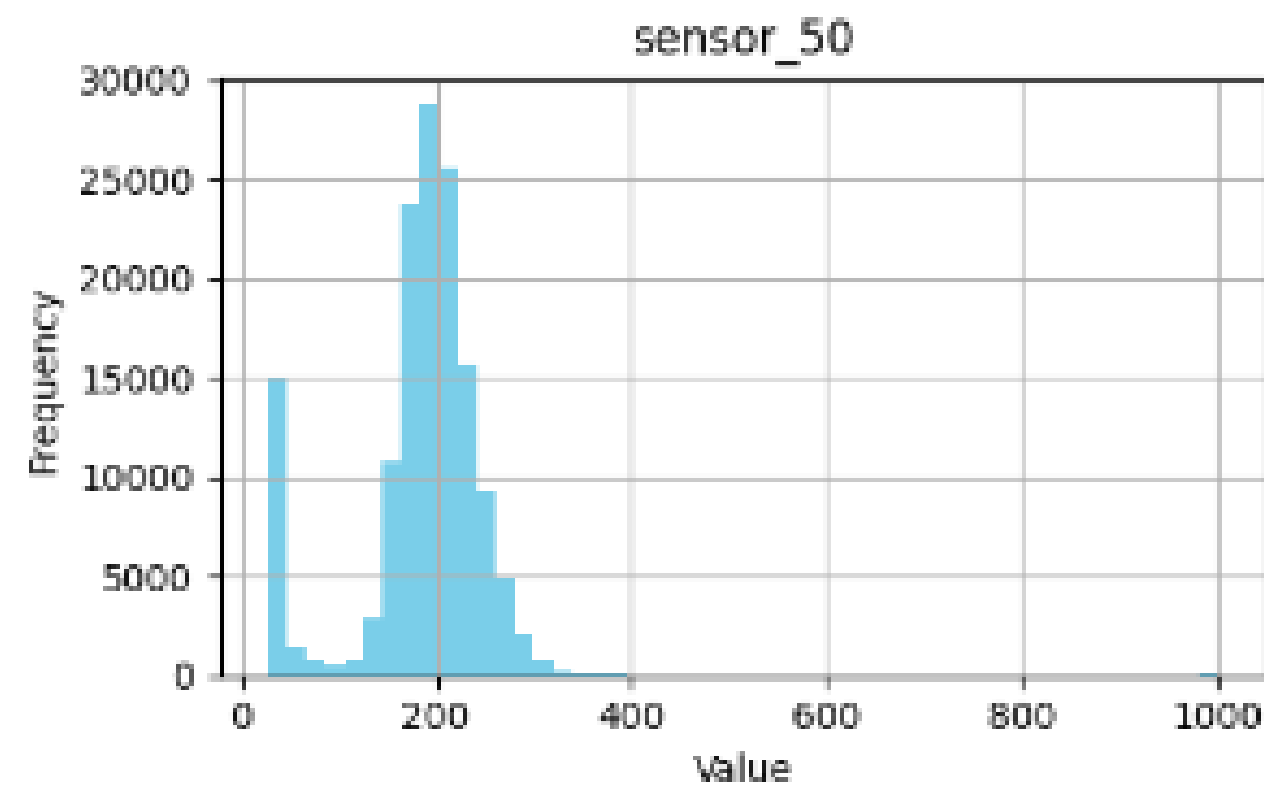
Data Prep

- Cleaned and preprocessed data for quality and consistency
- Merged similar machine statuses to simplify the target variable
- Visualized data distribution and sensor correlations
- Utilized exploratory data analysis for a deeper understanding of data

