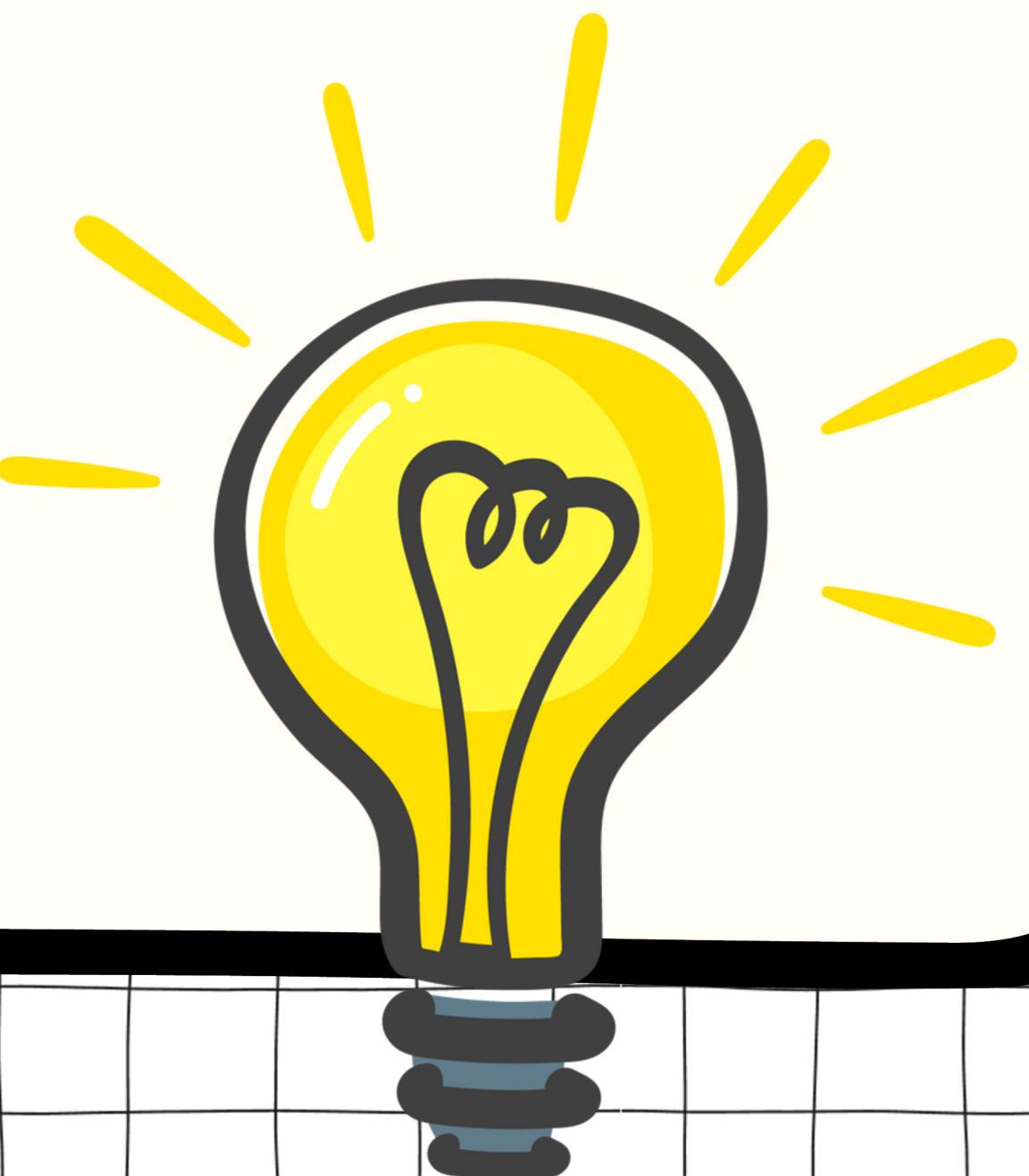
