

# SALES FORECASTING FOR COMPANY USING MACHINE LEARNING

Tejaswini C S  
Assistant professor  
Department of CSE  
Vidya Vikas Institute of  
Engineering and  
Technology, Mysore  
[thejanaveen.vviet@gmail.com](mailto:thejanaveen.vviet@gmail.com)

Amrutha O  
Student  
Department of ISE  
Vidya Vikas Institute of  
Engineering and  
Technology, Mysore  
[amrutha0331@gmail.com](mailto:amrutha0331@gmail.com)

Harshini J C  
Student  
Department of ISE  
Vidya Vikas Institute of  
Engineering and  
Technology, Mysore  
[jcharshini@gmail.com](mailto:jcharshini@gmail.com)

K Gouri  
Student  
Department of ISE  
Vidya Vikas Institute of  
Engineering and  
Technology, Mysore  
[k.gouri2779@gmail.com](mailto:k.gouri2779@gmail.com)

Gagan T N  
Student  
Department of ISE  
Vidya Vikas Institute of  
Engineering and  
Technology, Mysore  
[tmgagan9@gmail.com](mailto:tmgagan9@gmail.com)

**Abstract** - For modern retailers operating a huge chain of stores, accurate sales forecasting is key to the development of the business, even to its success or failure.

Sales forecasting allows companies to efficiently allocate resources such as cash flow and production and create a sound business plan. In this paper, we propose an efficient and accurate sales forecasting model using machine learning.

Machine learning is a branch of AI that enables the machine to automatically learn from data, improve its performance based on previous experience and make predictions. Machine learning involves a series of algorithms that work with a huge amount of data. These algorithms are fed with data to train them and based on the training, they create a model and perform a specific task. These ML algorithms help in solving various business problems like regression, Classification, prediction, clustering and association etc.

Machine learning (ML) is an important tool to utilise artificial intelligence technologies. Because of its learning and decision-making capabilities, machine learning is often referred to as AI, although it is actually a subdivision of AI. It was part of the development of AI until the late 1970s. Then it split off and developed independently. Machine learning has become a very important response tool for cloud computing and e-commerce.

**Keywords** – Sales forecasting, Machine learning, Deep neural network, Gradient boosting, Amazon Best Sellers Rank, Forecasting, XG Boost, Gross domestic product, SHAP, Price forecasting Price prediction, Sales prediction, Python, Jupyter

## 1. Introduction

In a dynamic business environment, sales forecasts play an important role in decision making, resource allocation and overall performance. This brief provides an in-depth look at the application of Python-based machine learning techniques to sales forecasting, an important aspect of today's business management. Using historical sales data and related factors, machine learning algorithms are used to create predictive models to gain insight into future sales. This summary provides an overview of the key steps of sales forecasting, including preliminary data, feature selection, model selection, and evaluation. It emphasizes the importance of choosing appropriate algorithms (such as time series models, regression techniques and integration) according to the nature of the sales data. Additionally, the abstract discusses the importance of design to improve model performance and the use of techniques such as cross-validation to increase robustness. Issues related to data quality, seasonality, and sample interpretation are also addressed. Through real-world examples and code snippets, the summary demonstrates the effectiveness of sales forecasting using popular Python libraries such as pandas, scikit-learn, and model statistics. Explain the benefits of accurate sales forecasting, including product development, strategic planning, and effective resource allocation. As the industry continues to seek solutions from data, sales forecasting insight using Python machine learning is an essential skill for today's professionals to improve competitiveness and decision-making.

## II. MACHINE LEARNING

In the late 1970s and early 1980s, artificial intelligence research focused on using knowledge-based logic approaches rather than algorithms. In addition, researchers in computer science and artificial intelligence have abandoned neural network research. This caused a split between artificial intelligence and machine learning. Until then, machine learning was used as a tutorial for AI. The field of machine learning, which included a large number of researchers and engineers, was reorganized into a separate field and struggled for almost a decade. The industry's focus has shifted from AI training to solving practical service delivery problems. His focus shifted from approaches inherited from artificial intelligence research to methods and tactics used in probability theory and statistics. During this time, the ML industry maintained its focus on neural networks and then flourished in the 1990s. Most of this success was a result of the growth of the Internet, which benefited from the ever-increasing availability of digital data and the ability to share its services over the Internet.

### A. HISTORICAL FORECASTS

Historical sales forecast, as previously mentioned, is used when companies have at least one year of historical data to import for reference. If companies are less than a year old, they must resort to other methods of quantitative forecasting, such as intuitive sales forecasting. However, there are cases where a company that has been in existence for more than a year may not use historical forecasting as a sales forecasting method. For example, this method would not be very reliable if the company is constantly launching new products. A sales team will have difficulty developing a sales forecasting process for a company that has new products that do not have historical data to refer to, making it difficult to forecast product sales. There are many factors that can come into play when determining whether historical forecasting is right for your company, and because every company is different. there is no universal formula that can be applied to everyone. Having a good sales team led by a sales manager who understands the company's sales process and sales cycles is integral to good historical forecasting. A company's sales team being able to determine the seasonality of a product and how it relates to the average sales cycle can be a useful tool for a sales manager to analyze historical data. The best way to use historical data is to use it in conjunction with other forecasting methods, such as pipeline forecasting, sales cycle length forecasting, opportunity stage forecasting, or summary forecasting.