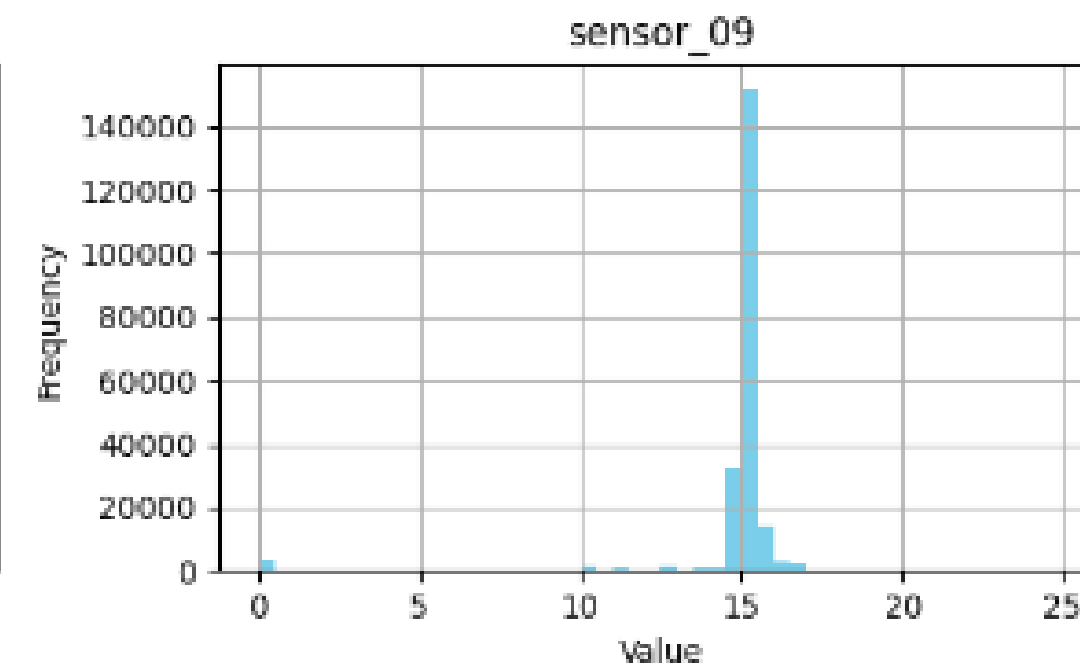
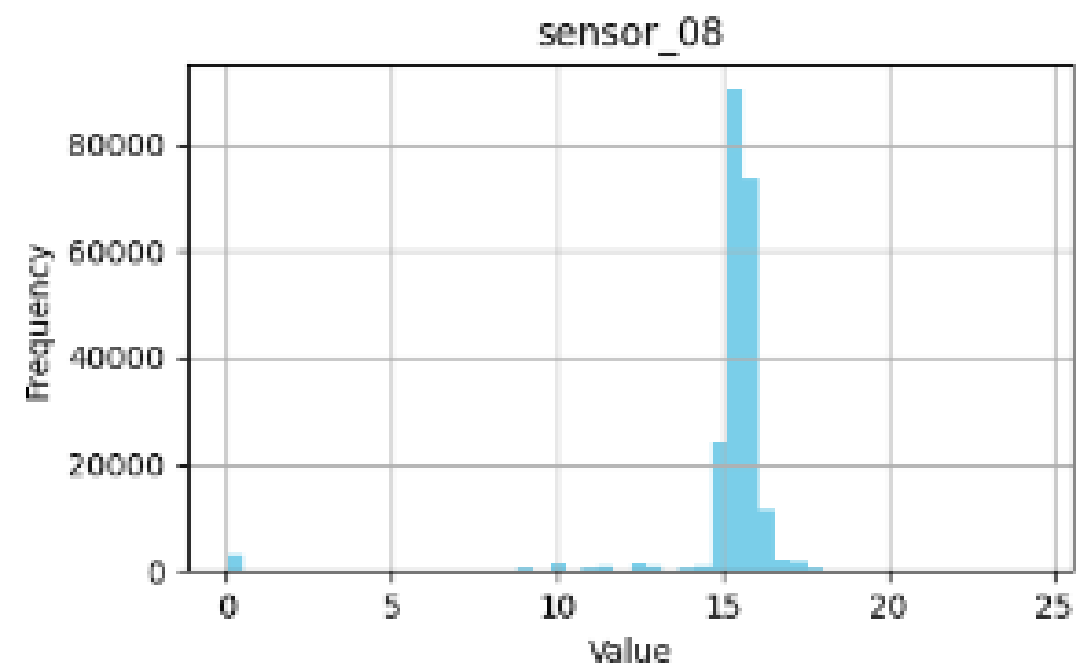
