AI based forecasting

What is AI forecasting?

- AI forecasting is the use of artificial intelligence and **machine learning** algorithms to ***analyze historical data and predict future outcomes***.
- Traditional forecasting methods rely on **static models or expert intuition**.
- AI forecasting? It processes vast, complex datasets to uncover hidden patterns, identify trends, and generate dynamic predictions that keep improving.

Core Components of AI-Based Forecasting

- **Data Aggregation**
  Consolidates historical financial records, activity-based costing data, and operational metrics to build and train predictive models.
- **Machine Learning-Based Forecasting**
  Utilises machine learning techniques such as regression models, neural networks, and time-series analysis to predict future business performance based on historical patterns and trends.
- **Scenario Simulation**
  Evaluates the potential impact of market fluctuations, demand variability, supply chain disruptions, and other business factors on financial outcomes and cash flow forecasting.
- **Integration with Financial Systems**
  Connects forecasting models with budgeting platforms, financial reporting tools, and accounting systems to support seamless decision-making and financial planning.
- **Exception Handling**
  Identifies anomalies, deviations, and unusual patterns in financial or operational data, enabling timely intervention, corrective actions, and improved forecasting accuracy.

Why is AI forecasting better than traditional forecasting methods?

Traditional forecasting	AI forecasting
Struggles to handle complex data patterns	Can capture and model intricate and non-linear relationships in data.
Typically handles structured data	Can handle structured and unstructured data, large datasets, and high-dimensional data
May provide lower accuracy in capturing non-linear patterns	Offers higher accuracy as it can learn from data and model complex patterns.
Not well-suited for real-time forecasting	Can be configured for real-time forecasting
Subject to human bias in some cases	Predictions are completely data-driven
Limited scalability, especially with large or complex datasets	Can be scalable to accommodate growing datasets

What are some popular AI forecasting models & techniques?

- ***ARIMA (AutoRegressive Integrated Moving Average):*** The ARIMA model is preferred for handling time series data, which is an integration of autoregressive (AR) and moving average (MA) components.
- Good for univariate time series data without trend and seasonality.
- **Use case:**
- **Website traffic forecasting**: Let's say you want to predict the website traffic over the next 3 months. ARIMA can be applied to capture trends and seasonality in website traffic, helping you make forecasts for marketing strategies.
- ***ETS (Error, Trend, Seasonality):***The ETS model is also a time series forecasting technique that decomposes time series into three components: error, trend, and seasonality.
- Good for sales, demand forecasting, etc.

- **Use case:**

- **Sales forecasting**: ETS can be used to forecast the sales of a retail store. It helps in understanding the underlying trends, seasonal fluctuations, and errors in sales data, so you can optimize inventory and staff.

- ***STL (Seasonal-Trend decomposition using LOESS):*** The STL model decomposes time series data into three components: seasonal, trend, and residual. Loess is a method used for estimating non-linear relationships.

- Good for data with strong seasonal and trend patterns like sales, weather, etc
  Use case:

- **Sales forecasting**: STL can be applied to forecast sales in a region. It helps in understanding the seasonal variations in purchase patterns.

- ***Regression model:*** Regression models can also be used for time series data, but they are not exclusive. These models estimate relationships between a dependent variable and one or more independent variables.

- **Use case:**

- Marketing ROI analysis: Businesses can analyze the ROI for their marketing campaigns by using regression models to identify the marketing channels or strategies that drive the most sales and leads.

How does AI forecasting work?

- AI forecasting leverages advanced machine learning algorithms to identify patterns and trends that can be used to make accurate predictions about future events or outcomes. The process typically involves:

- ***Data collection:*** Gathering relevant data from various sources. For example, sales records, market trends, economic indicators, and more.

- ***Data preparation:*** Cleaning and formatting the data to prepare it for analysis, handling missing values, and removing outliers.

- ***Model training:*** Using machine learning techniques like regression or ARIMA to train a model on the data. This model training helps learn **the underlying patterns and relationships**.

