International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

STORE ITEM DEMAND FORECAST

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Abstract: *Demand forecasting plays in vital in total's world for the retail business. Proper demand management of store items directly impacts the efficiency of running a retail business. As the retail stores are in direct contact with the clients (shoppers) demands on a daily basis, demand forecasting is a key driver for such businesses. The goal of the project is to identify the best analytical method to solve such problems. The project uses the Deep Neural Network Algorithm as well as Recurrent Neural Network Algorithm. In this project, the goal is to forecast 3-month sales for 50 different products in 10 different stores when given 5 years of store item sales data.*

Keywords: RNN, DNN.

I. INTRODUCTION

First, the project would require a dataset containing historical sales data of the store items. This dataset would be used to train a deep neural network model that would predict the demand for each item in the future. The next step would be preprocessing the data. This involves cleaning and feature engineering to ensure that the data is in a suitable format for the neural network. After preprocessing, the data would be split into training and testing sets. The neural network would be trained using the training set, and its performance evaluated using the testing set. As the neural network is trained, its parameters would be optimized using techniques such as backpropagation and gradient descent. The model would also undergo hyperparameter tuning to improve its accuracy. Finally, the trained model would be deployed to the production environment to make demand predictions for store items. The predictions would be periodically updated and evaluated against actual sales data to continually improve the accuracy of the model.

II. EXISTING SYSTEM

The existing system of store item demand forecasting is typically based on historical sales data, which is analyzed to identify patterns and trends in customer buying behavior. This data is then used to predict future demand patterns, which is used to determine inventory levels and stock replenishment schedules. In many cases, advanced analytics techniques such as machine learning and predictive modeling are used to improve the accuracy of demand forecasting. These techniques are taken into account a wide range of factors that may impact demand, such as seasonality, promotions, pricing, and external factors like weather and economic conditions. However, demand
forecasting is a complex and constantly evolving task that requires ongoing analysis and adjustment. Factors such as changes in customer preferences, new competition, and unforeseen events like pandemics can all impact demand patterns, making it difficult to accurately predict future sales.

III. PROPOSED SYSTEM

The system would involve collecting and analyzing historical sales data, inventory levels, and external factors such as weather patterns, events, and holidays. Based on this information, a machine learning algorithm would be used to predict future demand for each item in the store. The system would also incorporate real-time data from point-of-sale systems, allowing for on-the-fly adjustments to the demand forecast. This would ensure that the inventory levels are optimized to meet customer demand while minimizing stock-out and overstock situations.

To improve the accuracy of the forecast, the system would also consider other relevant data sources such as social media trends, competitor analysis, and consumer surveys. This would help refine the demand prediction model and provide valuable insights into consumer behavior. Overall, such a system would help retailers to make more informed decisions about inventory management, pricing strategies, and marketing efforts, leading to increased sales and profitability.

IV. TECHNOLOGIES USED

Python and Google Collaborative Notebook are the technologies we used for this project.

Google Collaborative: Collab is the abbreviation for Google Collaborative, a version of the free Jupyter notebook environment available online. You can do a lot of things with it, including create and run Python code, use Markdown to document your code, and view datasets. It works fully within the browser and requires very little setup. Data analysis, teaching, and machine learning all frequently use it.

Python: Python is mostly used programming language that can be used for a variety of activities, including automating processes and writing scripts as well as developing websites and software. Python has the ability to develop software that is ready for production, read and modify documents, interact with data storage systems, and build web applications on a server. Python is frequently combined with other programming languages, frameworks, and tools like Django and Flask to increase its effectiveness and utility.

