DEMAND PREDICTION USING AI

Demand prediction, also known as demand forecasting, is the process of estimating the future demand for a product or service based on historical sales data, market trends and other related factors. The goal is to anticipate how much of a product or service customers will purchase during a specific period.

Demand Forecasting can be done using AI, historical sales data, statistical and machine learning algorithms, forecasting tools. Here is the outline of the steps involved in Demand Forecasting:

1. **Data Gathering:** Collecting historical sales data is the starting point. Additionally, gather data from market research efforts, customer feedback, and any relevant datasets that can provide insights into factors influencing demand.
2. **Data Integration:** Integrate data from various sources using a robust platform. This ensures a holistic view by combining information from different departments or systems within the organisation.
3. **Data Preprocessing:** Clean and preprocess the data to ensure its quality. This involves handling missing values, identifying and addressing outliers, and resolving any inconsistencies in the dataset.
4. **Feature Engineering:** Identify features (variables) that could impact demand. Create new features or transform existing ones to enhance the predictive power of forecasting models.
5. **Model Selection:** Choose appropriate forecasting algorithms based on the nature of the data. Common choices include time series analysis for temporal patterns and regression models for considering external factors.
6. **Training and Validation:** Split the data into training and validation sets. Train the selected model using the training set and validate its performance on the separate validation set to ensure it generalizes well to new data.
7. **Hyperparameter Tuning:** Optimise the hyperparameters of the chosen model to improve its accuracy. This may involve adjusting settings that control the model's learning process, and cross-validation can be used to find optimal configurations.
8. **Real-time Data Integration:** If applicable, integrate real-time data from IoT devices to provide dynamic insights into current market conditions, product usage, and other relevant factors.

9. **Dashboard Development:** Develop a user-friendly dashboard that visually represents demand predictions and key metrics. This tool facilitates easier interpretation and decision-making for stakeholders.
10. **Quality Assurance:** Implement measures to ensure both the quality of the data used for training and the accuracy of the forecasting models. Regular checks and validations are essential.
11. **Continuous Monitoring:** Establish a system for ongoing monitoring of model performance. This involves tracking how well the model's predictions align with actual outcomes over time.
12. **Iteration and Model Updates:** Regularly update models based on new data and changes in market conditions. This ensures that forecasting models remain accurate and relevant.
13. **Documentation:** Document the entire process, including data sources, methodologies, and any assumptions made during the forecasting. Documentation aids in transparency, knowledge sharing, and future reference.
14. **Collaboration and Communication:** Facilitate effective communication and collaboration among different departments involved in the forecasting process. This ensures that insights gained from forecasting are shared and utilized across the organisation.
15. **Security Measures:** Implement robust security measures to protect sensitive data involved in the forecasting process. This includes customer information, market research findings, and other proprietary data.

Tools and Techniques required:

1. ML Tools/Libraries:Utilize Python-based tools and libraries such as scikit-learn, TensorFlow, PyTorch, and Keras for machine learning, enabling advanced modeling and analysis.
2. Visualization Tools/Libraries:Employ visualization tools like Tableau, Power BI, Matplotlib, Seaborn, and Plotly for intuitive representation of demand patterns and key metrics.
3. Dataset Type:Work with a labeled dataset containing historical sales data, market trends, and customer behavior to train forecasting models.
4. Data Analytics:Apply descriptive statistics, feature engineering, data mining, and predictive modeling techniques to extract insights and enhance the accuracy of demand forecasts.
5. Collaborative Business Approach:Foster a collaborative approach involving operators, maintenance personnel, quality

control engineers, and data scientists to collectively identify and address demand-related issues.

Summary and Recommendation for Demand Forecasting:

Effective demand forecasting involves using Python-based tools like scikit-learn, TensorFlow, and PyTorch for modelling and visualization tools such as Tableau and Power BI. Work with labeled historical sales data, apply data analytics techniques, and foster a collaborative business approach. Recommendation: Start with scikit-learn, progress to TensorFlow and PyTorch for complex patterns, utilize Tableau and Power BI for visualization, ensure datasets have labelled historical sales data, apply data analytics for understanding, and foster a collaborative approach for holistic demand forecasting.