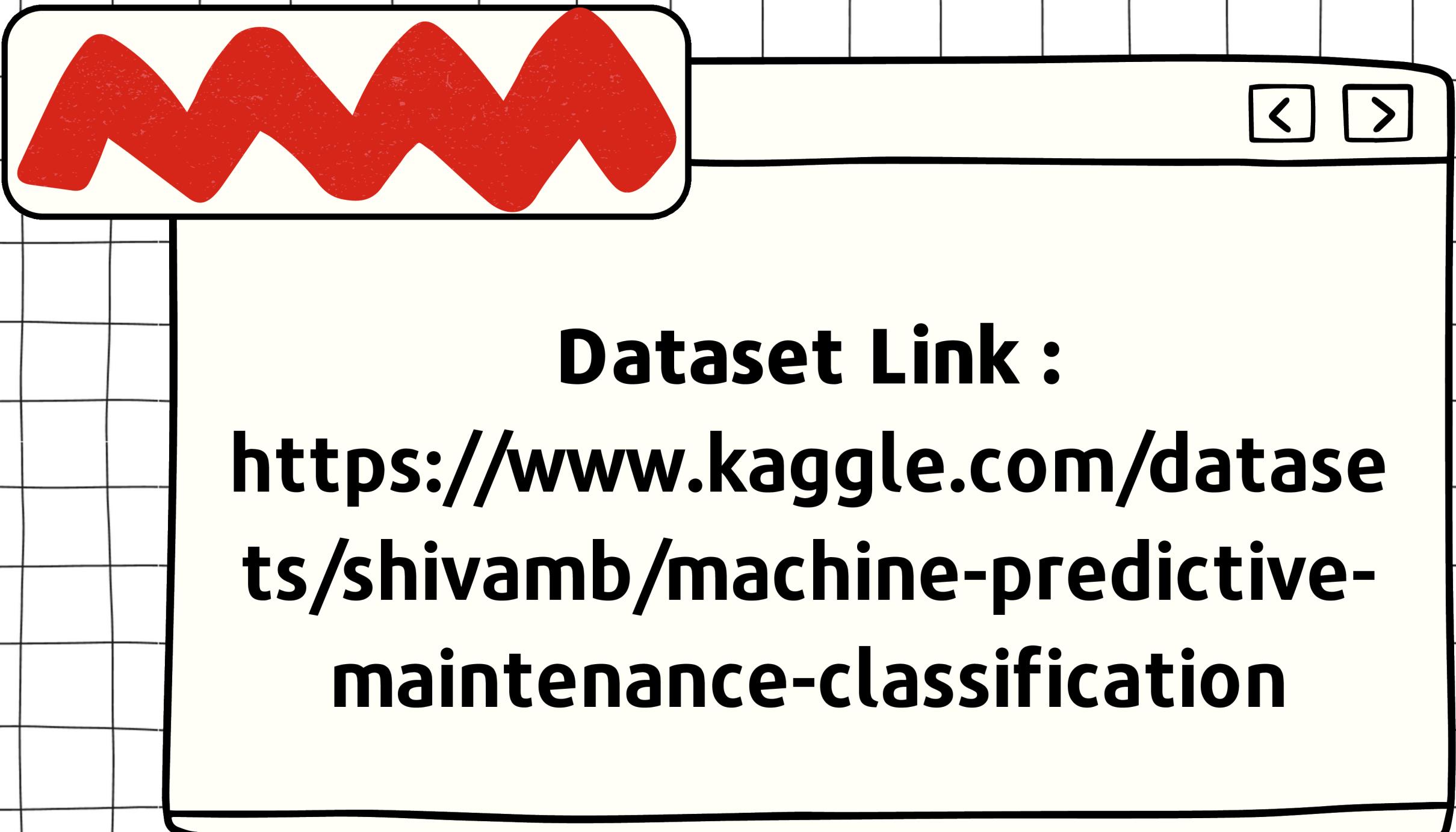