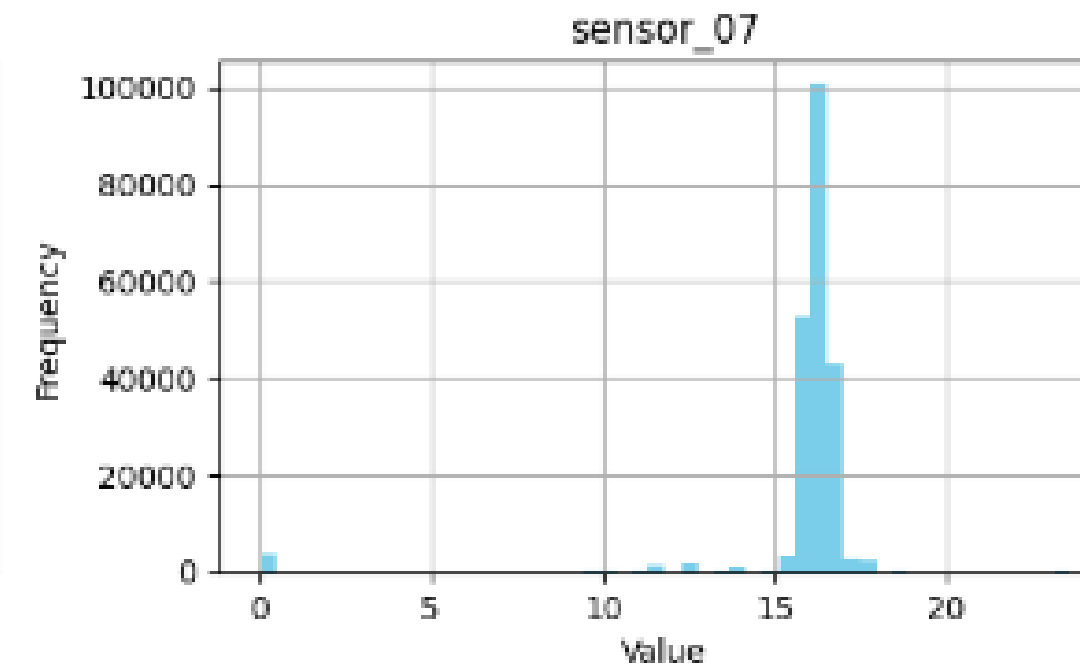
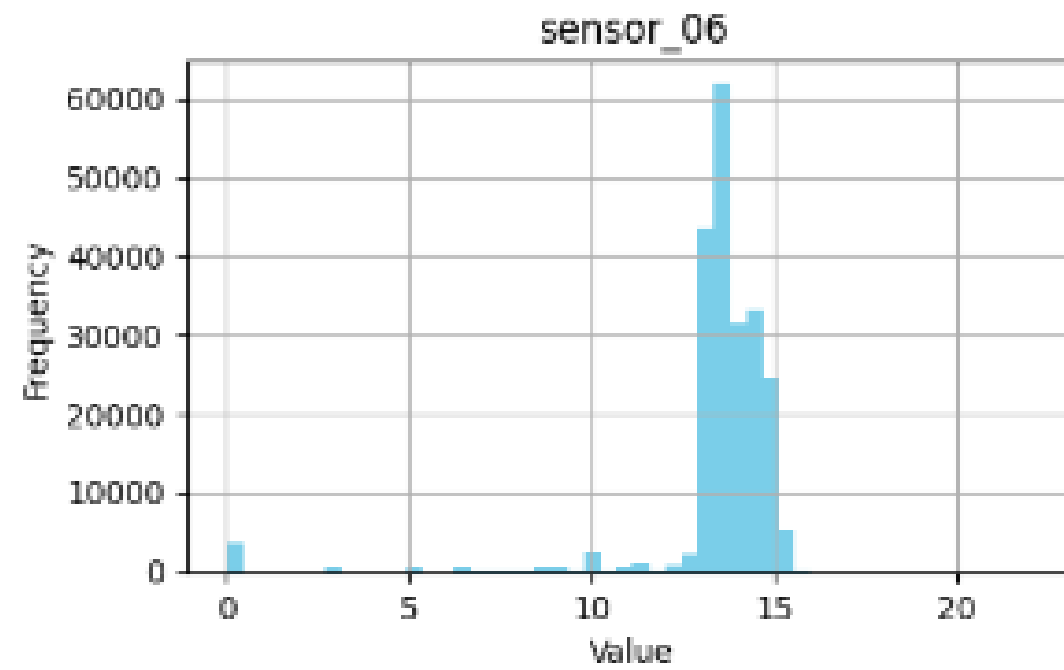
Data



