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Efficient Food Storage and Price Prediction System

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Abstract: India produces about 150 million tonnes of food grains per year. Production has been steadily increasing due to advancement in production technology, but losses have remained static at 10%. The main reason for this is improper storage, and an average of 6% out of a total 10% loss takes place during storage of food grains. The post-harvest losses in India amount to 12 to 16 million metric tons of food grains each year, an amount that the World Bank stipulates could feed one-third of Indias poor and the farmers incur huge losses. There is a need for sufficient modern warehousing capacity and also ensuring scientific storage methodology to be followed in the storage facilities existing. The proposed system provides a way to improve the efficiency of the food supply chain at different market levels. The objective of this project is to maximize the utilization of available space and market value prediction. The common practice of storing food grains is using bags of predetermined capacity and storing them in a random fashion which may or may not reach the optimum point of storage efficiency. By implementing stacking algorithm the method of placing the bags to achieve maximum efficiency is known.An accuracy of more than 90% was observed in the price prediction algorithm. For any number and types of bags the stacking algorithm provides the total number of stacks formed for a given compartment. Thus, decreasing the probability of wastage due to improper storage methods.
Index Terms: price prediction, food storage, machine learning, food wastage

I. INTRODUCTION

IN India, around 150 million tonnes of food grains is produced every year. Production has been steadily increasing due to advancement in production technology, but losses have remained static at 10%. This means that the loss of food grains is also increasing with the increase in food production. Improper storage is the primary reason for wastage.An average of 6% out of a total 10% loss takes place during storage of food grains. Storage of grain in India is done at many levels. The major
production is stored at farmer level and the root cause of massive storage loss lies here.
The grain is stored in bulk mainly by: traders, big farmers, cooperatives and government agencies such as the Food Corporation of India (FCI). The available storage capacity of these sectors is of the order of 18.55 million tonnes which is about 12% of total production. The main agencies storing surplus grain, and the amounts involved, are as follows:

A. The FCI 7.7 million tonnes (Mt)
B. Central Warehousing Corporation 2 Mt
C. Central Warehousing Corporation 2 Mt
D. Decreasing the time of execution.
E. Some state governments 1.9 Mt.

There are many kinds of storage systems followed depending on the length of storage and the product to be stored.The post-harvest losses in India are huge and amount to 12 to 16 million metric tonnes of food grains each year, an amount that the World Bank estimates could feed one-third of India's poor. The monetary value of these losses amounts to more than Rs.50,000Cr per year. It has been reported that high wastage and value loss are due to lack of storage infrastructure at the farm level. As per estimates available, the storage gap in warehousing capacity in the next 10 years is around 35 million mega tonnes. There is a need of not only sufficient modern warehousing capacity but also ensuring scientific storage methodology to be followed in the storage facilities existing.

II. LITERATURE SURVEY

Price forecast models like nave, or distributed lag models have performed very well in predicting agricultural commodity prices (Hudson, 2007).Other models such as deferred future plus historical basis models (Kastens et al., 1998),autoregressive integrated moving average (ARIMA) models and composite models(Tomek and Myers, 1993) lead to more accurate estimates. However, as the accuracy increases, so does the statistical complexity(Hudson, 2007).The increased fluctuation in price of agricultural commodities may increase the difficulty of predicting accurately, making the simple methods less reliable. Even the more complex forecast methods may not be efficient in this new market environment.To overcome these limitations, machine learning (ML) models can be used as an alternative to complex forecast models.After interacting with the local traders,the idea about the functioning of food supply chains was known which formed the basis of the propsed work.

