

**AI in Product Management**  
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**Lecture - 25**

**Sales Forecasting Models using AI**

Welcome to this NPTEL online certification course. On artificial intelligence in product management, now we are talking about module 25, which is sales forecasting models using AI. So now we are talking about part 6, which is AI in sales forecasting, strategy, and scenario analysis. And we are talking about sales forecasting models using AI. So to introduce this, to give an overview of this module, in this module we will discuss sales forecasting using AI and what the advantages of using AI in sales forecasting are.

Then we will discuss the sales forecasting models that use AI and how you can implement these sales forecasting models. And finally, we will also discuss certain real-world examples of AI sales forecasting and best practices for using AI in sales forecasting. Now let us look at sales forecasting using AI. Sales forecasting is the expression of the anticipated sales revenues that a company may generate over a defined period. It answers the more pertinent questions like the projected amount,

A sales opportunity would bring to the business and the periodicity at which the company would realize this sales objective. Accurate sales forecasting prepares the business for exigencies and maintains resilience. As a result, businesses can cater to customer demands and manage logistics not just today but also in the future. Before getting into the benefits of sales forecasting with AI, let us see the context by understanding the pitfalls of sales forecasting. Traditional sales forecasting methods suffer from the following maladies.

The first is overly optimistic sales predictions. Sales, being the lifeblood of any business, are often subject to undue and constant pressure to perform by the highest standards. Due to aggressive quotas and the stress of bringing in additional revenues, salespeople may inflate some numbers and become overly optimistic with sales estimations. Sometimes, inaccuracies in sales predictions may also stem from plain human error or any subconscious or deliberate attempt to overestimate the sales projections. The second is a lack of high-quality data.

Speaking of errors, the leading cause of sales forecasting mistakes could result from inaccurate, poor-quality data. After all, nearly 29% of organizational data was found to be inaccurate, with 95% of businesses not having a data governance program. What is worse is that nearly 25 to 30% of data reportedly goes bad every year, which dampens the efficacy of even the best sales forecasting tools. In the simplest words, if you put garbage data in, you will get garbage. Sales forecasting data out. The third is low sales team morale. In stark contrast with employee optimism, you also have low sales team morale to blame for sales forecasting inaccuracies. Naturally, when your reps are feeling disengaged and facing burnout, they will not excel at their jobs, which could widen the gap between the goals and the results. In fact, low morale

could also translate into employee churn, which will cause your business to miss the sales prediction mark. The fourth is changing market conditions. The COVID-19 pandemic clearly illustrates how sales estimation is not an exact science. If anything, it is a product of several external factors, some of which are beyond a business's control. Whether the changing market conditions originate from customers, lead demand, or are triggered by the competition,

They can make sales forecast calculations tricky as the industry may shift overnight. Such a problem highlights the need for making sales forecasting dynamic enough to respond in real time. The fifth problem is unpredictable sales cycles. Just like the market, sales cycles are also highly unpredictable. As such, sales forecasting methods

that make sales predictions by measuring the pipeline may already be setting the stage for future discrepancies. After all, even your best sales reps cannot accurately predict the possibility of closing a deal. At best, they can give you an estimate on the possible timeline. Given such uncertainty, even conservative estimates made on the basis of sales cycles could end up seemingly over-optimistic. Now, what are the advantages of using AI in sales forecasting? Keeping the above-mentioned shortfalls in mind, let us now take a look at how artificial intelligence takes sales forecasting to the next level. So, the first thing that it does is greater accuracy.

Sure, data is a critical component of accurate sales forecasting. However, AI pushes data accuracy up a few notches through iterative learning. This means that your AI sales forecasting tool will get smarter after every cycle, which essentially means that your sales predictions would largely be on point. Not to mention that AI-powered platforms are

capable of compiling high volumes of data from several sources to establish a single source of truth. This means that your sales team can evaluate the

Impact of internal and external data, as a result, it also addresses any data quality issues plaguing your sales process while making the sales estimation more holistic. The second is data-driven decision-making. Ask any of your salespeople to explain the methods of sales forecasting, and you might receive a different answer every time. While there is nothing wrong with having different methods of sales forecasting, the variations might bring about inconsistencies in your projections. At the same time, even the sales forecasting method that appears highly analytical and quantitative relies on some amount of instinct to arrive at a number. AI-powered sales forecasting tools implement standardization as the appropriate sales forecasting method depending on the situation.

The use of a single data-driven strategy at any given point makes AI sales prediction a lot more practical, reliable, and attainable. The third is to augment employee skills. Tell any sales rep that the sales forecasts for the next quarter are due, and watch the stress and panic set in. Tell them you have now implemented AI in sales forecasting, and watch their emotions do a 180. After all, the input into sales forecasting calculation has now been reduced to the click of a button.

