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Inventory Backorder Prediction

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Abstract: Product going to out of stock is a common problem in supply and chain scenario that comes under unpredictable risk in demand and supply. We aim to use Machine Learning predictive models in area of the business processes in decision making. By predicting products, backorder predictive models provides flexibility to decision authority, better clarity in the process, and helps in maintaining greater accuracy. The machine learning models that are tree based are chosen to predict material backordering. The backorders of products are predicted in this project by considering various models.
Keywords: Backorder, product, Prediction, Material, Demand.

I. INTRODUCTION

When a product is ordered by a customer, which is not available readily due to lack of stock of the product in the store but it can assure the delivery on a particular date in future and the customer waits for the same. This scenario is called backorder of that particular product. The task is to classify whether a product would go to Backorder based on the given input data or not. To predict, the target variable consists of two values, if it is “Yes” - the predicted product is considered as Backorder. If the output is “No”- the predicted product is not going to Backorder

II. LITERATURE SURVEY

1) Profit Function Maximizing Inventory Backorder Prediction System Using Big Data Analytics (2020):
Authors: Mohammad Abedin, Peter Hajek
In consumer purchasing pattern predicting, the thing discovered is that consumers who want to buy a product, whenever inventory goes to shortage then customers want their needs of ordering to be backordered. This model supported that feature and items are backordered accordingly.Addition to that, the model predicts two classes those are major and minor classes in a dataset.

2) Predicting material backorders in inventory management using machine learning (2017):
Authors: Rodrigo Barbosa de Santis, Eduardo Pestana de Aguiar
In this paper, classifiers in machine learning are used and proposed a model for predicting backordering, where the relatively associated frequency of items that are in backorder stage is rare when compared to items that do not. Some metrics such as precision-recall curves, sampling techniques and area under the Receiver Operator Characteristic are employed in this particular task. Using the mentioned techniques the items are backordered accordingly. It also determined yes or no for a given input product based on the availability of the product.

III. PROPOSED SYSTEM

A. Data Exploration, Cleaning, Visualization
1) Exploring datasets using Pandas, Matplotlib, Seaborn.
2) Checking Null values, checking outliers.
3) Plotting correlation matrix and plotting bar graphs.

B. Model Selection:
One model with accuracy among Decision Tree, Extreme Gradient Boosting, Random Forest is selected.

C. Model Dump:
Selected model is dumped to Joblib library.

D. Webpage and styling:
Webpage is made using Html and CSS

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E. Flask Framework

1) Then the saved model dumped in Joblib is used in Flask Framework
2) Integration of webpage with Flask Framework is done.
3) Values in that frame for features will get from html page when user enters the values.

F. Output

Output is displayed as either product went to backorder or not.

IV. ARCHITECTURE

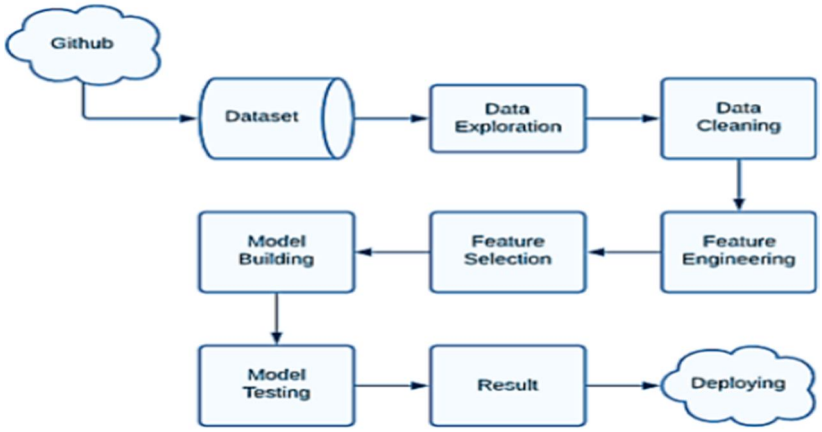


Fig.1. System Architecture

V. ALGORITHM

Machine learning follows statistics that solve many classification and clustering problems. In this project we are using three machine learning algorithms which can be applied to prediction, like Random Forest, Decision Tree (DT) and Extreme Gradient Boosting. Algorithm with more accuracy will be considered.

A. Decision Tree

Decision tree is a tree like structure used to identify output. It is a powerful data mining tool.

```
model_1 = DecisionTreeClassifier()
model_1.fit(x_train, y_train)
y_pred_1 = model_1.predict(x_test)
acc_score = accuracy_score(y_test, y_pred_1)
conf_matrix = confusion_matrix(y_test, y_pred_1)
```

```
print("Accuracy score for Decision Tree",acc_score)
```

B. Random Forest

Random Forest follows a tree structure algorithm for bootstrapping which combines decision trees to construct a model of prediction. As different trees are combined there will be more accuracy.