•• **Predictive Maintenance System Project**

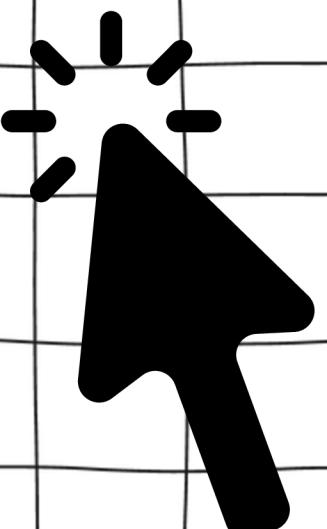


Problem Description

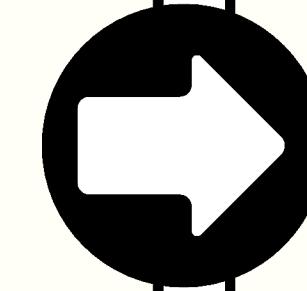
Our task is to develop a predictive maintenance system that can forecast potential failures in industrial equipment. The goal is to analyze historical equipment data to predict future maintenance needs, thereby preempting equipment failures.



Dataset Link :
**[https://www.kaggle.com/datasets
shivamb/machine-predictive-
maintenance-classification](https://www.kaggle.com/datasets/shivamb/machine-predictive-maintenance-classification)**



Steps Involved



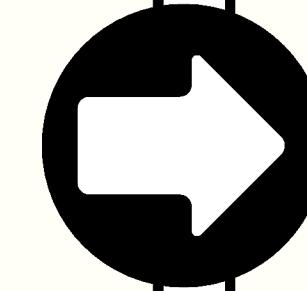
**Importing
Python
Libraries**

**Data
Preprocessi
ng**

**Loading
Dataset**

**Data
Visualization**

Steps Involved



**Feature
Selection**

**Model
Building**

**Ordinal
Encoding**

**Model
Evaluation**

Model Selection Approach



As it is multi Classification problem means we have to predict the failure type whether the it is Power failure, Overstrain failure , or tool wear failure etc .For this we use these algorithms to implement this

Logistic Regression

Decision Tree

SV Machine

Random Forest

Accuracy of Models

...
**Logistic
Regression
has 98%
Accuracy**

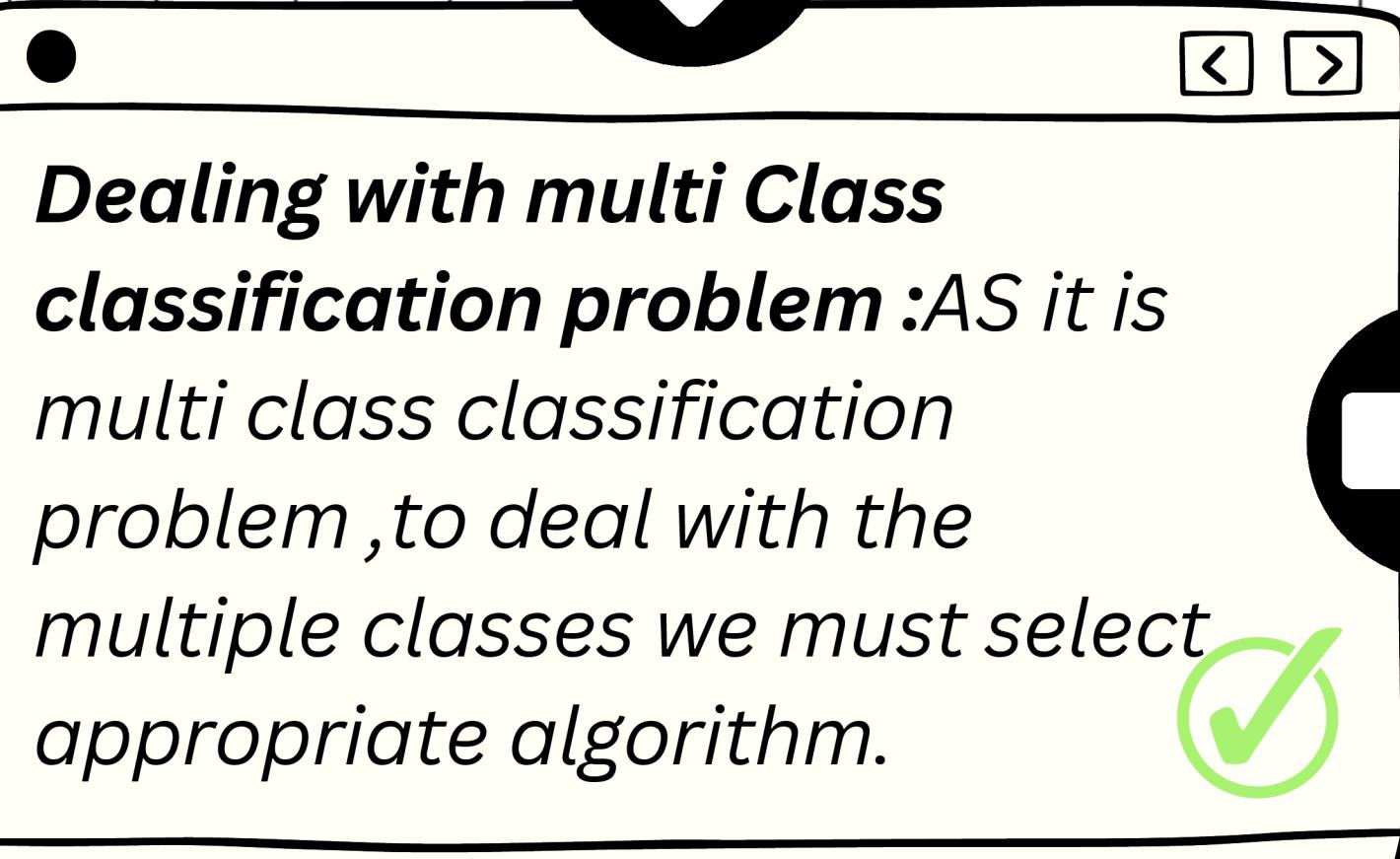
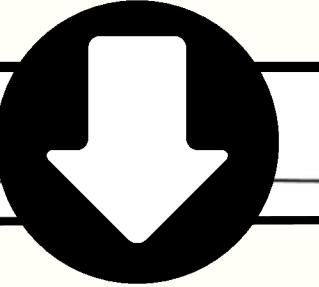
...
**Decision
Tree has
100%
Accuracy**

