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SALES FORECASTING

WHITE PAPER

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What is Sales forecasting

The need for forecasting is probably as old as human history is. Ancient maritime navigation would be based on the knowledge of seasonality and weather forecasts. While we have advanced as a race, the need for forecasting has remained steady if not increased but the techniques have vastly evolved owing to our knowledge of mathematics.



In the field of retail, sales forecasting is helping business achieve a clear competitive advantage. In particular in consumer oriented markets like fashion and electronics market demand is often uncertain and product life cycles are short thereby making forecasting more challenging.

Challenges in sales forecasting

The impact sales forecasting on success and performance of companies is crucial. Inaccurate forecasts can lead to stock-outs or over stock and lead to spiralling losses for the business. Specifically longer time-to-market means that production plans have to be submitted much before future demand is known. Factors as varied as weather, holidays, economic situation, public events all have an impact on demand. Moreover in case of fashion the SKUs are usually replaced end of the season thereby making for a very dynamic product portfolio.

How does sales forecasting help business

The primary **use cases** in sales forecasting can be summed up in three different areas

1. Ordering - Armed with sales forecasting data businesses can better plan when and what products to order. The next seasons purchases can be determined by the volume of sales of the current year. Buying too little or too much of inventory can be a disaster. Imagine the impact on planning if the forecast could anticipate the economic conditions and the changes in buying patterns of consumers.

2. Distribution - Which items sell better in which stores can help in better distribution logistics.
3. Stock Replenishment - The knowledge of which products are successful and which have not really taken off can help in the reordering decision. To mitigate stock out and over stock scenarios goods can be moved from one store to another. This is a complex process and needs to take in to take into account logistics costs and time of travel to ensure the business benefits accrue as expected.

The **business benefits** that accrue from sales forecasting can be categorized into the following business areas



Cash Flow

Knowledge about revenue growth or downturn in the coming months can help business from spending at times where conservation of cash to battle recession may be a better choice.



Promotions and specials deals

Based on sales forecast for specific items at different stores can help push inventory that is lying idle.



Purchasing

Forecasting can be utilised for better budgeting decisions by the purchasing department.



Planning

The production planning can fare much better if sales forecasts are taken into consideration.

Traditional forecasting methods

Traditional forecasting methods have been a mix of approaches that have utilised expert judgements and time series forecasting models like Moving Average smoothing of time series data. These methods are prone to provide erroneous forecasts in conditions when the data is noisy or stock out data is missing for example.

Another challenge is that most of the forecasting tools are at a gross volume for each store instead of individual SKUs per store. This grain of result is too coarse to garner any business value. This is done primarily because the number of SKUs and Store leads to an extremely large dataset. Moreover there is great variance between the sales trends of these different SKUs.

Hence while there has been no dearth of appreciation of the business value an accurate forecast can bring to the business the tools and techniques have not yielded desirable results.

Recent Advances

With the advent of artificial intelligence the use of artificial neural networks (ANNs) have been progressively deployed for achieving greater accuracy.

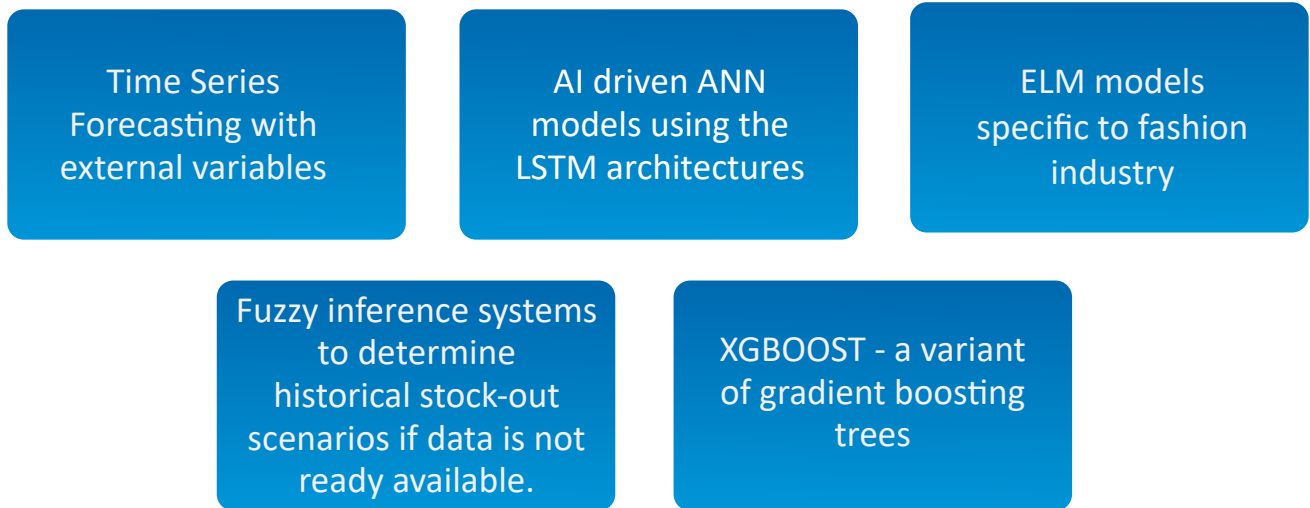
- Specifically for Fashion retail forecasting a new set of algorithms called **Evolutionary learning machines** that provide better performance and faster learning compared to gradient-based learning algorithms.
- Further studies have applied **Evolutionary neural networks** and have demonstrated very promising results especially in case of noisy data.
- A new model was promoted to deal with idiosyncrasies of the apparel industry and lack of historical sales data that applies soft computing methods like **fuzzy inference systems and neural networks**.

