PROJECT :- MACHIN DOWNTIME

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Role as a Data Analysis

Profile

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- Project Architecture - Data Flow Diagram
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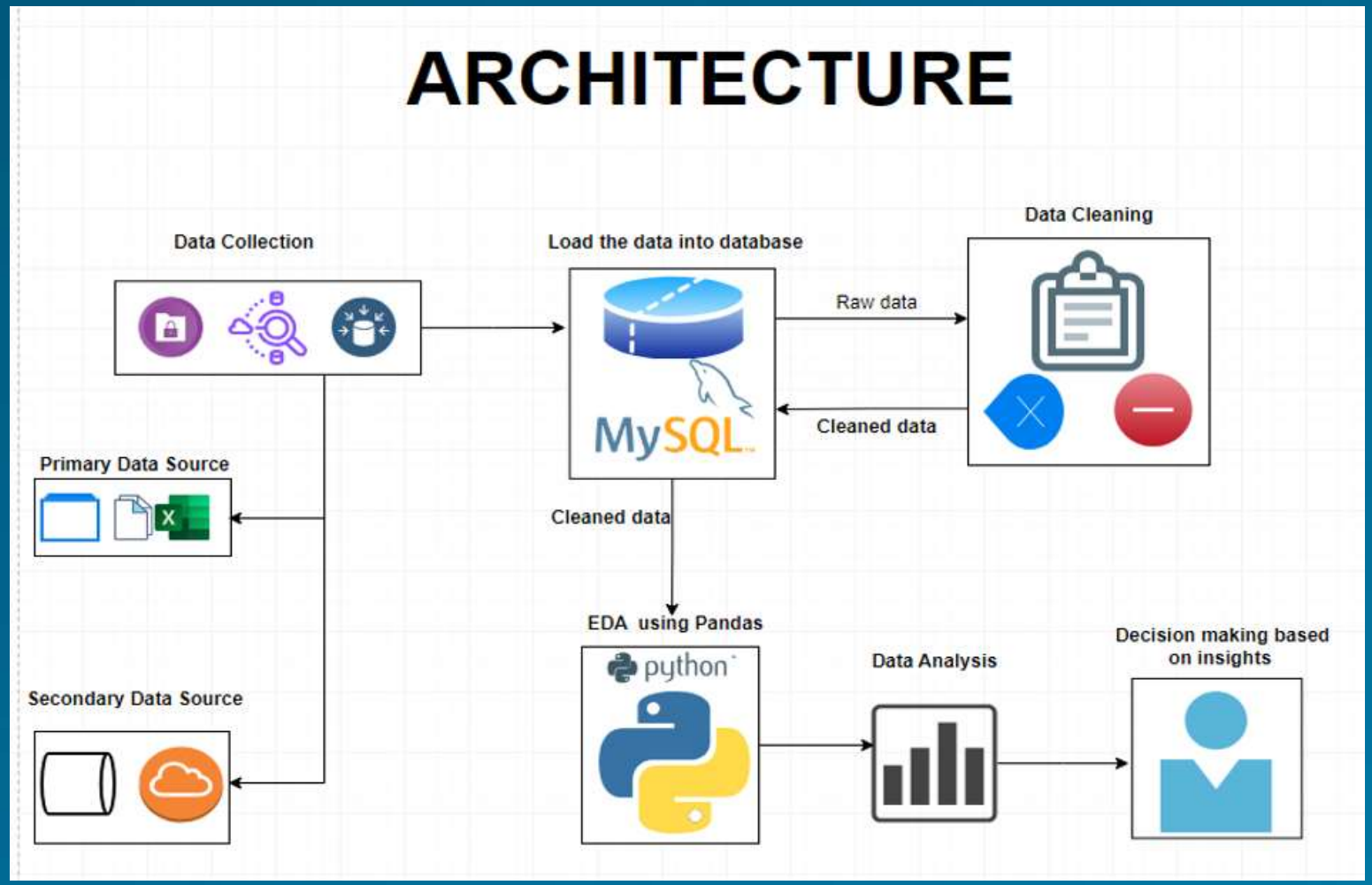
PROJECT ARCHITECTURE



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Business Problem

Manufacturing pumps involves various machines and processes, which are critical for the production process. Unplanned machine downtime in a pump manufacturing facility can have significant negative consequences for productivity, cost-efficiency, and overall operations.

The main business problem is as follow:

a. Machine which manufacture pumps

b. Unplanned Machine Downtime which is leading to loss in productivity

c. Productivity Impact: Reduced Production Output

d. Operational Costs: Increased expenses from repair and maintenance

e. Quality Issues: Defects in machine and its parts

Project Overview and Scope

The project involves working with a leading vehicle fuel pump manufacturer to address a critical business problem. The primary issue at hand is unplanned machine downtime in the manufacturing process, which is adversely affecting productivity. Machine downtime can disrupt the production process, result in loss of output, and increase maintenance costs. The client's business objective is to minimize unplanned machine downtime while also keeping maintenance costs in check.

Scope of the Project:

- **Data Analysis**
- **Client and Business Problem**
- **Data Preprocessing**
- **Data Exploration Correlation Analysis**
- **Feature Engineering**
- **Recommendations**

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Data Dictionary

Features	Data Type	Description
Date	Date	Date of the record
Machine_ID	String	Machine Identifier
Assembly_Line_No	String	Assembly line Identifier
Hydraulic_Pressure(bar)	Float	Hydraulic pressure in bar
Coolant_Pressure(bar)	Float	Coolant pressure in bar
Air_System_Pressure(bar)	Float	Air system pressure in bar
Coolant_Temperature	Float	Temperature of the coolant
Hydraulic_Oil_Temperature(Â°C)	Float	Temperature of the hydraulic oil in Celsius
Spindle_Bearing_Temperature(Â°C)	Float	Temperature of the spindle bearing in Celsius
Spindle_Vibration(Âµm)	Float	Spindle vibration in micrometers
Tool_Vibration(Âµm)	Float	Tool vibration in micrometers
Spindle_Speed(RPM)	Integer	Spindle speed in revolutions per minute
Voltage(volts)	Integer	Voltage in volts
Torque(Nm)	Float	Torque in Newton meters
Cutting(kN)	Float	Cutting force in kilo-Newtons
Downtime	String	Status of the machine

Exploratory Data Analysis [EDA]

Statistical Insights

The code calculates the –

1st Business Moment: Measure Of Central Tendency mean, median, mode

2nd Business Moment: Measure Of Dispersion Variance, standard deviation, max, min,

3rd & 4th Moment Business Decision skewness values, kurtosis values

These values provide summary statistics for the dataset. The code is available both in SQL and Python.

Analysis is structured in a way to get a clean insights to the data, comparing values before and after data cleaning.

Business Insights

The business insight of this project revolves around a leading vehicle fuel pump manufacturer's goal to minimize unplanned machine downtime in their production process while simultaneously minimizing maintenance costs.

The key insights and objectives are as follows:

• Minimize Unplanned Machine Downtime:
Cost Saving:
• Data-Driven Decision-Making:
• Machine Health Monitoring:
• Predictive Maintenance
• Correlation Analysis:
• Visualization
• Feature Engineering:

Data Preprocessing

Data Reading :-

To begin, the dataset was imported into the analysis environment using pd.read_csv(), making it accessible for subsequent preprocessing and analysis.

Dataset Information:-

Started by gaining an understanding of the dataset's structure and characteristics using the data.info() method. This step provided valuable insights into the data's columns, data types, and any missing values.

Descriptive Statistics:

This utilized the data. Describe() method to generate summary statistics for the dataset. This allowed you to gain insights into the central tendency, dispersion, and distribution of numerical features in the data.