## B. REINFORCEMENT MACHINE LEARNING

Reinforcement learning works based on a feedback-based process in which an AI agent (a software component) automatically explores its surroundings using hits and tracks, taking action, learning from experience, and improving its performance. The agent is rewarded for every good action and punished for every bad action; therefore, the goal of a reinforcement learning agent is to maximize rewards. In reinforcement learning, there is no labeled data as supervised learning and agents only learn from their experiences. The process of reinforcement learning is similar to a human being; for example, a child learns various things through the experiences of his daily life. An example of reinforcement learning is playing a game where the Game is the environment, the agent's moves at each step define the states, and the agent's goal is to get a high score. The agent receives feedback in terms of punishments and rewards. Due to its way of working, reinforcement learning is used in various fields such as game theory, operations research, information theory, multi-agent systems. The reinforcement learning problem can be formalized using a Markov decision process (MDP). In MDP, an agent constantly interacts with the environment and performs actions; it reacts to every action of the environment and generates a new state.

## III SALES FORECAST

Sales forecasts are one of the most important things a company does. It supports sales planning and is used across the enterprise for staffing and budgeting. Despite their importance, many organizations use outdated practices that produce poor forecasts. It could be compared to the days of yesteryear, when farmers depended on signals such as cats washing behind their ears or old-timers' knee pain to predict the weather. With the advent of super computers, weather forecasting has greatly improved. In large businesses, however, the tools used to forecast sales remain little more reliable than an arthritic knee Sales forecasting is the process of estimating a company's sales for a specific period of time—usually a month, quarter, or year. A sales forecast is a prediction of how much a company will sell in the future. Creating an accurate sales forecast is critical to business success. Recruiting, payroll, compensation, inventory management and marketing all depend on it. Public companies can quickly lose credibility if they miss a forecast. Forecasting goes hand in hand with sales channel management. Getting an accurate picture of qualification, engagement and velocity for each deal helps sales reps and managers provide data for reliable sales forecasting. A forecast is different from sales targets, which are the sales a business wants to achieve. Sales forecasting uses various data points to provide an accurate forecast of future sales performance.

#### IV. BUSINESS FORECASTING TOOLS

By identifying the tools that are most useful for your forecasting, you can create projections that provide valuable guidance to your team. Here are some of the best resources you can use when creating your forecast. Statements of cash flows. A cash flow statement provides an overview of the money your company is spending and receiving from clients, including when you expect transactions to take place. It is an extremely valuable tool for creating projections for your business, as having cash on hand when needed is a vital element of any business plan. The more accurately you understand periods of high and low cash reserves, the better prepared you are to make necessary adjustments, such as rescheduling a project or seeking loans when cash on hand is insufficient for your needs. Cash flow statements are essential components of business forecasting tools and provide valuable information about a company's financial health and liquidity. They help businesses predict how changes in various financial variables will affect their cash position over a period of time, usually a month, quarter or year.

##### A. Statements of Cash Flows

A cash flow statement provides an overview of the money your company is spending and receiving from clients, including when you expect transactions to take place. It is an extremely valuable tool for creating projections for your business.

#### V. CONCLUSION

Machine learning is constantly evolving and new methods are being developed every day. In macroeconomics, progress has been made in recent years in the use of such methods with big data. However, with such approaches, the interpretability of the models is usually lost.

According to Occam's razor, models should be simple and explainable. Nevertheless, ML methods are not easy to interpret, e.g. due to a highly non-linear structure or a large number of inputs.

In the future, demand forecasting models should use techniques that focus on predictive accuracy and avoid the common mistake of confusing explanatory methods with predictive methods. Explanation and prediction are not the same thing, and in a statistical sense they can act as opposing forces. Direct demand forecasting models should avoid standard OLS and logic models and use penalized regression techniques such as LASSO. LASSO is a highly interpretable, readily available technique that helps models make good out-of-sample predictions and select only the most important predictors. LASSO helps modelers to focus on the most meaningful predictors and avoids the problem of adding

marginally significant variables that might help the model from an explanatory perspective but compromise its actual predictive ability.

#### References

- [1] .A study on agriculture commodities price prediction and forecating by Girish hegde , Viswanath R hulipalled , J.B Simha .
- [2] Best Seller rank (BSR) to Sales :An Emperical look at Amazon.com Amit Sharma,Hongrui Liu,Hongwei Liu.
- [3] Interpreting direct sales' demand forecasts using SHAP values Mariana Arboleda-Floreza,Carlos Castro-Zuluaga
- [4] Demand forecasting of spare parts with regression and machine learning methods:Application in a bus fleetMetin ifrax ,Adnan aktepe ,Tahsin cetinyokey
- [5] A machine learning approach to predicting bicycle demand during the COVID-19 pandemicCarolina Baumanis,Jennifer Hall, Randy Machmehl
- [6] Machine learning methods for inflation forecasting in Brazil: New contenders versus classical models Gustavo Silva Araujo , Wagner Piazza Gaglianone
- [7] Sales forecasting using deep neural network and SHAP techniques Jun hang chen ,Wang koju,Shurui xu ,Zhe liu.
- [8] Machine Learning Model for Sales Forecasting by Using XG Boost Author- Xie dairu1, Zhang Shilong
- [9] Retail Sales Forecasting Using Deep Learning: Systematic Literature ReviewLinda Eglite and Ilze Birzniece
- [10] Predicting sales using Machine Learning TechniquesSai Nikhil Boyapati, Ramesh Mummidi