...
**SVM has
85%
Accuracy**

...
**Random
Forest has
100%
Accuracy**

Challenges Occured

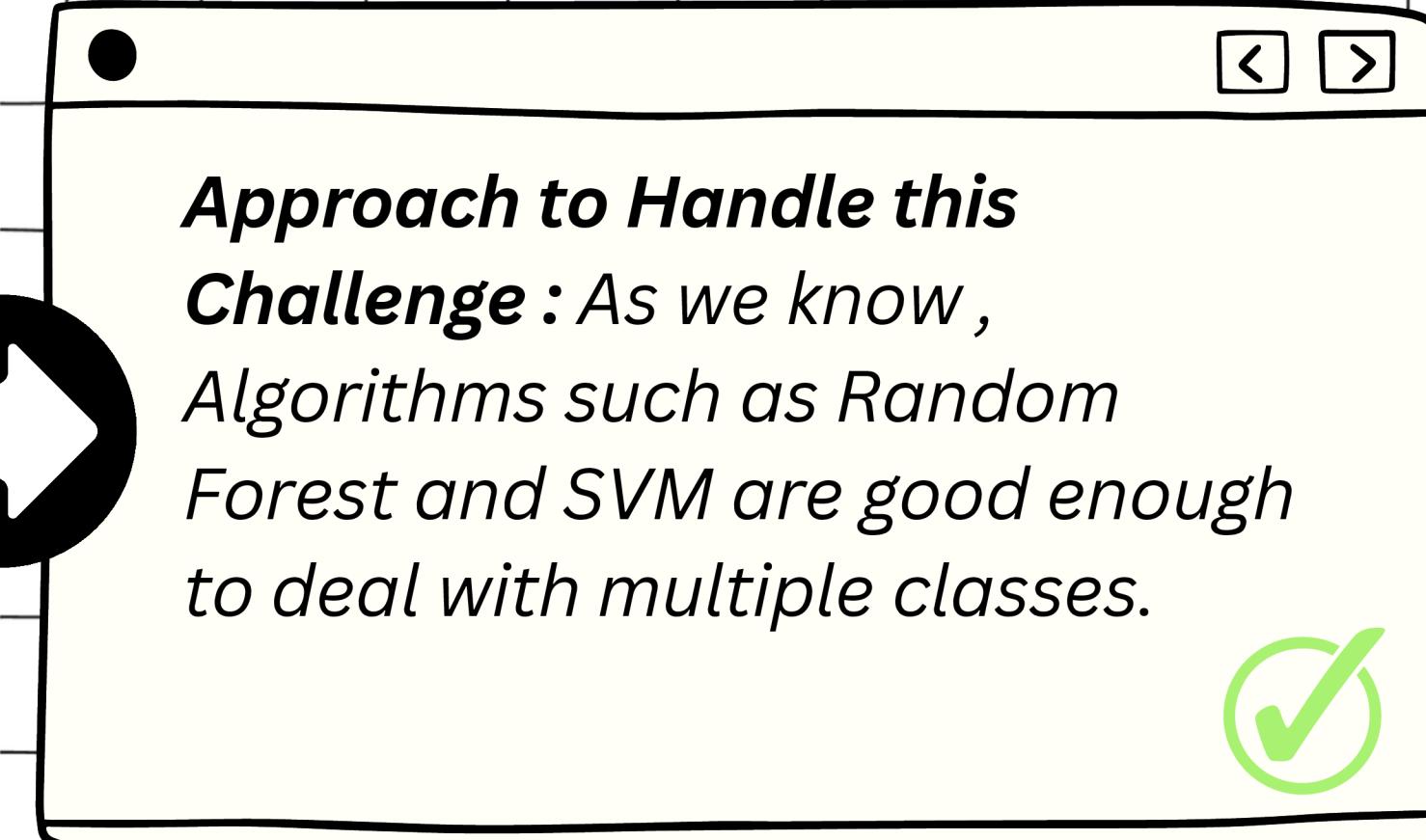
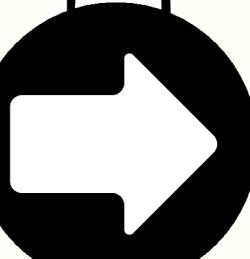
...