C. Extreme Gradient Boosting Classifier

It is an optimization library designed to have good efficiency, flexibility. It implements machine learning algorithms in its framework.

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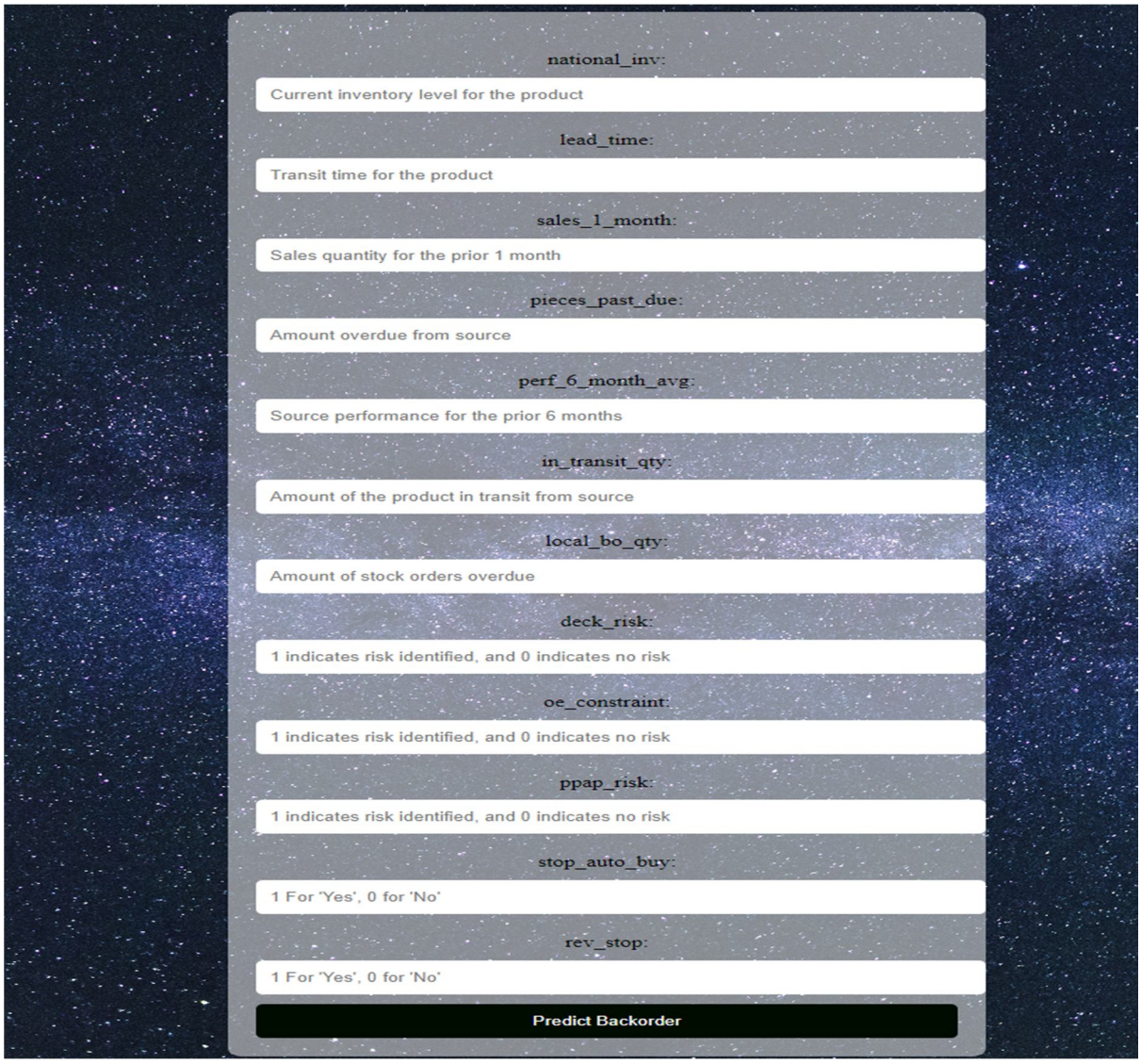
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VI. RESULTS

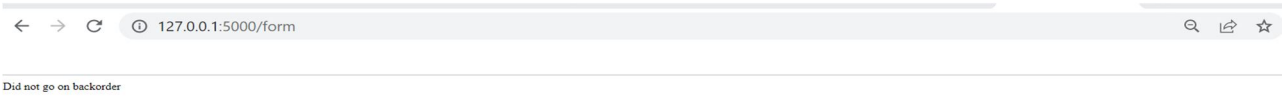
In our system we can detect whether a product is on backorder or not.