Plus, if you were to send your entire sales team on a number-crunching adventure, you would be drawing from their already quickly emptying time, time that they would have otherwise put into making actual sales. AI sales forecasting boosts employee morale, optimizes resource allocation, and cuts down processing time all at once. The fourth is real-time sales forecasting. As we have seen already, businesses will have to react quickly to market changes and reevaluate their sales goals in real-time. In this case, AI for sales

Sales forecasting acts as a bridge between your sales predictions and real-time market conditions. It can automatically factor in market changes and recalibrate the sales estimations to make the sales forecast more realistic and reasonable. Interestingly, the changes will not only take effect immediately and in real-time but will also be done automatically, taking some pressure off your sales team. So, with AI sales forecasting software by your side, You no longer have to worry about black swan events.

The fifth is effective risk management. AI for sales forecasting protects your business from a series of risks. Your business would be dodging the risk of making inaccurate sales predictions or the sales forecast calculation process becoming more data-driven. You will also be mitigating the risk of making emotion-based decisions by relying purely on data.

Your sales projections would also be shielded from any external factors linked to the market or your competition.

The business would also no longer run the risk of bringing down employee morale, resulting in immediate churn. In other words, sales forecasting lays the groundwork for hands-on risk management on all fronts. Sixth is stronger business relations. In industrial sectors such as retail and e-commerce, sales forecasting forms the basis of business relationships based on demand. For instance, a last-minute increase in your order volumes will put your entire supply chain under stress to ensure product deliverability on time.

Similarly, sales forecasting may regulate the amount of stock that you have on hand. So, while staying fully stocked can lead to happy, satisfied customers, having too much stock could result in excess inventory, which can get costly. Sales forecasting using AI eliminates this. All the guesswork and ensures that you maintain rewarding relationships with all the stakeholders. Now, let us look at the sales forecasting model using AI.

So, AI-driven sales forecasting models use machine learning and artificial intelligence techniques to predict future sales outcomes based on historical data, consumer behavior, and external factors. These models can analyze large data sets quickly, identify hidden patterns, and provide more accurate and dynamic forecasts compared to traditional forecasting methods. So, we will discuss some of the key AI-based models used for sales forecasting in the upcoming slides. The first is time series forecasting models. Time series models analyze sequential data points collected over time to predict future values.

These models are widely used in sales forecasting because they can capture trends, seasonality, and cyclic behavior. The use case is that it is useful for predicting recurring sales patterns, seasonal fluctuations, and sales trends over time. The common models are ARIMA, that is AutoRegressive Integrated Moving Averages, a statistical model that uses past data points, lagged values, and their relationships to forecast future sales.

Prophet by Facebook, an open-source forecasting tool that handles seasonal day trends and holidays in time series data, making it highly effective for sales data. The third is Exponential Smoothing, a method that applies smoothing techniques to weigh recent observations more heavily than others, than older ones, capturing trends and seasonality. The second is machine learning regression models. Regression models predict sales outcomes by modeling the relationship between dependent variables, that is sales, and one or more independent variables, for example, pricing and market trends, etc.

Machine learning regression algorithms can capture complex non-linear relationships between variables. Use cases are that it is effective for predicting sales based on multiple variables, marketing campaigns, pricing, economic conditions in non-linear environments. Common models are linear regression, which models the linear relationship between independent variables and the target variable, that is sales. Random forest regression, an ensemble model that uses multiple decision trees to predict sales, reducing the likelihood of overfitting and improving prediction accuracy. Gradient boosting, XGBoost, LightGBM, a powerful ensemble method that sequentially builds models to correct prediction errors.

Widely used for highly accurate sales predictions. The third comes natural language processing models, and NLP models analyze text data. For example, customer reviews, social media posts, and product descriptions to gain insights into customer sentiments, trends, and product demand, which can be used for sales forecasting. Use cases: NLP models are particularly useful for forecasting sales based on qualitative data from unstructured sources like social media or customer reviews.

So, common methods include sentiment analysis using NLP to determine customer sentiments around products, which can influence future sales predictions. Topic modeling extracts key topics from customer feedback or social data to identify factors that may impact sales trends. Next comes predictive analytic models. Artificial intelligence and predictive analytics are revolutionizing sales forecasting, taking accuracy and efficiency to new levels.

Predictive analytics involves using statistical algorithms and machine learning techniques to identify the likelihood of future outcomes based on historical data. When combined with AI, it becomes a powerful tool that can process large volumes of data, identify patterns, and predict future sales with a high degree of accuracy. Companies across various industries are leveraging predictive analytics and AI for sales forecasting. Retailers can predict demand for specific products.

