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Demand Forecasting for Aqua Tech Technical Textiles

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Abstract*: Demand forecasting plays a significant role in the Aquatech industry, where innovation integration with aquacultural practices drives efficiency and effectiveness. This abstract outline the importance, challenges, techniques, and implications of demand forecasting in the sector. Demand forecasting is essential for businesses to anticipate trends, optimize resource allocation, and enhance operational efficiency. By accurately predicting future demand for aquacultural products, services, and technological outcomes, companies can make informed decisions regarding production, operations, and marketing strategies. However, demand forecasting in this industry faces several challenges, including seasonal variations, data availability, technological complexity, and uncertainties. Aquaculture demand is influenced by factors such as precipitation patterns, regulatory policies, and consumer preferences, making it difficult to develop precise forecasting models. Various techniques are used for demand forecasting, including statistical methods, data analytics, and machine learning algorithms. Time series analysis, regression analysis, and hybrid forecasting approaches are commonly employed to analyze historical data and predict future demand patterns. Accurate demand forecasting has significant implications for businesses, including improved resource planning, supply chain management, and customer satisfaction. By aligning production capacities with anticipated demand and optimizing supply levels, companies can minimize costs, reduce waste, and enhance competitiveness in the market. Demand forecasting is a critical aspect of strategic planning and decision-making in the specialized industry. By utilizing advanced techniques and effectively addressing challenges, businesses can enhance their ability to anticipate trends, meet customer demands, and drive sustainable growth in an increasingly dynamic and competitive environment*

Keywords: Machine Learning, Python, ABC Category Analysis, XYZ Category Analysis, MAE, MSE, MAPE.

I. INTRODUCTION

In the swiftly evolving sedulity, where advanced technology intersects with monoculture, demand auguring is vital for managing misgivings and optimizing resources. Factors analogous as technological advancements, changing consumer preferences, and global influences like climate change contribute to the complexity and openings in demand auguring for companies. Demand auguring in this sector involves predicting future conditions for products, services, or results that incorporate technology into monoculture practices. This includes a different range of offerings, analogous as perfection fishing outfit and monoculture drones.

We have conducted demand auguring for" PRIYAFIL," a leader in the technical fabric's sedulity. Priyadarshini fibers Pvt. Ltd, known as Priyafil, is a celebrated manufacturer and exporter of HDPE monofilament woven and knitted fabrics, polyknit shade net fabrics, and defenses. Our brand is recognized for delivering high- quality technical fabrics with varied operations across sectors analogous as monoculture, structure, packaging, home fabrics and decor, pharma, construction, and geotech. With a civil presence and a strong distribution network, Priyafil ensures indefectible procurement and global exports. founded by Sri Ramdas M Prabhu in 1972 in Bangalore, Priyadarshini filaments has established a solid niche in the sedulity over the formerly five decades. Our unvarying commitment to quality and customer satisfaction has driven our success and fostered numerous mutually salutary connections.

Our synthetic woven fabric morass are largely effective paraphernalia used to produce fish pounds, nets, fencing enclosures, and Hapas of various layouts and confines. These UV-- static paraphernalia are largely regarded in fish husbandry and monoculture due to their resistance to environmental rudiments. Available in various shapes and sizes, these breeding structures are essential for effective fish husbandry and sericulture practices.

II. LITERATURE SURVEY

Anderson & et al. presents, the significance of aquaculture in the setting of fisheries financial matters, highlighting its potential part in assembly future fish request, financial impacts, and maintainability issues. Anderson's work emphasizes the growing importance of aquaculture in global fish production, driven by the limitations of wild fisheries facing overfishing and environmental degradation. This shift impacts the demand for specialized materials in aquaculture, such as nets, enclosures, and filtration systems, which are essential for sustainable fish farming. Advanced filtration materials can reduce water pollution, and efficient netting materials can minimize habitat damage. As the industry adopts more eco-friendly practices, the demand for innovative specialized materials is expected to rise, highlighting the need for accurate demand forecasting in aquatech [1].