A card designed to look like a smartphone screen. It features a black border and rounded corners. At the top, there is a navigation bar with a left dot, a back arrow, a forward arrow, and a right dot. The main content area contains the following text:

Dealing with multi Class classification problem : AS it is multi class classification problem ,to deal with the multiple classes we must select appropriate algorithm.

In the bottom right corner of the card is a green circle with a white checkmark.



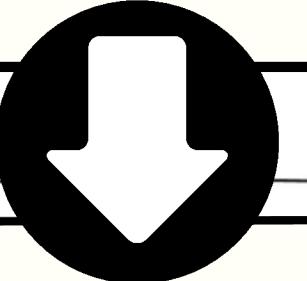
A card designed to look like a smartphone screen. It features a black border and rounded corners. At the top, there is a navigation bar with a left dot, a back arrow, a forward arrow, and a right dot. The main content area contains the following text:

Approach to Handle this Challenge : As we know , Algorithms such as Random Forest and SVM are good enough to deal with multiple classes.

In the bottom right corner of the card is a green circle with a white checkmark.

Challenges Occured

...



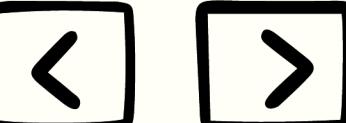
Dealing with Categorical Columns : It is also one challenge to deal with categorical columns with a large number of unique values can lead to sparse representations and increase the dimensionality of the dataset, making it more complex to process.



Approach to Handle this Challenge
:Techniques like Label Encoding or Ordinal Encoding applied on categorical columns with a manageable number of unique values. We applied Ordinal Encoding as it is ordinal data



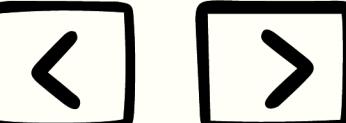
Insights



1. Air Temperature: The distribution is relatively symmetric and spread across a range between 296 and 304. This suggests consistent air temperature readings with a slight concentration around the center of the range.

2. Process Temperature: The distribution is bell-shaped, indicating a normal distribution with most values clustered around the mean, around 311. This could suggest stable process temperature during operations.

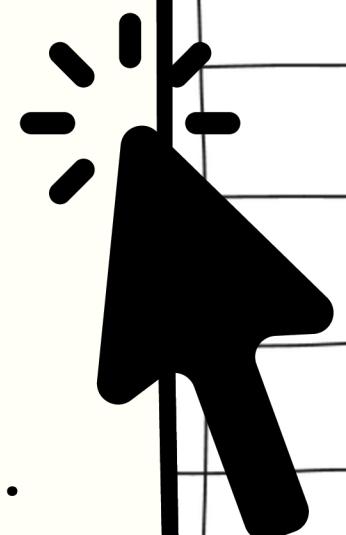
Insights



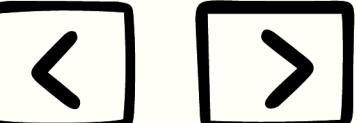
3. Rotational Speed: The distribution is right-skewed, with most observations concentrated between 1250 and 1750. This implies that in most cases, rotational speeds are on the lower side.

.

4. Torque: The torque feature also shows a right-skewed distribution, with most values falling between 10 and 40. This skewness indicates that higher torque values are less common.



Insights



5.Target: The target variable is highly imbalanced, with most instances concentrated at 0 (non-failure). This imbalance indicates that failures (1) are rare events in the dataset, which could influence model training.

6.No Failure : The category No failure has the highest count that shows many products do not face any kind of failure.

Thank you