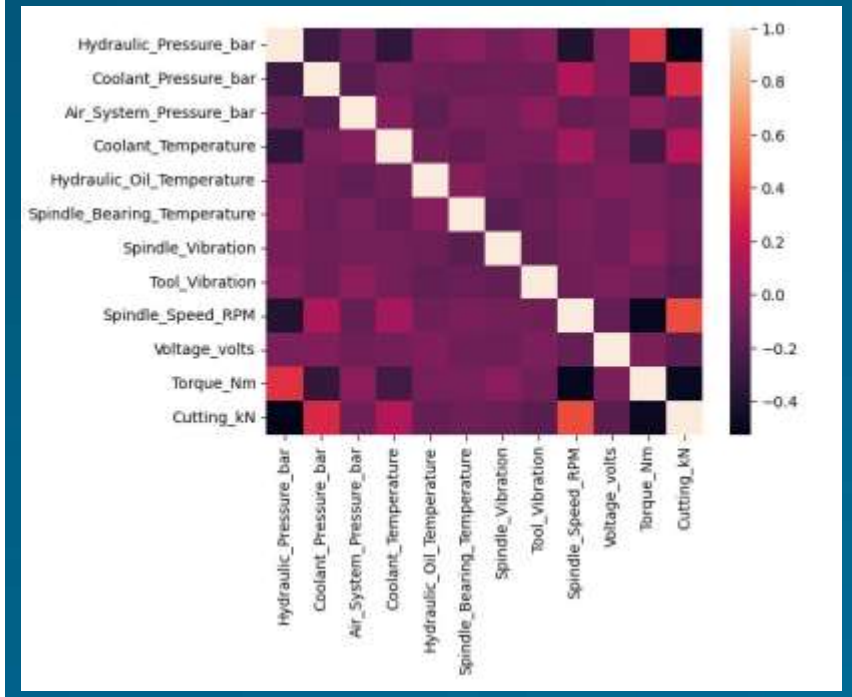
Duplicate Data Identification:

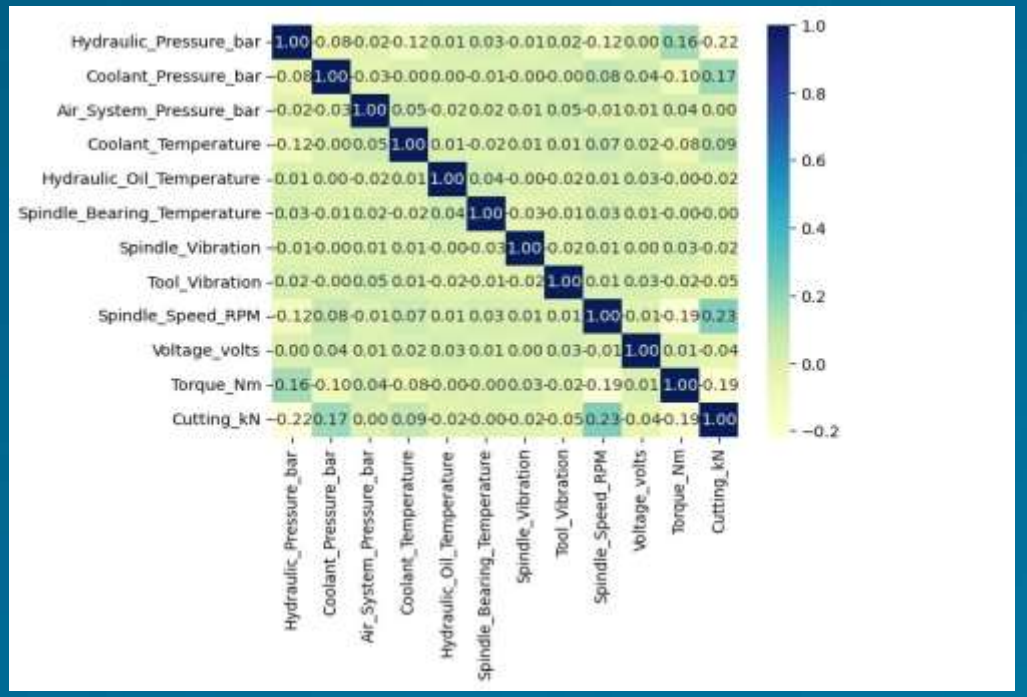
To ensure data integrity and consistency, identified duplicate records within the dataset using the data. Duplicated() method. This step is crucial in maintaining data quality and can help in detecting and handling redundant information.

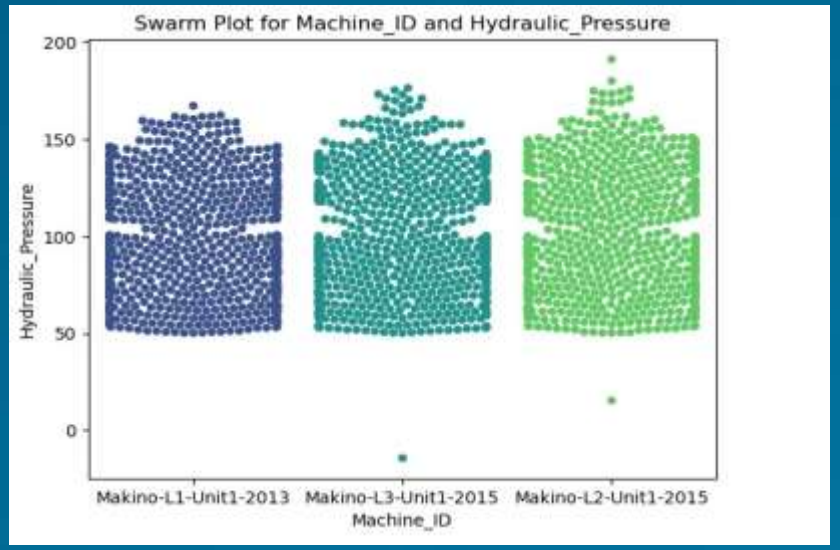
Visualization Data:

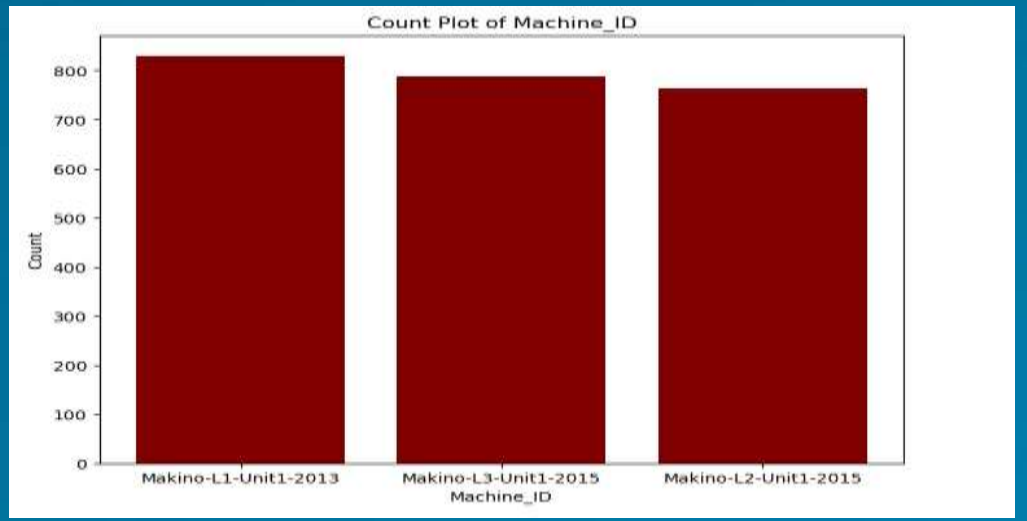
After that we are Visualize Data using proper diagram