- ***Forecasting:*** Applying the trained model to the data to generate forecasts or predictions about future events or outcomes.

Benefits of AI forecasting

- **Improved forecast accuracy:** By using machine learning models and drawing from a wider range of data sources, AI forecasting offers more accurate forecasts than approaches that rely on limited inputs. This accuracy is especially valuable in volatile environments that have rapid market changes and periodic disruptions.

- **Faster forecasting cycles:** Built-in automation allows forecasts to refresh as new data becomes available, reducing manual updates and shortening planning timelines. This process helps teams respond more quickly and keep forecasts aligned with current conditions.

- **Better resource allocation:** More reliable demand, sales and financial forecasts might lead to smarter, data-driven decisions about inventory, staffing and budgets. When forecasts improve, organizations can better match supply, labor and funds to expected demand.

- **Greater scalability:** AI systems can produce and update large numbers of forecasts simultaneously. This capability helps growing organizations manage complexity without extra manual effort.

- **Stronger decision support:** Instead of providing just one number, many AI forecasting tools show a range of possible outcomes and allow teams to explore different scenarios. This process helps leaders understand what might happen under different assumptions

and make more confident choices—especially when the stakes are high.

Common use cases for AI forecasting

- **1. Consumer Goods and Retail**

- Retailers leverage AI forecasting to predict product demand at store and warehouse levels. By analysing historical sales patterns, seasonal trends, and promotional activities, retailers can optimise inventory distribution, improve staffing plans, and reduce stock shortages. For example, grocery chains may anticipate increased beverage sales during holiday periods and adjust inventory accordingly.

- **2. Energy and Utilities**

- Energy providers use AI forecasting to estimate electricity demand, identify potential grid stress, and reduce outage risks. These forecasts combine historical consumption data with weather conditions and calendar events. For example, utility companies can prepare for increased demand during heatwaves by allocating additional resources and maintenance crews.

- **3. Financial Services**

- Banks and financial institutions employ AI forecasting to predict deposits, cash flow, loan defaults, and credit risks under varying economic conditions. By identifying potential repayment issues early, organisations can strengthen risk management strategies, optimise capital reserves, and improve financial stability.

- **4. Healthcare**

- Healthcare organisations use AI forecasting to predict patient admissions, emergency department visits, and workforce requirements. For instance, hospitals may forecast increased respiratory cases during flu seasons and proactively adjust staffing levels, bed availability, and resource allocation to maintain quality patient care.

- **5. Manufacturing and Supply Chain Management**

- Manufacturers apply AI forecasting to estimate product demand, anticipate supplier delays, and optimise production planning. By analysing maintenance histories, operational

patterns, and market demand, organisations can ensure adequate inventory levels while minimising excess stock and associated costs.

- **6. Media and Subscription Businesses**

- Subscription-based organisations use AI forecasting to predict customer renewals, churn rates, and service demand. For example, telecommunications providers can identify customers at risk of cancellation and implement targeted retention strategies before revenue is affected.

- **7. Travel and Hospitality**

- Airlines, hotels, and transportation companies leverage AI forecasting to predict bookings, cancellations, and customer demand. These insights support pricing optimisation, route planning, resource allocation, crew scheduling, and maintenance planning, helping organisations improve operational efficiency and profitability.

Challenges and limitations of AI forecasting

- **Data quality:** AI models rely on high-quality, accurate, well-structured data. Clear data ownership and governance is necessary to help maintain performance.

- **Changing conditions:** Market shifts, new regulations or supply disruptions can alter patterns. Regular monitoring and retraining help forecasts stay aligned with the current situation.

- **Transparency and trust:** Decision-makers need to feel comfortable using the forecasts. Being able to see what influenced the numbers—and to question or adjust them when needed—helps build trust.

- **Operational processes:** An effective AI forecasting system requires monitoring, version control and integration into planning workflows.