III. DESIGN DETAILS

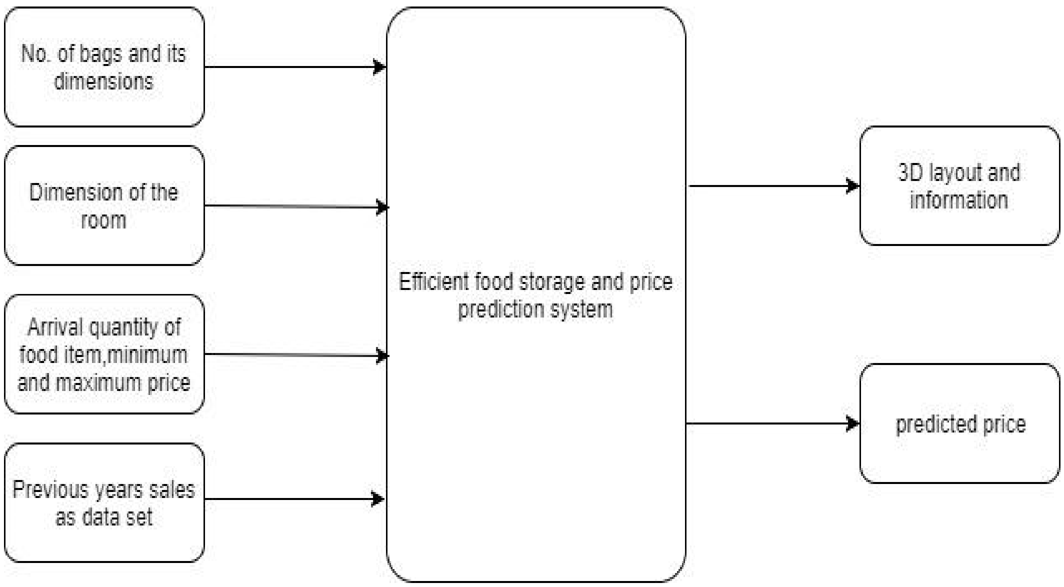

Fig.1. Block Diagram

The input arrival quantity as specified in the Fig.1 refers to the quantity of the commodity available in the market on that day. The data set of the previous years contains the information about the quantity of the commodity, minimum price, maximum price and the actual price of each day. These two inputs are used to forecast the price of the commodity in a particular day for specified quantity using a machine learning algorithm. The functionality of maximizing the storage efficiency takes the amount of food items to be stored and the available space as the input. The algorithm calculates minimum space required to store the food items and also provides the layout that could be adopted to store the items in order to minimize the space required. This ensures the effective usage of the available space and thus increases the storage efficiency.

IV. METHODOLOGY

The stacking algorithm is selected as the simplest method of achieving a good three-dimensional loading algorithm.The objective of the stacking algorithm is to maximize stacking efficiency where:
StackingEfficiency =

A. Stacking Methodology

$$\frac{\text{Total Compartment Volume}}{\text{Total Pallet Area Stacking Height}}$$

The compartment dimensions are fixed and the bag dimensions are variable which depends on the user input. The dimensions include length, breadth and height of the bag based on which base area of each type of bag is calculated. All the bags are sorted based on the base area from largest to smallest. Using the sorted list of different types of bag, stacks are organized. The bag with largest base area is taken first and placed in the compartment and the remaining height is calculated. Another bag of same dimensions, if available is placed on top of the first bag and the same process continues until the remaining height is smaller than the height of the bag. The next largest bag is checked for placement on the stack .The bag is placed if its height is less than the remaining height ,otherwise the next largest bag is checked to satisfy the condition and the process repeats until the remaining height is smaller than the height of the smallest bag, when the condition fails a new stack is created and the largest of all the bags is placed on the stack. The whole process repeats until all the bags of each type are placed on the stacks.