Technology companies can assess software license renewals, and pharmaceutical firms can accurately estimate future drug sales. Despite its complexity, the integration of AI and predictive analytics is becoming an essential part of modern sales forecasting due to its impressive benefits in accuracy and efficiency. Now, let us look at implementing sales forecasting models. Advanced sales forecasting models can significantly boost accuracy and business planning.

Implementing these sophisticated techniques requires a strong data infrastructure and the right tools. Furthermore, organizations need to follow best practices for successful adoption and to overcome common implementation challenges. A company must have a robust data infrastructure to implement advanced sales forecasting methods. This infrastructure includes a database or data warehouse for storing historical and real-time sales data, data integration and cleaning tools, and an analytics platform for conducting the actual forecasting. Modern cloud-based data platforms offer scalability and flexibility, making them a popular choice for many businesses.

They can handle large volumes of data and integrate with various data sources, making it possible to unify disparate data for comprehensive analysis. Now let us look at the types of data to consider in sales forecasting. While the tools and techniques mentioned are critical, the types of data leveraged in sales forecasting are equally important. The richness and diversity of the data can profoundly impact the accuracy of the forecast.

Here are some data types that companies should consider. One is historical sales data. This data provides insights into past sales performance, which can predict future sales trends, especially when using methods like time series analysis and machine learning. Economic indicators include factors like GDP growth rate, unemployment rates, and inflation rates.

These offer a macro view of the company's economic performance, which can impact consumer purchasing power and behavior, thus affecting sales. Market trends, so data on current market trends and consumer behavior can provide valuable insights into potential increases or decreases in demand for various products or services. The competitors' data, Information about competitors' sales performance, marketing efforts, and product launches can inform your company's sales forecast by offering a comparison gauge. Seasonality and events, holidays, seasons, and significant events can greatly influence sales.

Therefore, including this data can refine the forecasting process. Internal factors, this could include data on marketing efforts, changes in pricing strategy, new product launches, and more. These factors are entirely within the company's control and can directly influence sales. Product lifecycle data, understanding where your product stands in the lifecycle, whether in the growth, maturity, or decline phase, can impact the future sales trajectory. By considering and integrating these diverse types of data,

Into the sales forecasting process, companies can enhance the reliability and accuracy of their forecasts. What are the best practices for implementation? Implementing advanced

sales forecast techniques is not a trivial task. It involves changes in technical infrastructure, business processes, and culture. Here are some key considerations for successful adoption.

One is to develop a data-driven culture. Encourage employees to base decisions on data rather than intuition. These shifts promote trust in forecasting models and their results. Invest in training. Ensure your team has the necessary skills to work with new tools and integrate forecasting results.

Start small. Begin with a pilot project that uses advanced methods to forecast sales. Learn from its experience before expanding to other areas of the business. Involve stakeholders. Include key stakeholders from different departments in the implementation process.

Their buy-in makes integrating advanced forecasting methods into businesses' decision-making processes easier. Despite all potential challenges, these practices can help businesses successfully adopt and use advanced sales forecasting methods. These methods can provide valuable insights. Empower companies to boost performance and stay competitive in the market.

Next, we will talk about real-world examples of AI sales forecasting. AI sales forecasting may seem a little vague. Some might even say that it sounds like a page straight out of a science fiction novel. So, to root this high-end technology into the realms of reality, we will discuss a few real-world scenarios that exemplify how AI can do the heavy lifting for managers. The first is a rapidly growing startup.

A startup slated for accelerated growth has a bunch of decisions to make. Such decisions could be with regard to ramping up production, scaling operations, and even recruiting talent. Actually, these critical decisions would also have cost implications, be it in the form of gains or losses. Here is where sales forecasting using AI makes an entry to validate such decisions. AI sales forecasting can dip into the startup's historical datasets to quantitatively demonstrate the rate of growth.

It can also paint a picture of what the growth in the successive years would look like. For instance, your AI sales forecasting software will dig into the sales records to identify that the startup is selling an average of 15,000 products per month. This average is also increasing by 10% per month. Such data helps the sales forecasting tools to make predictions on the anticipated growth in the next year.

The second is a business with multiple supply chain dependencies. Now that we have considered a fledgling startup with potential, let us shift our focus to a well-established

business. Say you are a bakery with multiple outlets and partnerships with supermarkets. The cost of raw ingredients like flour, sugar, and eggs may fluctuate. Similarly, you may also have to consider the cost of packaging, storing, and distributing your baked goods.