V. RESULTS

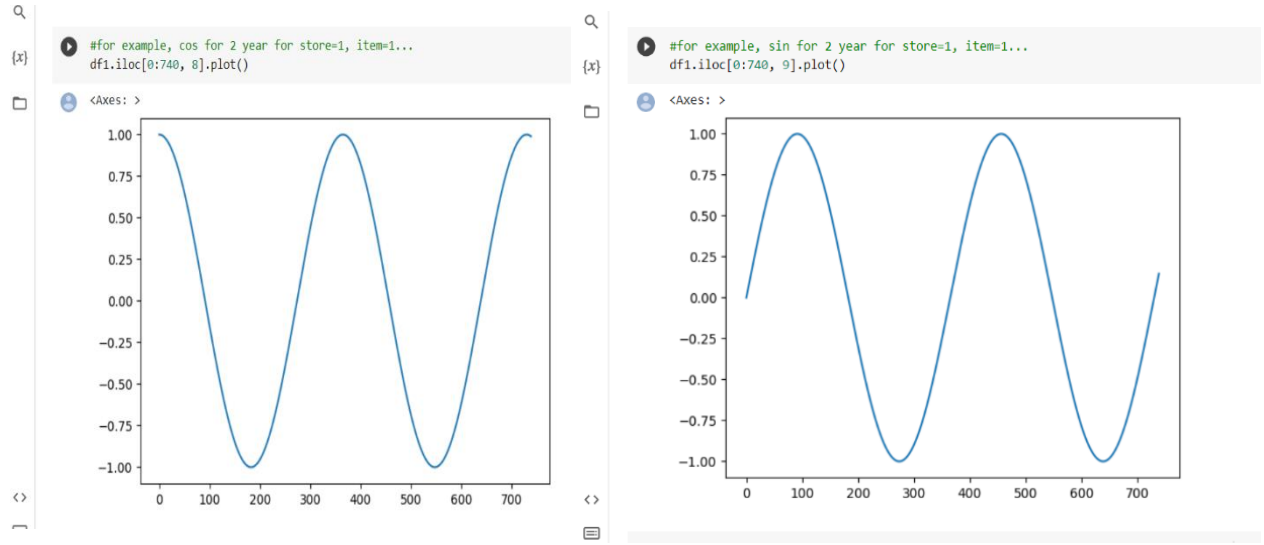
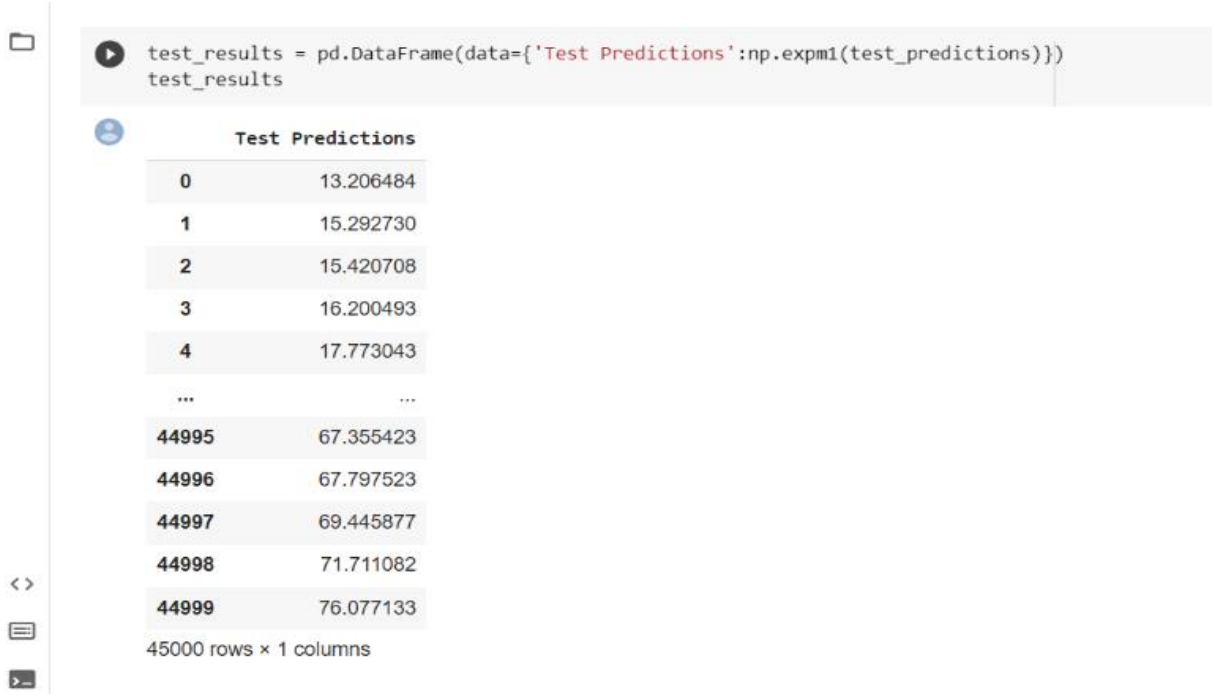


Fig 1.1 : The data of items in the store for two years and plotting the graph according to the dataset using sin and cos .



```
test_results = pd.DataFrame(data={'Test Predictions':np.expm1(test_predictions)})
test_results
```

	Test Predictions
0	13.206484
1	15.292730
2	15.420708
3	16.200493
4	17.773043
...	...
44995	67.355423
44996	67.797523
44997	69.445877
44998	71.711082
44999	76.077133

45000 rows × 1 columns

Fig 1.2 : These are the test prediction results of three month sales for 50 different products in ten different stores by using five years of store item sales data.

VI. SCOPE OF FUTURE USE

The future of store item demand forecast is a crucial aspect of retail management and has a significant impact on a company's profitability. With the advent of new technologies and advanced analytical tools, the scope of demand forecasting is rapidly expanding. Here are some potential areas of growth and development in the field of store item demand forecast:

Personalized recommendations: By analyzing customer data and purchase history, retailers can provide personalized recommendations to individual customers, increasing the likelihood of repeat purchases and customer loyalty.

Omni-channel retailing: As more and more consumers shop online and through mobile devices, demand forecasting will need to take into account the unique challenges of omni-channel retailing, such as the need for real-time inventory visibility across multiple channels.

Overall, the future of store item demand forecasting is likely to be shaped by advances in data analytics, artificial intelligence, and machine learning, as well as by changing consumer preferences and shopping habits.

VII. CONCLUSION

In conclusion, store item demand forecasting is a critical aspect of retail management that can have a significant impact on a company's profitability. By accurately predicting future demand for products, retailers can optimize their inventory levels, reduce stockouts, and increase customer satisfaction. There are several approaches to store item demand forecasting, including time-series models, regression analysis, and machine learning algorithms. Each approach has its advantages and disadvantages, and the choice of method will depend on the specific needs and requirements of the retailer. Overall, the future of store item demand forecasting is likely to be shaped by advances in data analytics, artificial intelligence, and machine learning. With the increasing availability of data and the development of more sophisticated analytical tools, retailers can expect to see continued improvements in the accuracy and precision of demand forecasts.

VIII. REFERENCES

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