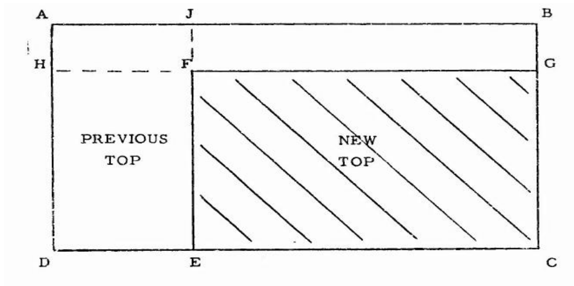

Fig. 2. Top view : After first level stacking of items

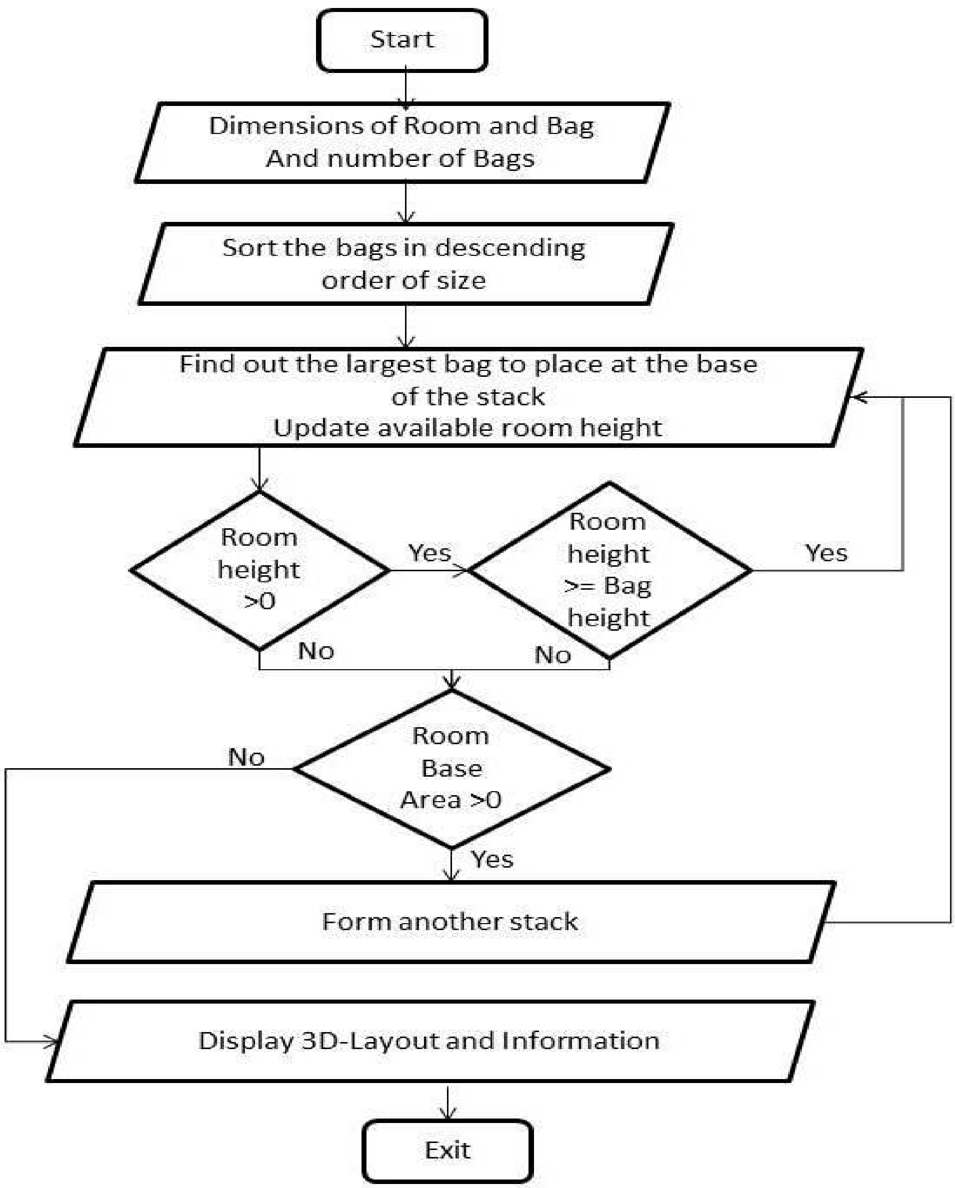

Fig. 3. Stacking process

B. Price Prediction Methodology

The required data for price prediction is obtained from the website of the National Horticulture Department. The collection of data consists of price of commodity for a given quantity as one of the attributes along with two other features- Minimum price and maximum price and was further grouped into months. The price of the commodity is predicted based on the data of the same month of the previous years thereby accounting different seasons