Data Visualization









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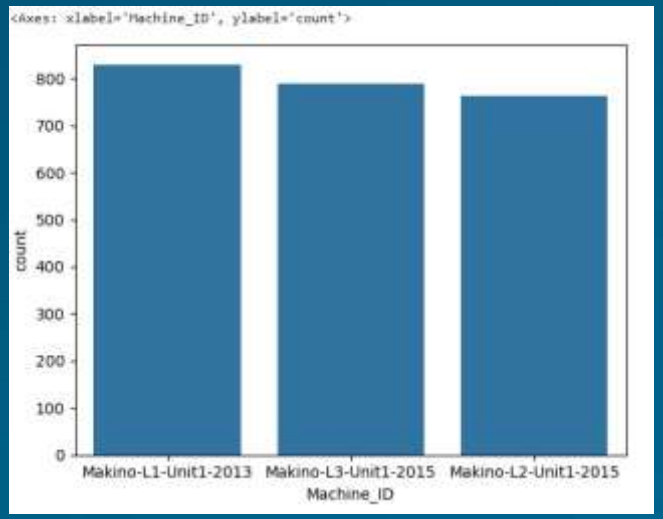

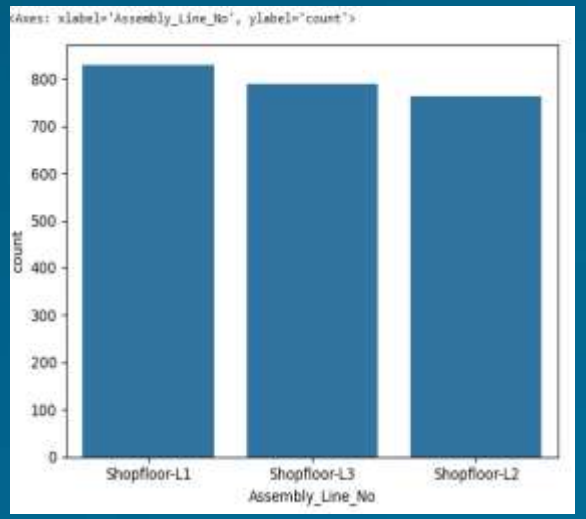

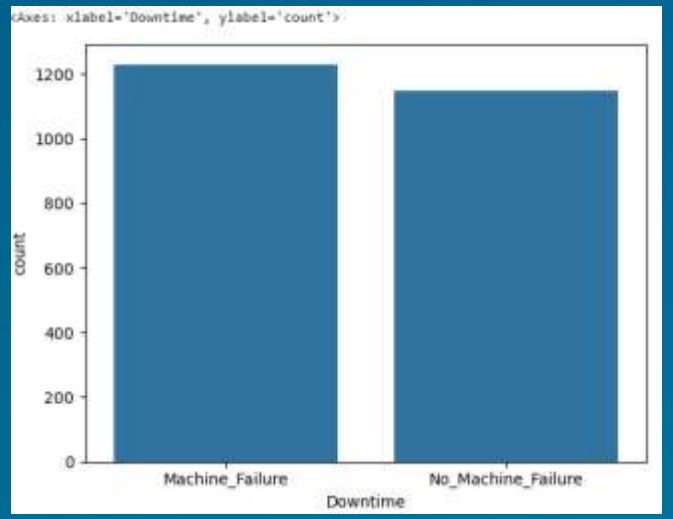

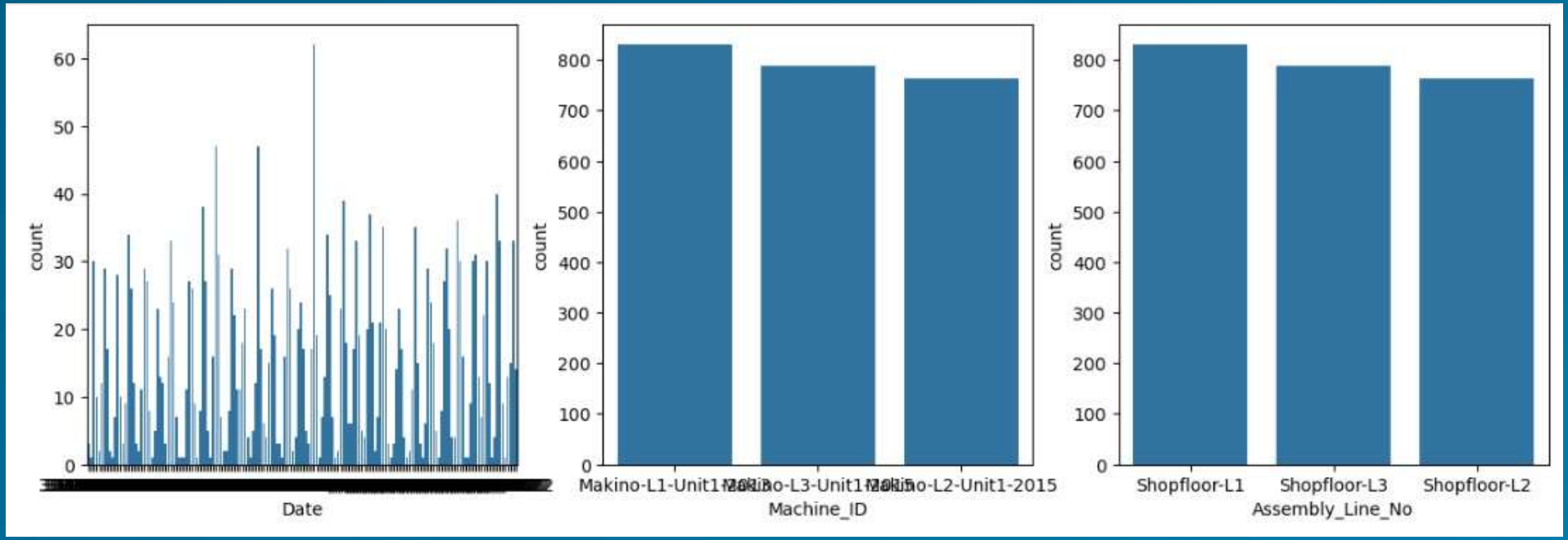