U. Rashid Sumaila & et al. an extensive analysis of the global fishing industry's challenges and opportunities. The authors emphasize the importance of sustainable fishing practices and the role of technological innovations in addressing these challenges. This work is crucial for understanding demand forecasting for aquatech technical textiles, highlighting sustainable fishing practices, climate change impacts, and socio-economic significance. It offers insights on policy options and innovations for sustainable fisheries management, benefiting policymakers, industry leaders, and researchers [2].

Chiung-Hsi Hsieh,Taho Yang,Chao-Ton Su & et al. optimizes production planning and resource allocation for fluctuating demand by integrating capacity planning at strategic, tactical, and operational levels. It uses historical data, market analysis, and collaborative forecasting to generate reliable demand forecasts, enhancing the efficiency and competitive advantage of fishing-net manufacturers [3].

Real Carbonneau & et al., optimizes production planning and resource allocation for fluctuating demand by integrating strategic, tactical, and operational capacity planning. It uses historical data analysis, market analysis, and collaborative forecasting with input from sales, marketing, and production. This approach enhances forecast accuracy, aligning production with market needs and boosting the operational efficiency and competitive edge of fishing-net manufacturers [4].

Peter Kacmary and Norbert Lorinc said, conventional estimating strategies struggle with the dynamic nature of these products. This study proposes an integrated approach combining quantitative methods like time series analysis and regression models with qualitative methods such as expert judgment and market analysis. This synthesis improves forecast accuracy, helping manage inventory levels, mitigate stockouts, and reduce excess stock in a dynamic market environment [5].

III. METHODOLOGY

3.1 Existing Method

Forecasting the demand for aquatech technical textiles poses a significant challenge within the aquaculture industry. It requires precise prediction of future needs for specific fabrics used in aquaculture, including HDPE monofilament woven and knitted fabrics, polyknit shade net fabrics, and screens. The complexity arises from managing seasonal fluctuations, accessing limited data, navigating technological intricacies, and addressing market uncertainties that impact aquaculture demand. Creating reliable forecasting models that consider these variables is essential for enhancing production efficiency, optimizing inventory management, and ensuring a prompt response to customer requirements.

3.2 Proposed Method

For the real-time data demand forecasting project for aquatech technical textiles, modern analytical techniques were used to accurately predict and manage market demand. Past sales data were analyzed, market trends were examined, and seasonal fluctuations were considered to create reliable forecasting models tailored to the specific characteristics of the aquatech textile sector. These insights were used to train a model using different approaches: M1, M2, M3, and M4

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models. Finally, all these models were evaluated using various evaluation metrics like Mean Absolute Percentage Error (MAPE), Mean Absolute Error (MAE), and Mean Squared Error (MSE).

IV. RESULTS AND DISCUSSIONS

For the real-time data, the analysis revealed that the performance metrics fell short of expectations, indicating that the current model or approach may require further refinement. The trends observed in the data suggest that the solution has not fully met the project objectives, highlighting areas for improvement. Although exact figures cannot be disclosed, it is clear that additional adjustments and optimizations are necessary to enhance performance and achieve the desired outcomes.

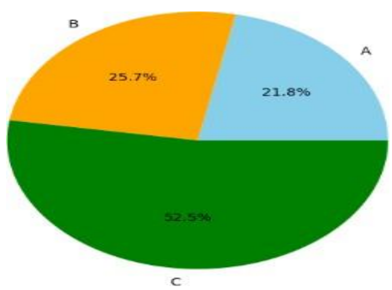

Fig 1: Percentage of ABC Components

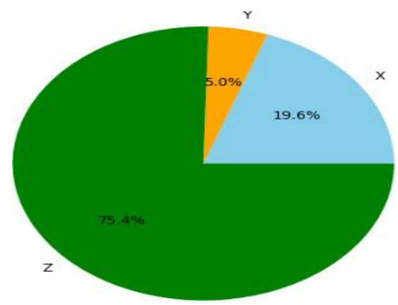

Fig 2: Percentage of XYZ Components

Figure 1: We've analyzed ABC components by volume in a pie chart: Component C (52.5%, green), Component A (21.8%, blue), and Component B (25.7%, orange), highlighting their significant roles and proportions.
Figure 2: The pie chart shows component Z at 75.4% (green), highlighting its crucial role. Component X, at 19.6% (blue), plays a notable but lesser role, while component Y, at 5% (orange), has a minimal yet essential contribution, clearly depicted in the chart.