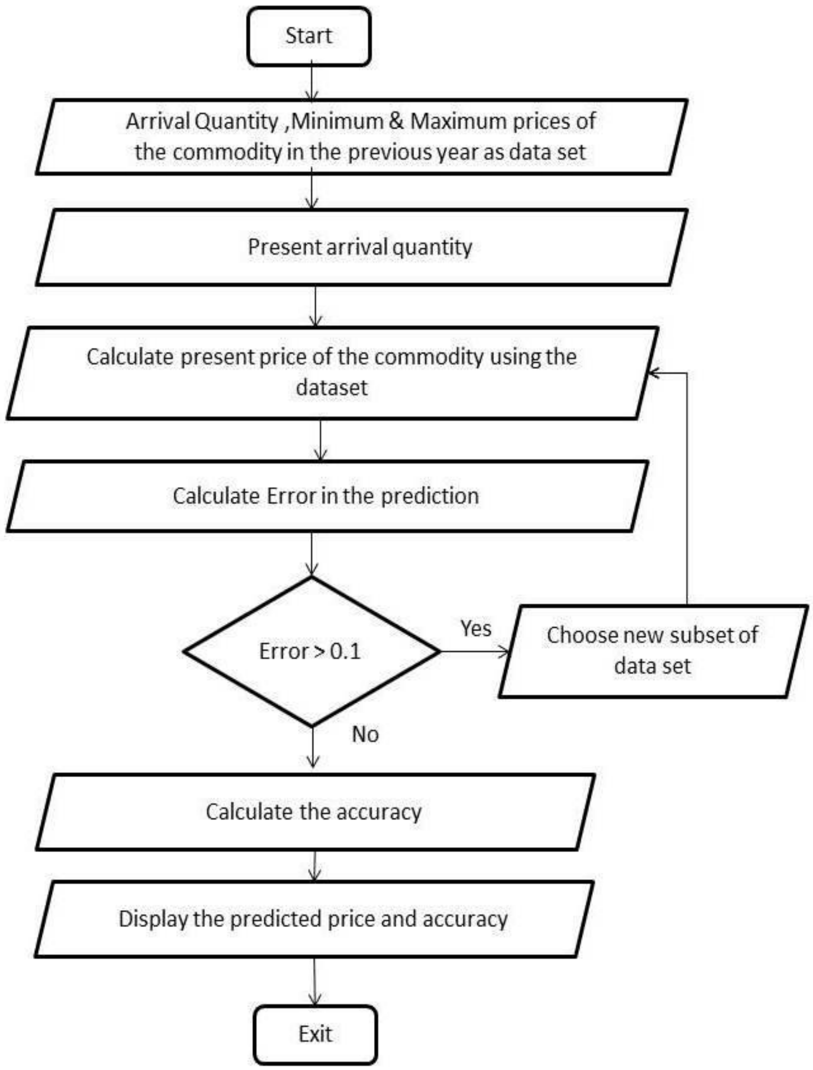

Fig. 4. Price prediction process

V. RESULTS

The price prediction module was first implemented using Ordinary Least Square(OLS) method using python. The variance was 0.524 indicating a weak fit. To overcome the inefficiency of the OLS method for price prediction,multiple linear regression is used.The dataset used for the implementation contains arrival quantity(quintals), minimum price(rupees per quintal), maximum price(rupees per quintal) and actual price for the month of January of three consecutive years(2014-2016). The module takes arrival quantity(quintals),minimum price and maximum price and predicts the actual price. The Fig.5 shows the result for a particular day in the month of January-2017 with arrival quantity(quintals) as 1440,minimum price as 1800 and maximum price as 2000.The predicted price is 1897.49 while the actual price is 1900. The stacking algorithm is programmed to dynamically consider the types of bags and respective dimensions. Two types of bags were considered for which the dimensions are provided by the user.Based on the room dimensions and the particular type of bag selected two stacks were formed. The algorithm ensures to minimize the number of stacks in a given area.

