

# **A Machine Learning Approach to Inventory Demand Forecasting**

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# ABSTRACT

## ***Informal description***

The problem of Inventory Demand Forecasting is extremely simple to understand, yet challenging to solve and optimize. An example for this is a grocery store that needs to forecast demand for perishable items. Purchase too many and you'll end up discarding the valuable products. Purchase too few and you'll run out of stock. Numerous businesses face different flavors of the same basic problem, yet many of them use outdated or downright naive methods to tackle it (like spreadsheet guided, stock-boy adjusted guessing).

## ***Formal description***

A computer program is said to learn from experience  $E$  with respect to some class of tasks  $T$  and performance measure  $P$ , if its performance at tasks in  $T$ , as measured by  $P$ , improves with experience  $E$ .

## ***For example:***

- **Task ( $T$ ):** *To Predict the stock of the items based on demand so that we do not go under-stocked or overstocked..*
- **Experience ( $E$ ):** *data for the past few years based on given intervals about the stock state at different times*
- **Performance ( $P$ ):** *Predict the demand and need for restocking or*

## **Phases of the project:**

### **1) Data:-**

As with any machine learning project, the first step is to collect, interpret, and analyze data. To implement a forecasting model, you should ideally have historic data regarding

- what products were in stock each day/week
- how many of each product were sold per day/week
- when was each product being promoted (e.g. when were products on sale)
- what days/hours was your business open

### **2) Evaluation Metric:-**

### **3) Validation Framework**

### **4) Develop a benchmark model**

### **5) Implementation**

# **1.INTRODUCTION**

## **1.1) Motivation :**

Seen real life scenarios where some times either products are Out of Stock or sometime they pile up and get out of the expiry date and thus lead to valuable items being discarded.

**For example** a clothing store that overstocks on winter coats will 1) reduce limited store space that could have been used to sell winter boots and 2) potentially result in having to sell the coats at a discount or loss come Spring to make space available for new items. These financial losses are harder to measure, but depending on the size of the business and quality of the existing inventory demand forecasting model, losses can be tens or hundreds of thousands of dollars annually.

## **1.2) Benefits of solution :**

**For example**, consider a grocery chain operating ten stores. Each store sells 100 perishable products with an average unit cost of \$3. On a typical day you restock the shelves with ten of each product since items are both

1) being sold and 2) being discarded.

If just 5% of the outflowing items are discarded, this is a loss of

10 stores x 100 products per store x 10 items per product off-shelves per day x 0.05 discard rate

**= 500 items discarded per day**

**or equivalently 547,500 discarded per year.**

If a forecasting model is used, the discarded items could be reduced.

## **2.Dataset finalization**

### **DATA SET-1**

<https://www.kaggle.com/aswathrao/demand-forecasting>

#### **2.1.1)What is the data about?**

One of the largest retail chains in the world ,we use their vast data source to build an efficient forecasting model to predict the sales for each SKU in its portfolio at its 76 different stores using historical sales data for the past 3 years on a week-on-week basis. Sales and promotional information is also available for each week - product and store wise. We try to forecast accurately the sales values for every such product/SKU-store combination for the next 12 weeks accurately.

#### **2.1.2)What are the number of features and describe each of the features and explain the importance?**

We have 8 features in this data set like record\_id,week,store\_id,sku\_id, total price and base price. etc.

Store\_id: Unique id of the store.

Sku\_id: Stock keeping unit printed on each product.The label allows vendors to automatically track the movement of inventory. The characters are a code that the price, product details, and the manufacturer.

### **DATA SET-2**

<https://github.com/Azure/MachineLearningNotebooks/blob/master/how-to-use-azureml/automated-machine-learning/forecasting-bike-share/bike-no.csv>

#### **2.2.1)What is the data about?**

In this we use automated machine learning, or automated ML, in the Azure MachineLearning studio to create a time-series forecasting model to predict rental demand for a bike sharing service.

#### **2.2.2)What are the number of features and describe each of the features and explain the importance?**

We have 14 features in this data set and we will be using all of these to predict the rental demand for a bike sharing service.(like date to check for any important occasions like festivals etc, temperature, humidity)

#### **REFERENCES:**

<https://www.gormanalysis.com/blog/a-machine-learning-approach-to-inventory-demand-forecasting/>