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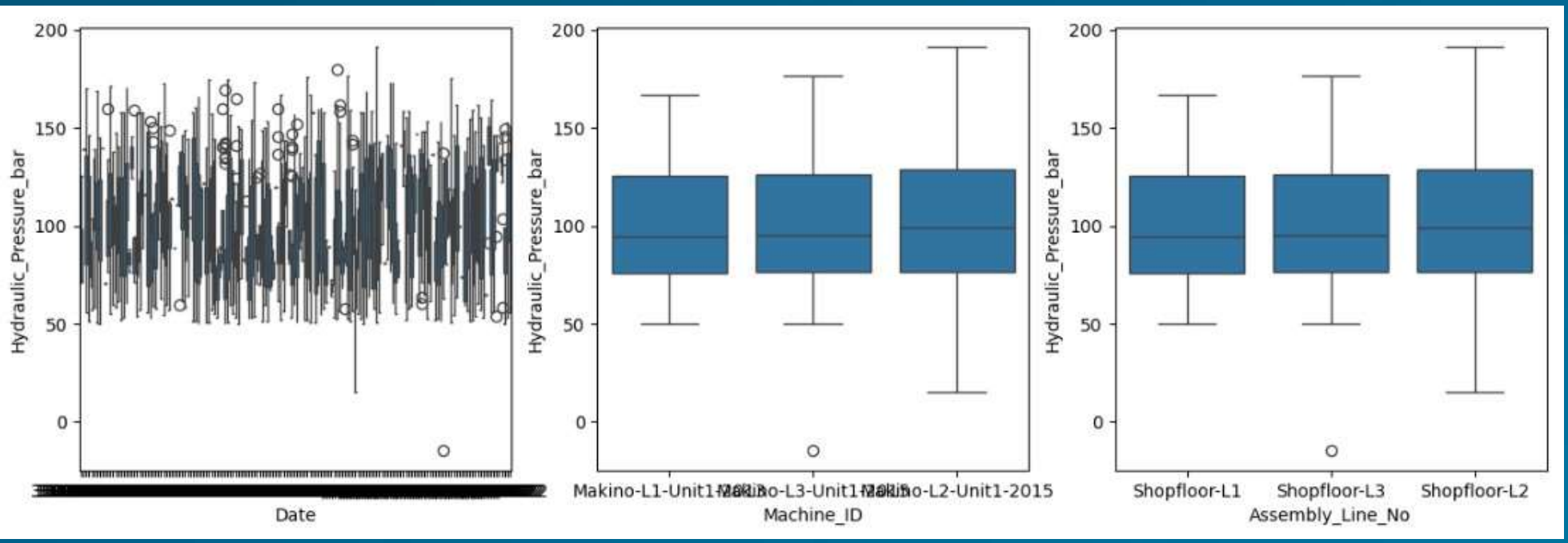

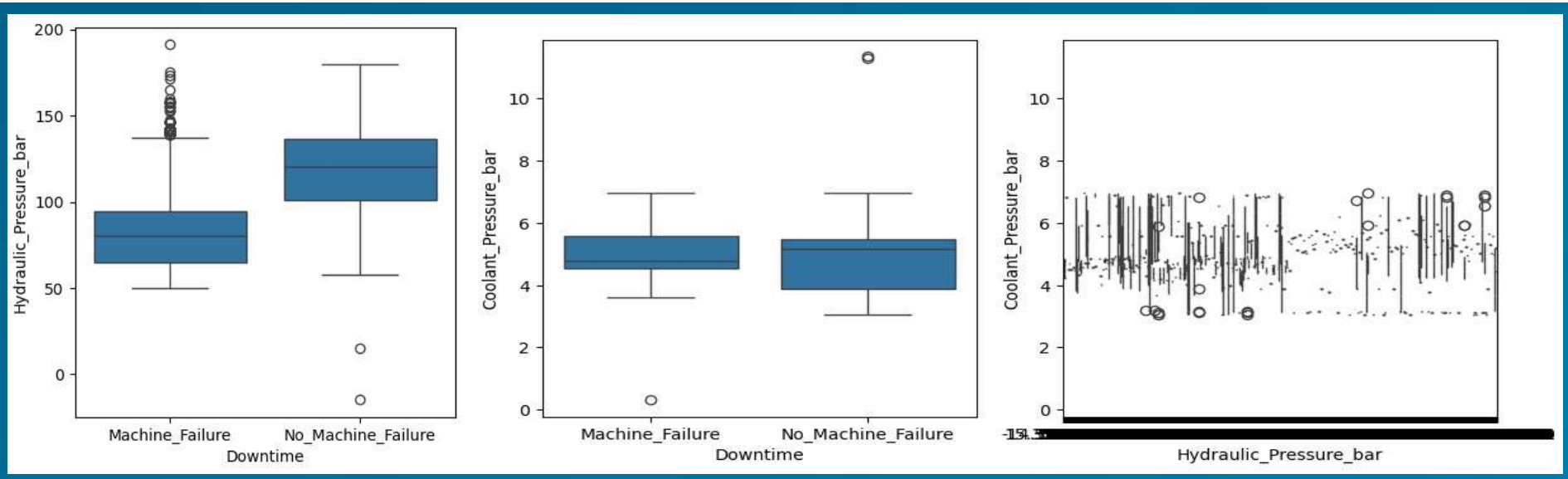

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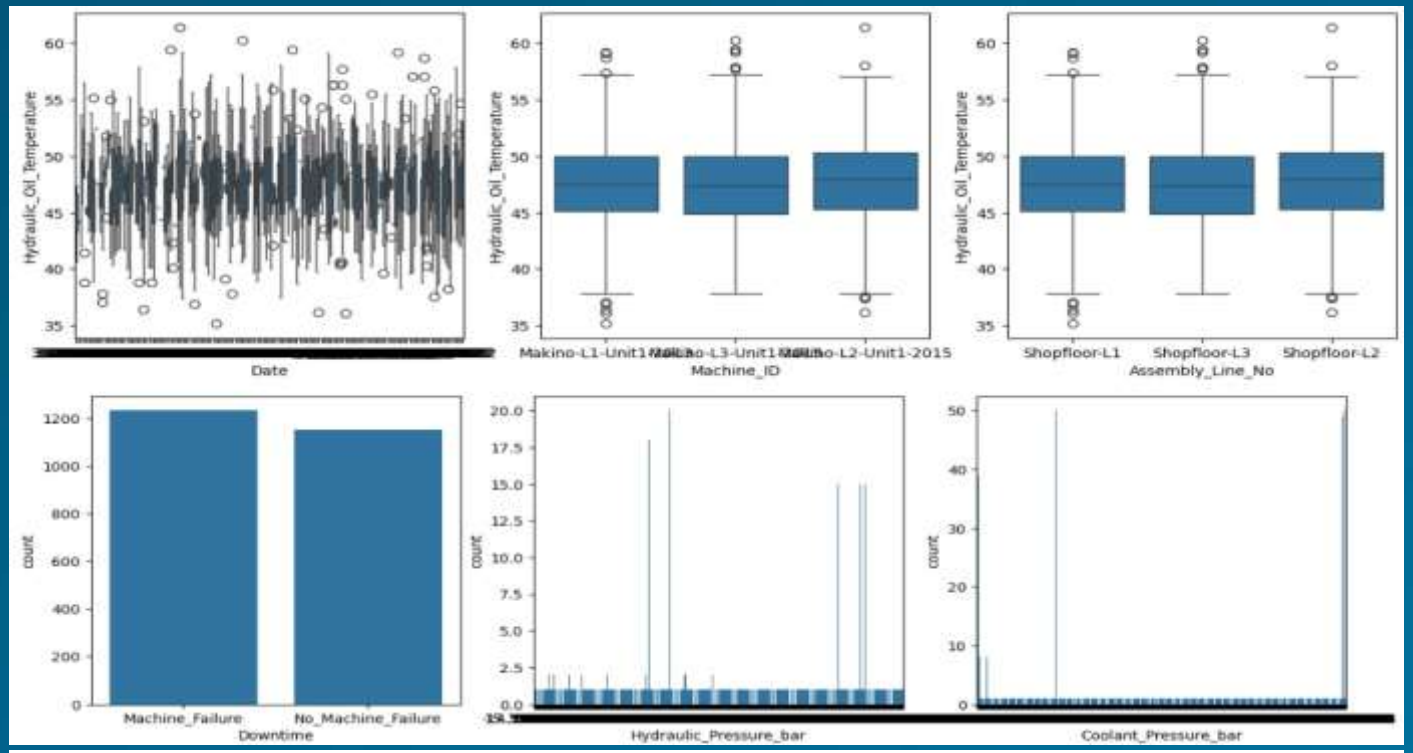