4.1 EXPERIMENTAL RESULTS OF THE PROPOSED LEARNING ARCHITECTURE

The initial model results indicate that the forecasting accuracy for volatile items has room for improvement. The high demand variability for these items has presented challenges in achieving precise forecasts. While the model has provided valuable insights, further refinement and optimization are needed to better handle the fluctuations and improve accuracy. Moving forward, additional adjustments to the model will be implemented to enhance its ability to manage demand volatility and better align with project goals.

Best Models for Each Product:

product_id	best_model	MSE	MAE	MAPE
P	M5	1.332572e+07	2487.153333	59.397157
Q	M4	1.332572e+07	932.063634	15.951959
R	M2	5.183614e+06	2174.102222	59.950357
S	M4	2.706412e+03	43.089304	10.217083

Forecasting Results:

Time ID	Actual Sales	Predicted Sales	Product ID	Model
56	3034.36	5894.736667	S	M5
57	2983.02	4658.280000	S	M5
58	1905.50	3583.056667	S	M5
59	4898.42	2640.960000	S	M5
60	4615.87	3262.313333	S	M5
61	7027.00	3806.596667	S	M5

Table 1: Best Model and Forecasting Results

Table 1 illustrates the best model for each product and forecasting results by giving clear picture on actual and predicted sales. The best model is decided on the basis of the accuracy of the evaluating metrics like MSE, MAE and MAPE.

V. CONCLUSION

In conclusion, while our demand forecasting model for aquatech technical textiles has provided valuable insights, the accuracy for items with high demand volatility has been less than anticipated. The real-time data analysis has highlighted areas for improvement. Moving forward, we will focus on refining the model to better manage demand fluctuations and enhance forecasting precision. Despite the challenges, the project has established a strong foundation for future improvements and offers clear guidance for optimizing demand forecasting processes.

REFERENCES

[1]. James L. Anderson,"Aquaculture and the Future: Why Fisheries Economists Should Care" was published in the journal Marine Resource Economics, 1997

[2]. U. Rashid Sumaila, Christophe Bellmann, and Alice Tipping, "Fishing for the Future: An Overview of Challenges and Opportunities" published in the journal Marine Policy,2016

[3]. Chiung-Hsi Hsieh,Taho Yang,Chao-Ton Su and Cheng-Han Lin, “The development of a hierarchical rough-cut capacity planning model and demand management system for fishing-net manufacturing” ,2006

[4]. Real Carbonneau, Kevin Laframboise, and Rustam Vahidov published the paper "Application of Machine Learning Techniques for Supply Chain Demand Forecasting” in the European Journal of Operational Research,2008, https://doi.org/10.1016/j.ejor.2006.12.004

[5]. The paper "Possibilities of Sale Forecasting Textile Products with a Short Life Cycle" by Peter Kacmary and Norbert Lorinc was published in the journal Fibres and Textiles in Eastern Europe.2017, https://doi.org/10.3390/su152115517

[6]. The paper” AN OVERVIEW OF FORECASTING METHODS: AN APPLICATION FOR AN APPAREL-TEXTILE FIRM IN THE PRODUCTION SECTOR” by A ERDIL published in IKSAD JOURNAL, 2020, https://doi.org/10.31623/iksad062415

[7]. "The Bangladesh Textile-Clothing Industry: A Demand-Supply Review" by Md. Masum was published in the Journal of Textile Science & Engineering.2019