Data



Data





Model Process



01

Regression Models

- Logistic and Random Forest

02

Ensemble Models

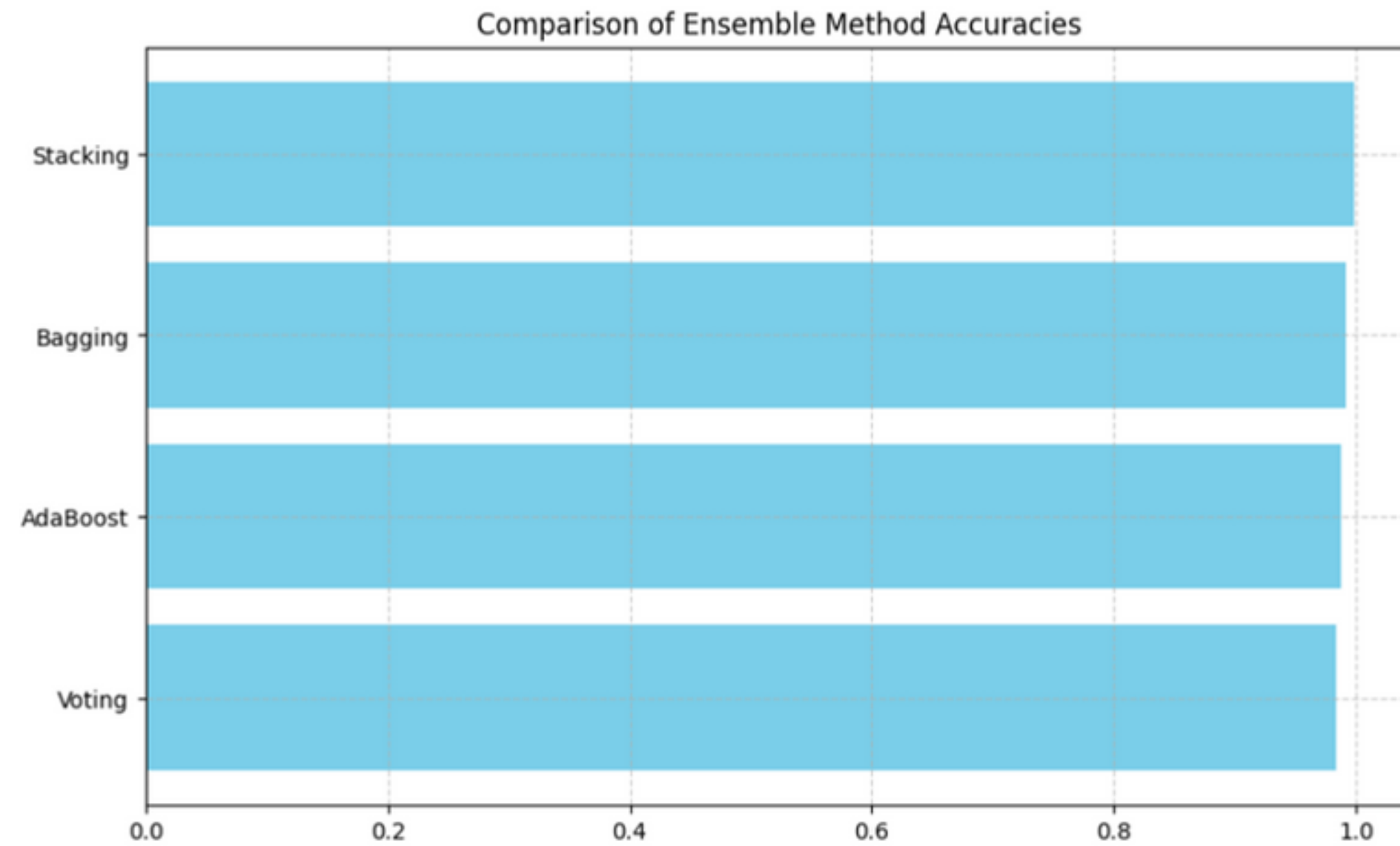
- Bagging, AdaBoost, XGBoost, Stacking, and Voting