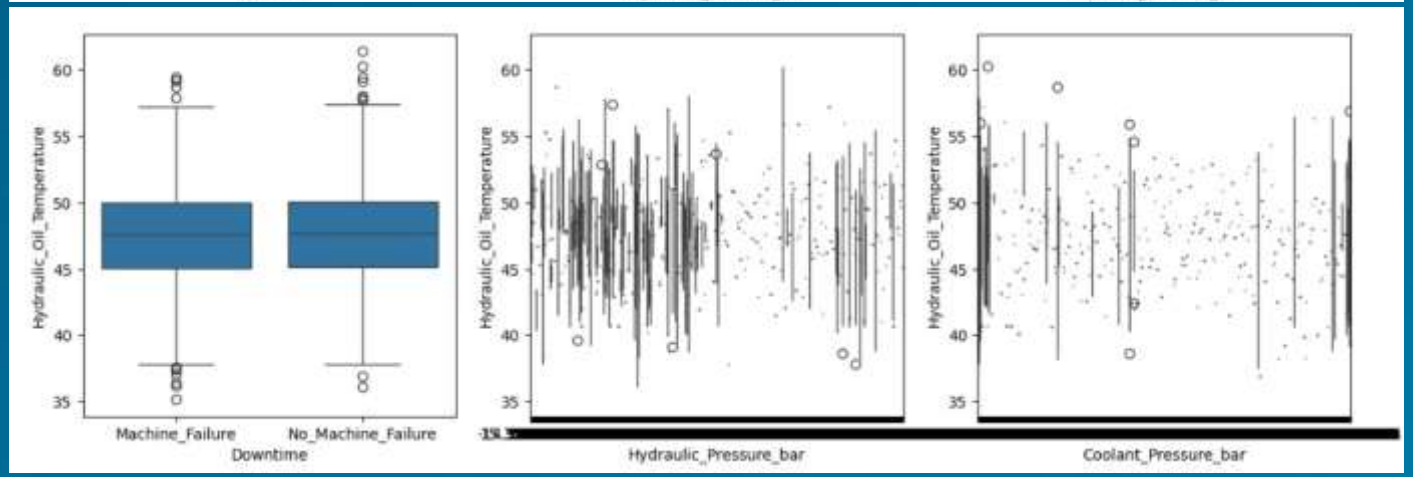

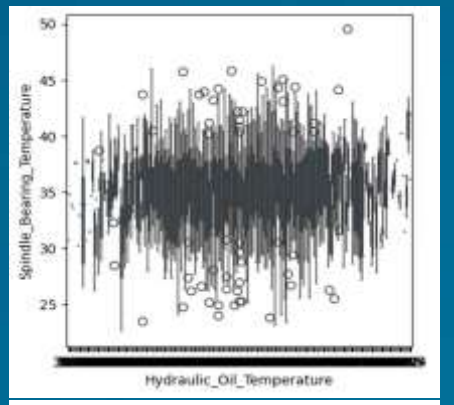

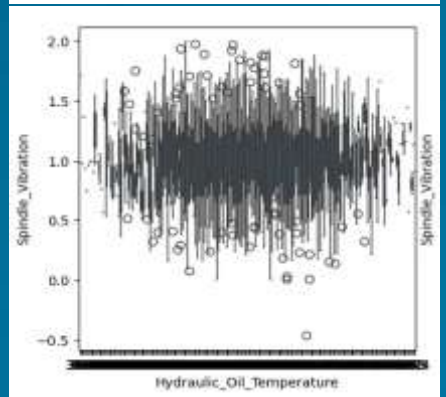

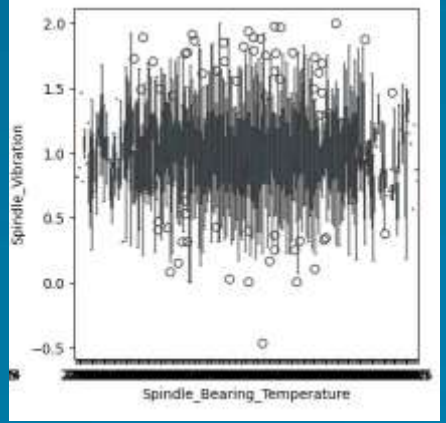

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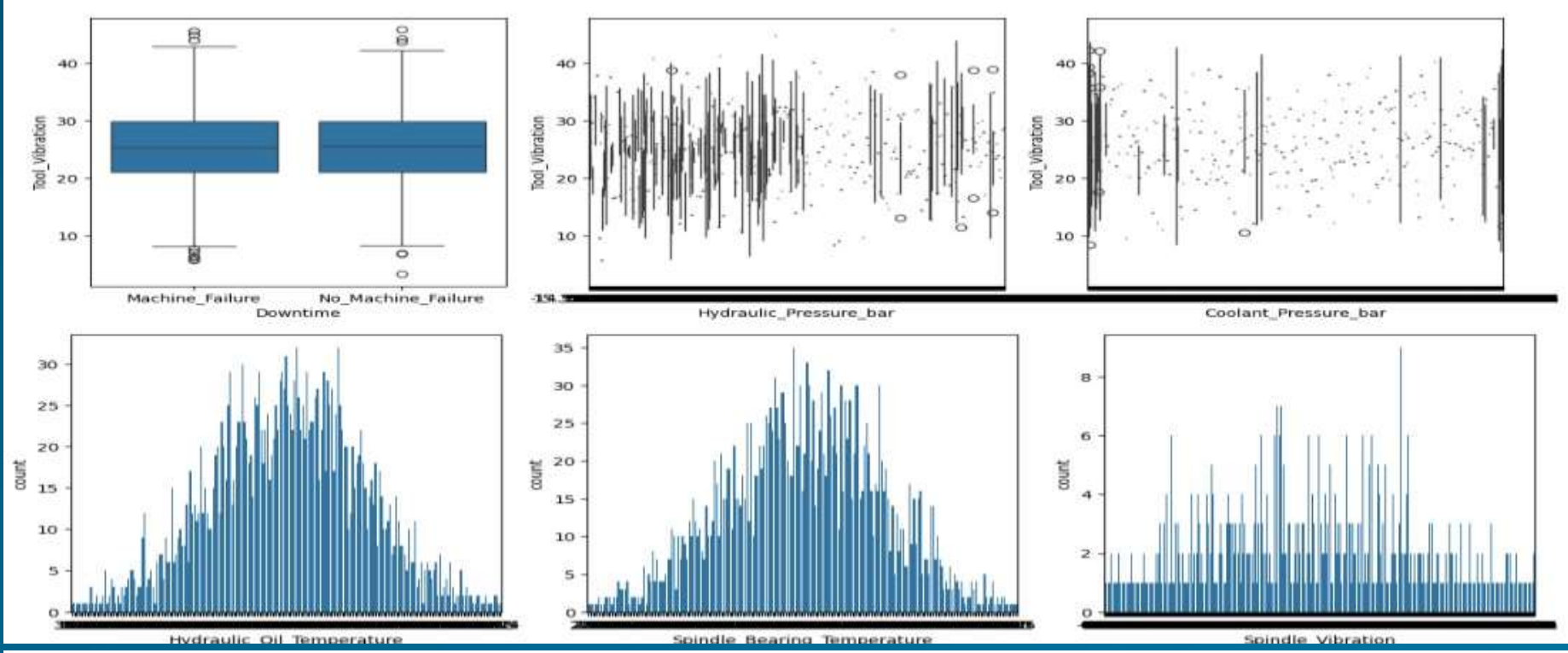