However these techniques are only used to baseline by most of the experts in the apparel industry due to either inadequacies or large confidence intervals.

BluePi's approach to forecasting

Apart from the above consideration BluePi has significant variance in the forecasting needs and approaches depending upon the industry and its peculiarities. For instance the solution deployed at two different multi-format retail stores tend to be different depending on the clientele. This is where a custom tailor made solution for each business come to the rescue.

BluePi has built several forecasting models that consist of the following approaches



In our experience a single model rarely suffices and the accuracy thus provided is not sufficient. Thus we deploy an ensemble model that uses a combination of one or more of the above techniques.

Our customised solution also extend beyond the forecasts to help you reap benefits from the above three use cases of ordering, distribution and stock replenishment. These require additional modeling and integration with the existing systems.

Our services extend end to end and encompass the following areas to help you meet your business goals

Case Study - Sales Forecasting for a multi format Retail Chain

About the Client

The client is a chain of retail stores headquartered in Kolkata, West Bengal having presence in over 35 cities and 120 locations in India. The client is based on the 'Food First' Format (it mainly offers fresh and packaged food). Many outlets though sport multiple formats for retailing food, apparel, fashion, electronics, lifestyle products, music and books. It is owned by RP-Sanjiv Goenka Group.

Business Challenge

The client is currently using excel for the reporting which poses multiple issues

- Reports are built on MS SQL which is an OLTP system and not suitable for analytics.
- Excel does not work once data volume goes in GBs and impossible to use it for the current data volume which is around 400GB for last 18 months.

The client is right now using data accumulated across stores for inventory and stock planning but it does not take all the factors responsible for sales growth/decline and does not help in getting a view in how much stock must be kept meeting demands at individual stores.

BluePi's Solution

- Data would be pulled from FTP server and stored into Redshift everyday. Reports will be generated with Redshift as data source, which provides seamless integration with the reporting tool and can be used to distribute reports without a need of installing software at individual workstation
- Data would be used for Sales Forecasting. Data will be extracted from Redshift. It would be cleaned, modeled and then used to forecast sales for a week in advance. Amazon Sagemaker will be used to build, train and deploy forecasting mode

Value Additions

- Once the model is successfully built, the prediction would be calculated daily for the staple articles for each store. The lead time horizon would be anywhere between 7 Days to 40 Days. An accuracy of 80% or more will be achieved for 85% of the articles.

- Reduce the stock holding time (or in-store inventory) by a third (approximately 30%).
- BluePi would also assist Spencers in continuously tuning the model to maintain and achieve better accuracy and thereby helping the business teams to plan the inventory better thereby avoiding surplus or deficit stock in turn reducing indirect costs

References

Evolutionary Extreme learning machine - Zhu, Qin, Suganthan, and Huang

Evolutionary neural networks - Au, Choi and Yu

Intelligent fashion forecasting systems - T.M. Choi, C.L Hui and Y. YU

About BluePi



It is often said that you cannot 'disrupt' and 'challenge' without incremental innovation being a part of the process. 'Challenge' is what interests us, transformation is what we're adept at! Started by a team of industry veterans, 'BluePi Consulting' is a born in the cloud, technology service provider. Our 'agility' in adopting innovative technology trends has fueled us to clock a year-on-year average growth of 200%.

We help customers unlock the value of their data by providing insights through predictive, prescriptive and qualitative analysis and visualizations.

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As founder and CEO of BluePi Consulting – A premier AWS partner in India, Pronam Chatterjee is responsible for driving the vision and strategy of the company. In 2012, he founded BluePi, which has grown from a 4 member team to an 100 member team.

Today, BluePi is a leading Application Development & Modernization, Cloud Migration & MSP, Big Data & Machine Learning Services and Media delivery platform service provider across industries like Media & Entertainment, BFSI Retail, Logistics & E-Commerce.

Pronam possesses a deep understanding of the cloud computing, mobile and web, Big Data and Data Science technologies which are driving innovation across Enterprises and Internet based startups alike.

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