The project at hand represents a pioneering effort to revolutionize supply chain management and demand forecasting through the integration of real-time data and advanced machine learning techniques. By leveraging comparative models such as Long Short-Term Memory (LSTM) networks and Extreme Gradient Boosting (XGBoost), this approach aims to tailor demand forecasting to the dynamic requirements of modern supply chains, thereby enhancing forecasting accuracy and supply chain responsiveness. Through the utilization of these sophisticated algorithms, the models can analyze complex datasets to identify subtle patterns and correlations within sales data and inventory trends that traditional forecasting methods may overlook. This level of precision not only improves the accuracy of demand forecasting but also supports supply chain optimization by reducing stockouts and minimizing inventory holding costs.Moreover, the incorporation of these comparative techniques ensures transparency and interpretability in model predictions, fostering trust among supply chain managers and business stakeholders. By elucidating the rationale behind model decisions, LSTM and XGBOOST empowers decision-makers to understand and act on model insights, enabling data-driven optimizations and agile responses to demand changes. This holistic approach not only addresses the inherent uncertainties in demand forecasting but also considers the dynamic needs of supply chain efficiency and cost-effectiveness. Through concerted efforts to harness the power of advanced machine learning models and explainability, this initiative is poised to transform the supply chain landscape, paving the way for a future where every decision is informed by reliable, transparent, and adaptable forecasting models tailored to evolving market conditions.

***Keywords:****Supply Chain Optimization, Demand Forecasting, LSTM, XGBoost, Comparative Analysis*