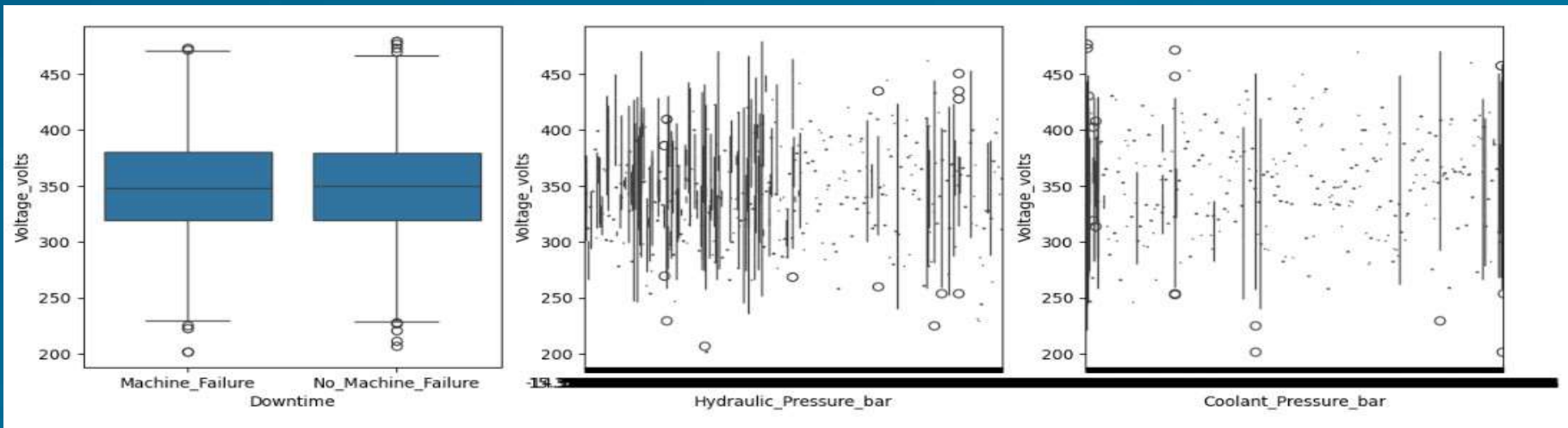

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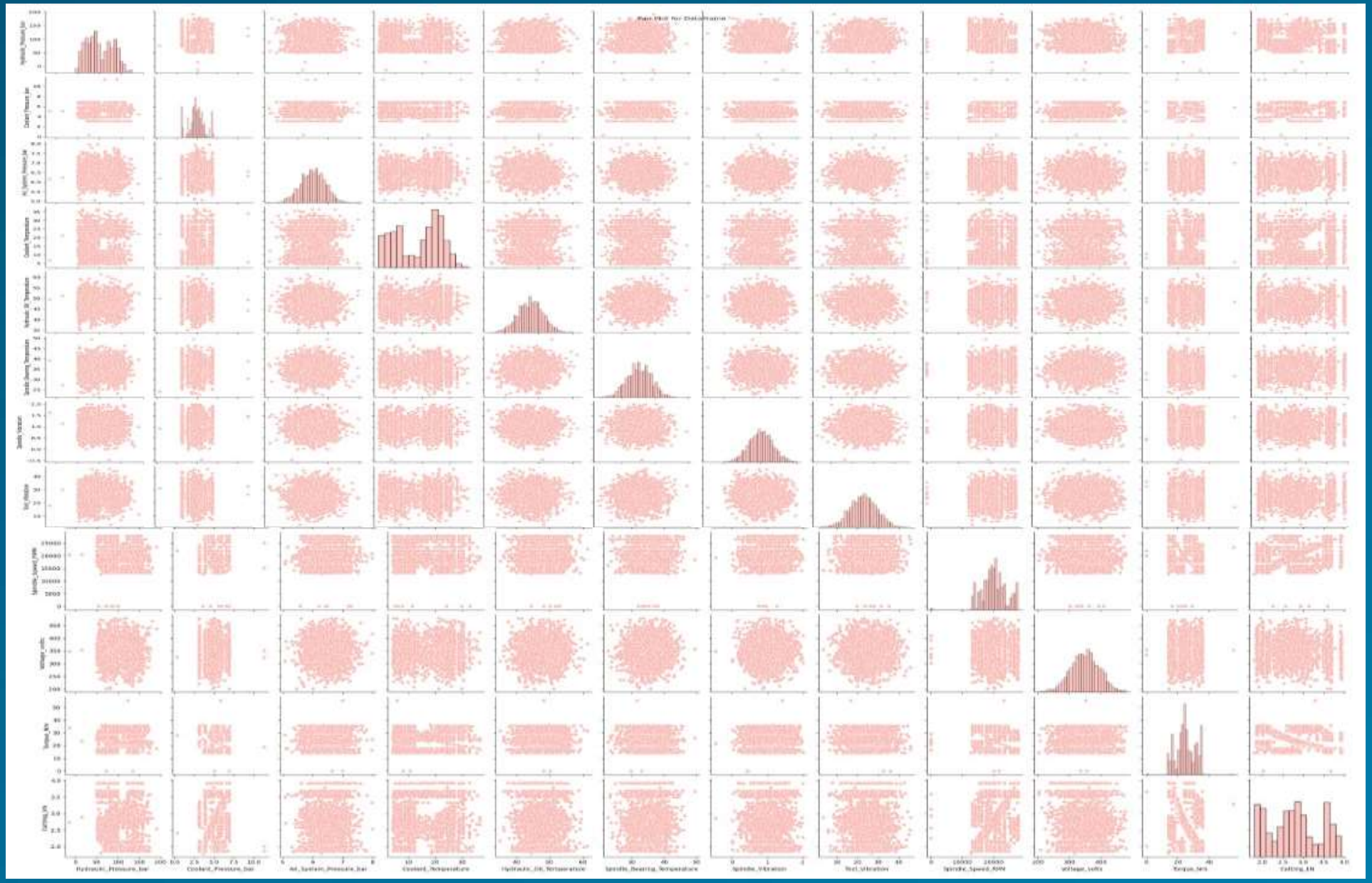