Slight changes in this value may seem minute at face value, but they can have a confounding effect on your business's profitability. As AI says, a forecasting tool can process historical data to identify pockets where the changes have the maximum effect. It could bring to light how the cost of eggs increases during winters or calculate the cost implications of switching to eco-friendly packaging. Based on such inputs, your business can tie up with alternative vendors, manage your inventory, or keep a stock of perishables to optimize sales and minimize losses. The third scenario is overnight market changes.

As we have emphasized several times, AI sales forecasting can act as a buffer against shifting market conditions. Primarily because it can also run data for cases that you would not have had to deal with before. To demonstrate this point, let us consider the recent example of the COVID-19 pandemic. Businesses would have never imagined Closing stores, serving customers exclusively at their homes, or watching their supply chain break down.

Suppose you were an online travel aggregator in such a scenario. You would be fielding calls, cancellations, and inquiries from distressed travelers who do not know what is in store. You would also have customer support agents who are unable to come to the office and cater to these calls. With AI sales forecasting software, you can make a tough decision to downsize. At the same time, an AI-powered cloud

based phone system would help you unify the remote workforce. Using AI solutions such as chatbots, your company can answer all FAQs without any human intervention. At the same time, more pressing queries can be escalated to human agents. The already stressed employees can leverage AI to offer suitable resolutions based on customer history, sentiments, and preferences. Thus, even a global crash trophy becomes somewhat manageable.

Now, what are the best practices for using AI in sales forecasting? Unfortunately, 79% of sales organizations miss their forecast by more than 10%. To ensure that your business does not face a similar fate when incorporating AI into sales forecasting, it is essential to follow some best practices. Indeed, AI can significantly enhance the accuracy, efficiency, and adaptability of sales predictions.

However, to fully realize these benefits, you need to implement AI-powered tools strategically and thoughtfully into your forecasting processes. We will discuss some key best practices that can help managers do so in the next slide. The first is to ensure data quality and consistency. The basis of effective AI-driven sales forecasting is high-quality data.

Businesses must ensure that the data fed into AI models is accurate, comprehensive, and clean. This involves regular audits to check for data accuracy, completeness, and consistency. Removing duplicates, correcting errors, and filling in missing values are critical steps needed to prepare data for AI processing. Plus, companies should strive to integrate data from diverse sources to create a more complete picture of the sales environment. Validate the results.

You also need to validate your AI-generated forecasts regularly. To do this, compare AI predictions with actual sales outcomes to assess accuracy. It helps you identify any discrepancies and provides opportunities for model improvement. Ideally, you should use a systematic approach to test and validate AI models, as this ensures they deliver reliable and accurate forecasts consistently. The third is to invest in training and development.

Implementing AI in sales forecasting requires a skilled workforce that understands both the technology and the business context. Investing in training and development programs to equip your team with the necessary skills to leverage AI effectively. Combine with Human Expertise: AI is a powerful tool, but remember that it should complement, not replace, human expertise. A skilled professional brings valuable insights, intuition, and contextual knowledge that AI might miss.

Combining AI-generated forecasts with human expertise can enhance decision-making processes. Do this by encouraging collaboration between AI systems and sales teams to validate and interpret AI predictions. Involve cross-functional teams. Sales forecasting shouldn't be the sole responsibility of the sales team.

Involving cross-functional teams, including marketing, finance, supply chain, and IT, ensures that forecasts are comprehensive and aligned with overall business goals. Each department can provide valuable insights and data to enhance the accuracy of AI-driven forecasts. Collaborative efforts also foster a better understanding of how forecasts impact different areas of the business. The sixth is to continuously monitor and adjust models.

AI models need continuous monitoring and adjustments to maintain their accuracy and relevance. This is why businesses should establish a feedback loop where forecasts are regularly compared with actual sales outcomes. With this comparison, they can easily identify any discrepancies and areas of improvement, as well as ensure their AI systems remain effective and accurate over time. So, there is no doubt in the fact that the integration of AI into sales forecasting is transforming the way businesses predict and plan for the future.

By using advanced algorithms and real-time data analysis, you can achieve unprecedented accuracy and efficiency in your sales forecasts. With AI tools on your side, you can gain more accurate sales forecasts to make informed decisions, respond swiftly to market changes, and stay ahead of the competition. So, to conclude this module, we discussed sales forecasting using AI and the advantages of using AI in sales forecasting. Then we discussed the sales forecasting models that use AI and how you can implement these sales forecasting models.

Finally, we also discussed certain real-world examples of AI sales forecasting and the best practices for using AI in sales forecasting. Here are some of the references from which the material for this module was taken. Thank you.