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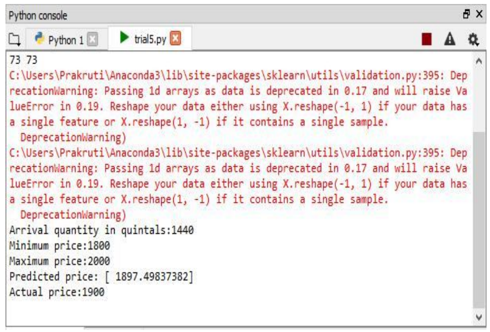


Fig. 5. Multiple linear regression

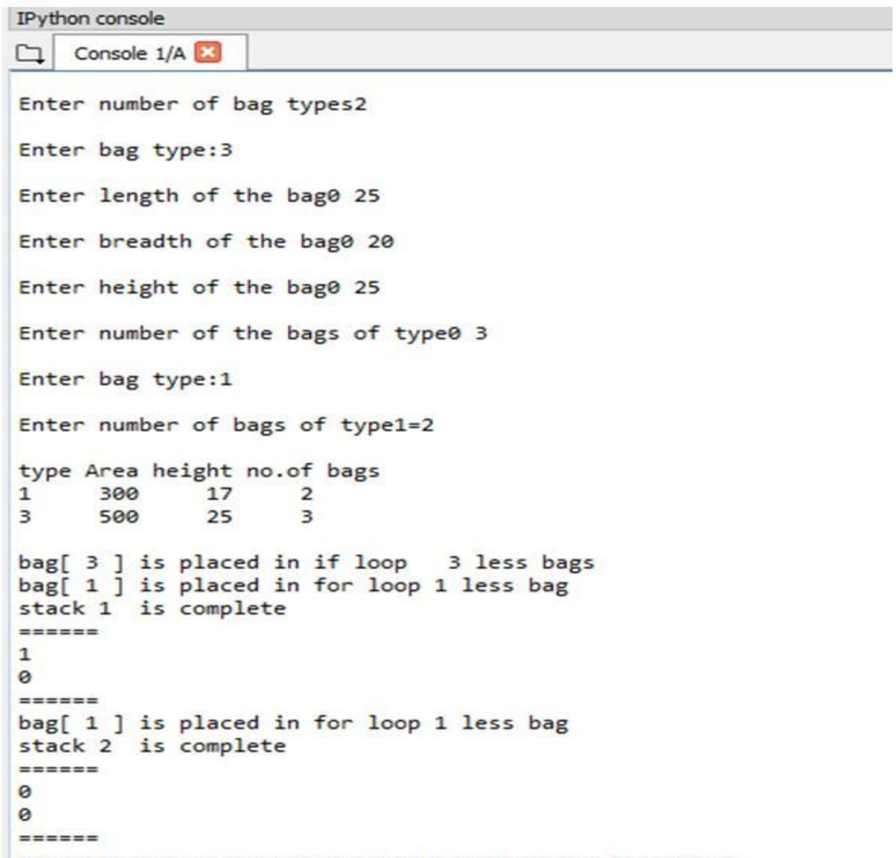


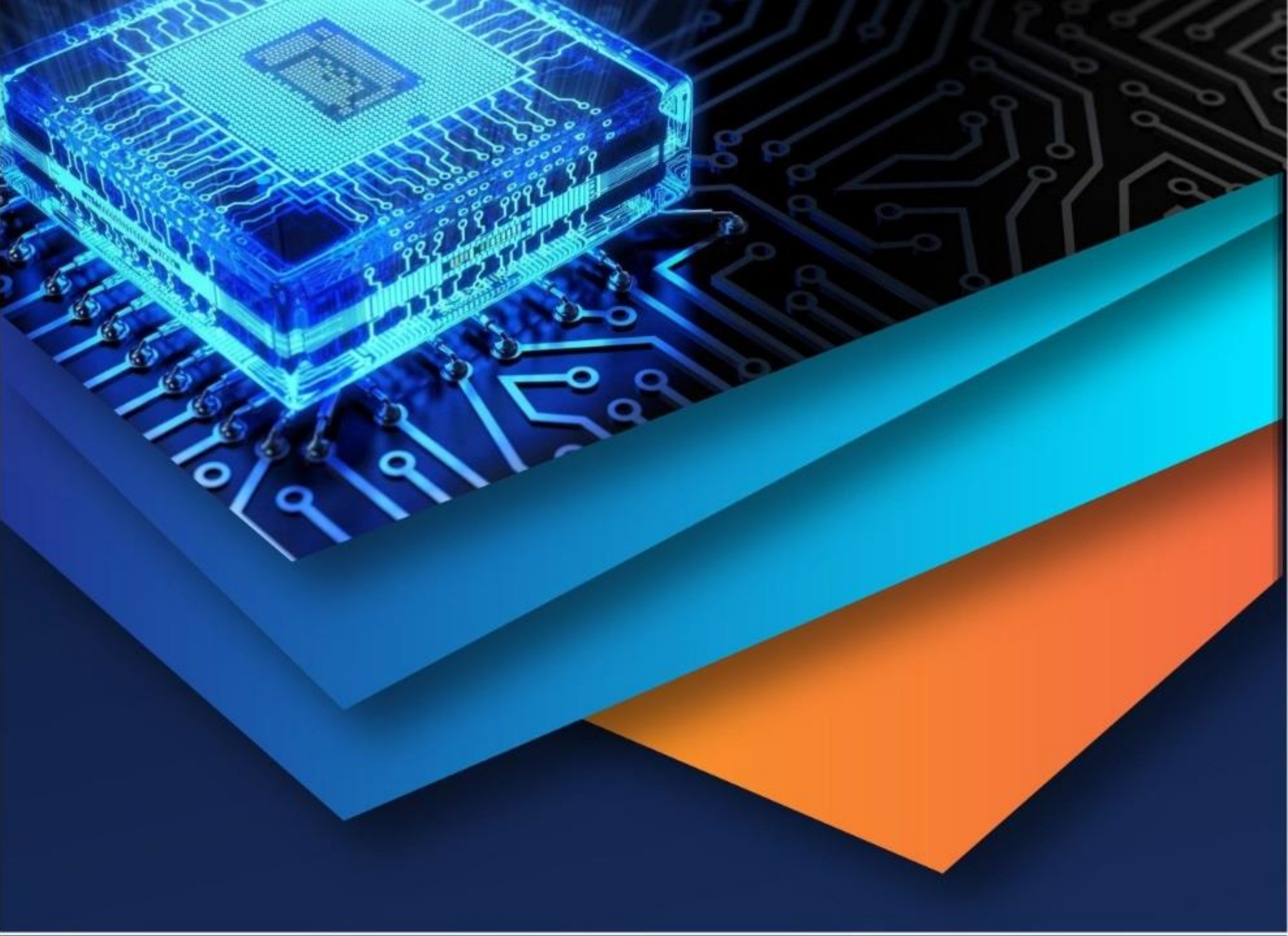
Fig. 6. Results of stacking algorithm for an example

VI. CONCLUSION

An accuracy of more than 90% was observed in the price prediction algorithm. For any number and types of bags the stacking algorithm provides the total number of stacks formed for a given compartment.The objectives to achieve efficient storing and price prediction were met using machine learning algorithms.This algorithm can be modified and improved for different industries. A 3-D represntation of the stacked bags can be implemented from the currently obtained result suggesting the number of bags that can be fitted in the remaining space of the compartment. A module to check the moisture content of food items before storing to ensure minimum losses due to retention of moisture leading to spoilage. The stacking algorithm and the price prediction algorithm can be further optimized to achieve a better result. Extending the scope of the project to other fields like pharmaceutical,medical applications,finance etc.

REFERENCES

[1] Gilmore, P. C, and Gomory, R. E. , ”The Theory and Computation of Knapsack Functions, ” Operations Resear.h, Volume 14, pages 1045-1074, (1966).
[2] Area-Efficient and Volume-Efficient Algorithms for Loading Cargo by Ernest Larry DeSha Lieutenant Commander, United States Navy B. S. , United States Naval Academy, 1961
[3] geeksforgeeks.org/dynamic-programming-set-21-box-stacking-problem/
[4] https://sigo.org.in/Post-Harvest-Loss/Statistics
[5] https://modernag.org/innovation/machine-learning-changing-modern-agriculture/
[6] Forecasting Agricultural Commodity Prices Using Multivariate Bayesian Machine Learning Regression by Andres M. Ticlavilca, Dillon M. Feuz, and Mac McKee
[7] http://pib.nic.in/newsite/PrintRelease.aspx?relid=148566
[8] Coursera : Machine Learning by Andrew N G
[9] ”Vehicle price prediction system using Machine Learning techniques”, IJCA, 2017
[10] http://www.cs.ox.ac.uk/teaching/studentprojects/undergraduate.html



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