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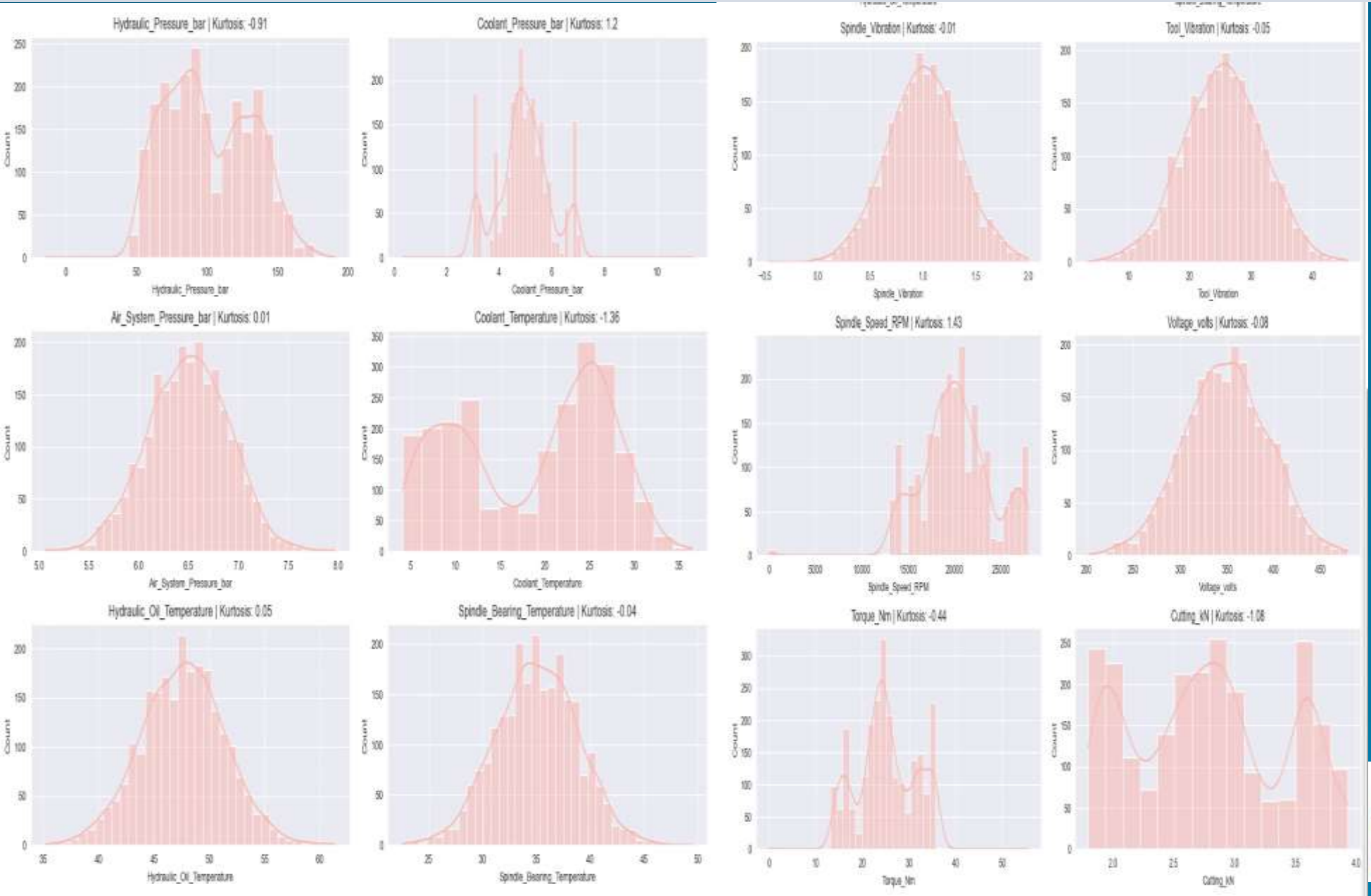

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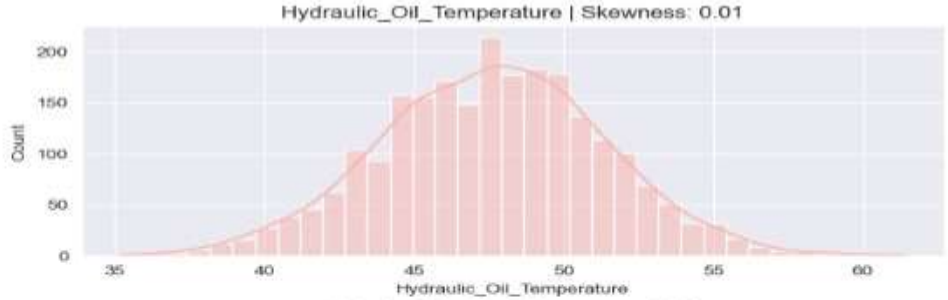