03

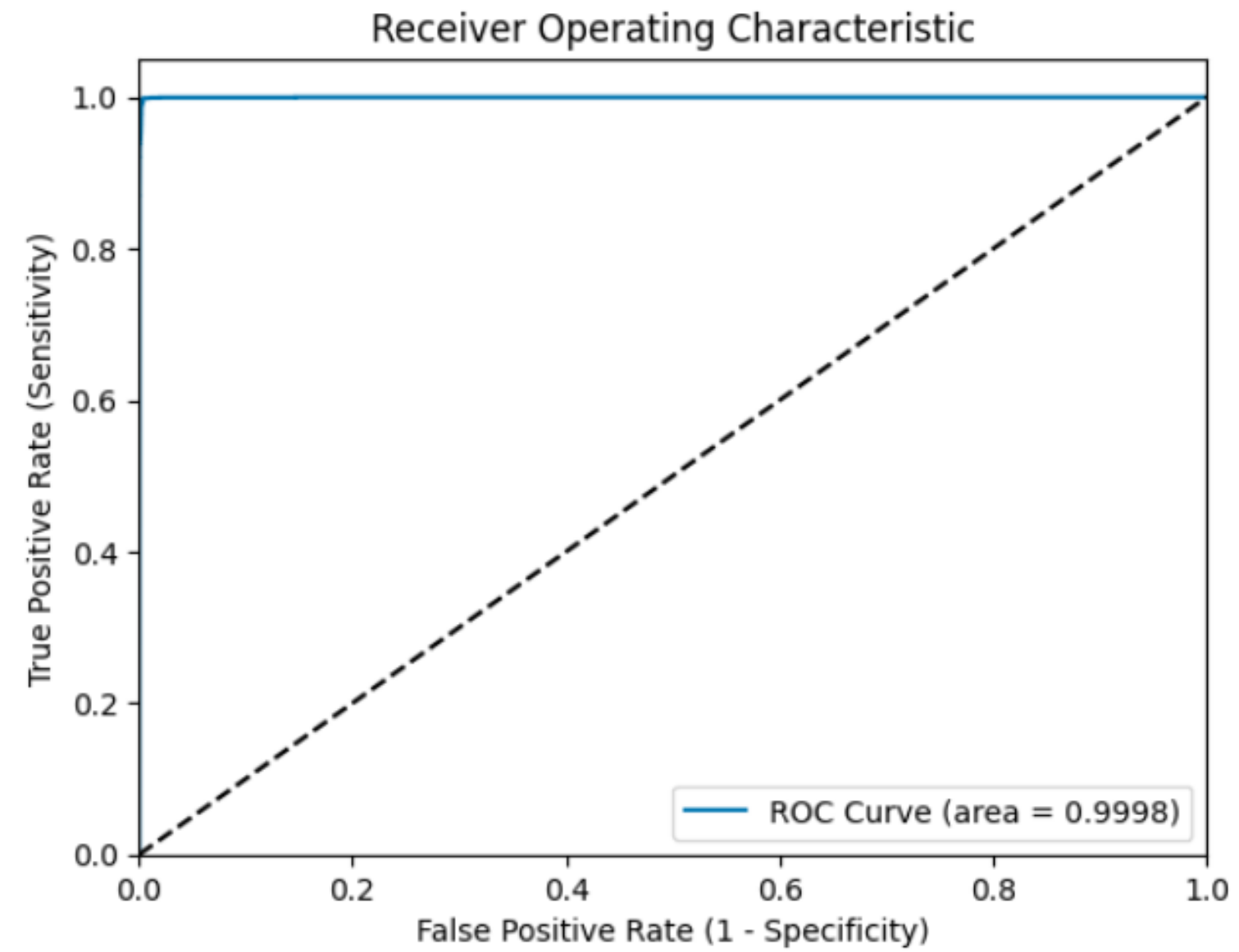
Tuning

- Gridsearch validation
- Hyperparameter tuning

Data



Data



Data



Results

- Achieved high consistency and accuracy across multiple models
- Near-perfect ROC AUC scores indicating excellent model performance
-





Next Steps

01

Refine models

- Continuous monitoring of key sensors for real-time predictive maintenance

02

Deployment

- Implementation into production with a real-time analytics pipeline

03

More data insight

- Further investigation into high-impact sensors for targeted maintenance

04

Further experiment

- Regular retraining of models with new data to maintain performance

CONTACT

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Our Team



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**THANK
YOU**