A. Backorder Prediction Homepage:

Users can enter details to this window of the Homepage. To predict the entered product went on Backorder or Not

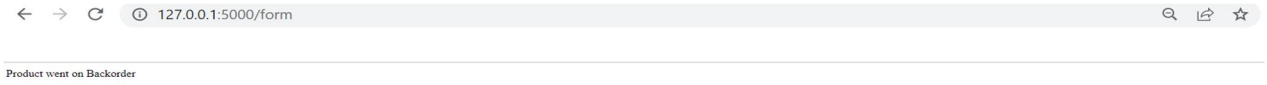


B. Output1



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C. Output2



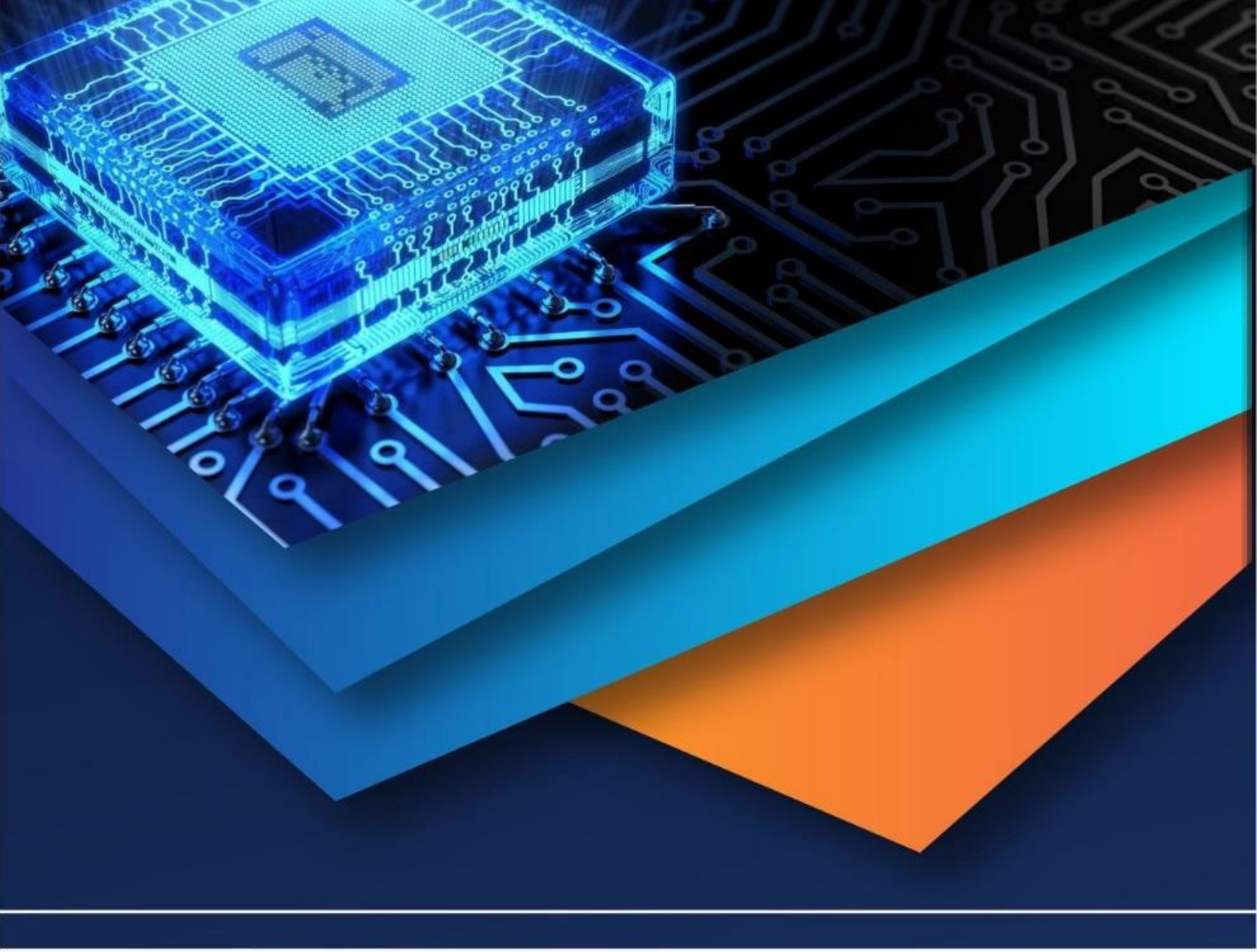
VII. CONCLUSION

As per the accuracy of the results we found that the backorder prediction based on the Decision Tree are more effective and accurate as compared to the other approaches.

This project has helped in identifying those products that will be backordered based on certain features extracted from the known data. The results prove it can control the inventory system, using a predictive machine learning classification. That leads to reduce the pressure of the supply chain problems. It results in greater flexibility and efficiency in inventory control and better customer satisfaction at a very low cost.

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