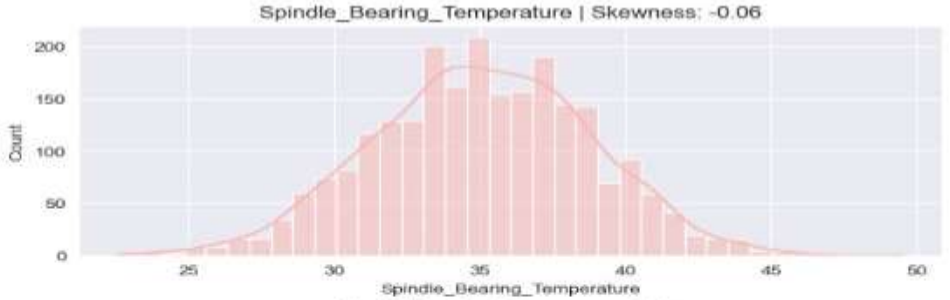

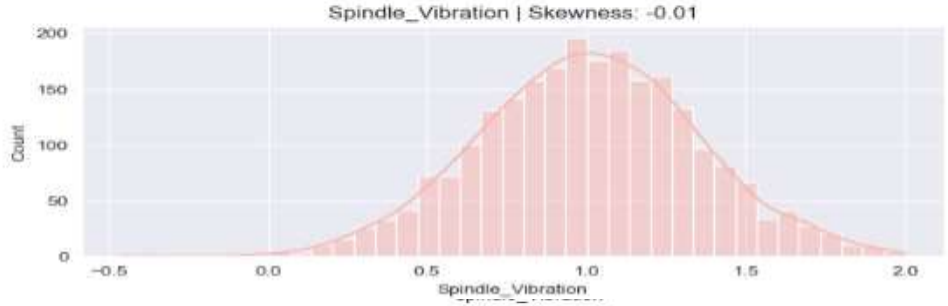

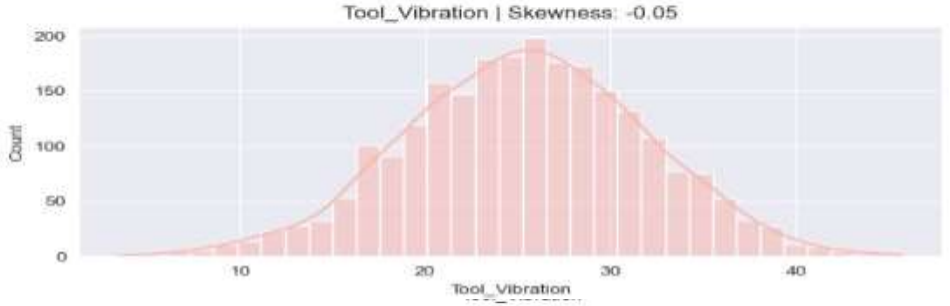

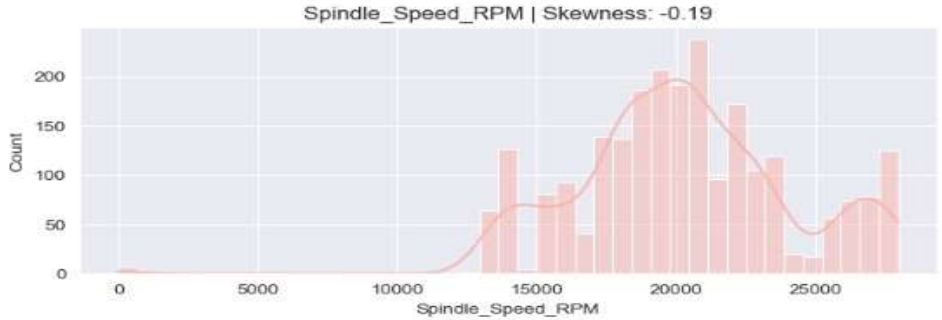

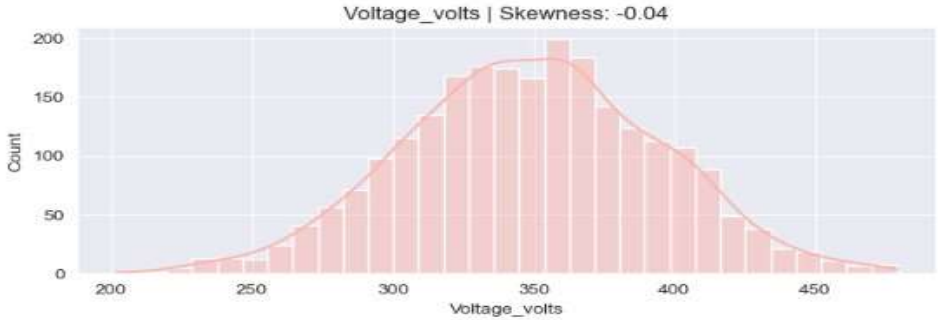

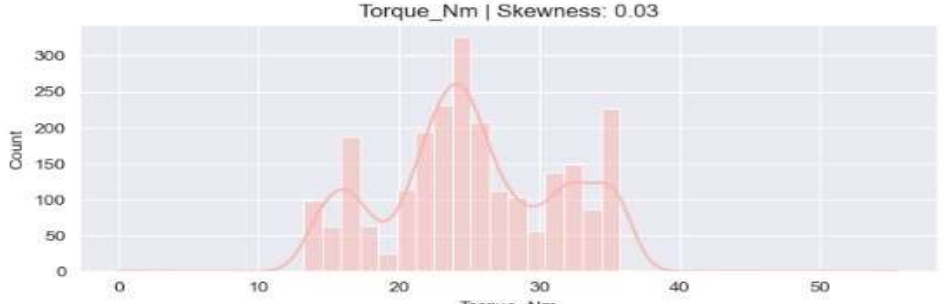

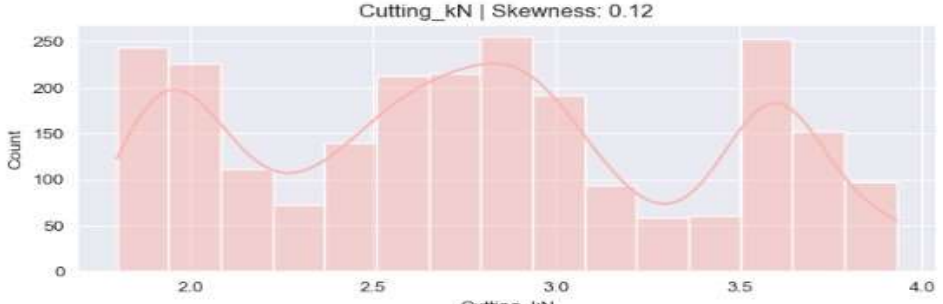

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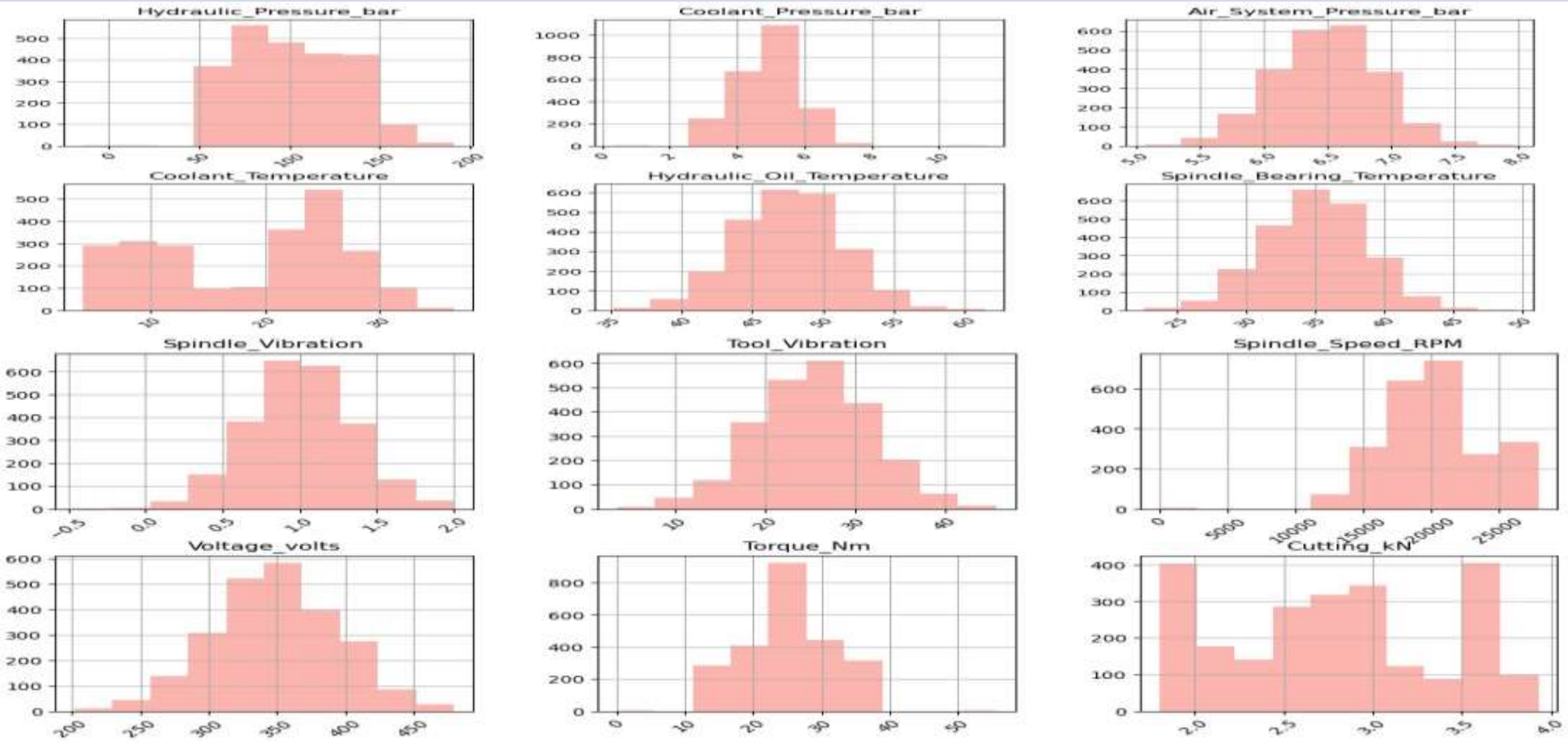

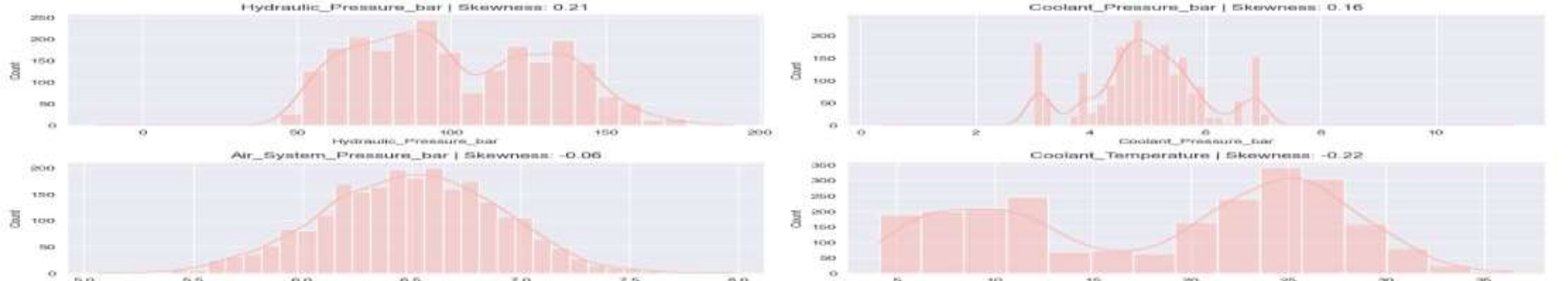

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