OptiU

RLA Agentic Forecaster – Technical Overview

1. Introduction

Accurate forecasting is the cornerstone of profitable supply chain management. Traditional forecasting has long struggled with accuracy due to static models, limited adaptability, and inability to incorporate external factors.

The **OptiU RLA Agentic Forecaster** revolutionizes this domain by deploying **agentic AI** that autonomously evaluates demand data, invokes the optimal forecasting algorithm, and continuously learns to improve accuracy. With the ability to deliver some of the **lowest RMSE (Root Mean Square Error) in the market**, it empowers businesses to unlock higher profitability, reduce waste, and optimize inventory.

2. Core Differentiators

2.1 Smart Model Selection

- Each material, SKU, or customer demand profile is assessed against a **portfolio of univariate and multivariate models**, including:
  - **AutoARIMA, RandomForest, ETS, SARIMA, XGBoost, SBA, NBEATS, TCN, LSTM, GRU, Prophet.**
- The agent automatically selects the **best-fit model** based on historical correlation, forecast accuracy, and stability.
- Ensemble capabilities allow the system to **pair models** (e.g., Prophet + XGBoost) for complex demand patterns.

2.2 Flexible Time Granularity

- Forecasts can be generated **monthly, weekly, or hybrid**.
- The agent dynamically picks the best suited time granularity for every product.
- Supports **short-lifecycle products** by adapting dynamically to early sales signals and market volatility.

2.3 Multivariate Forecasting

- **Cross-Series Forecasting**: Leverages the historical demand patterns of **multiple products, locations, or customer segments** simultaneously to improve the forecast of each item. This allows the system to capture shared seasonality, substitution effects, and correlated demand behaviors.
- **External & Causal Drivers**: Incorporates exogenous variables such as **promotions, weather, competitor pricing, marketing spend, macroeconomic shifts, and raw material costs** to enrich forecasts.
- **Causality vs. Correlation**: Distinguishes between true causal drivers of demand and spurious correlations, ensuring forecasts are both **accurate and explainable**.

2.4 Phase-In / Phase-Out Product Support

- Forecasts **new products with little/no history** using proxy SKUs and product attributes.
- Manages discontinuations without skewing baseline forecasts.

2.5 Missing Data Expansion & Synthetic Data Handling

- **Automatic Gap Filling**: When historical data is incomplete or inconsistent, the forecaster can **expand missing data points using statistical smoothing techniques** (e.g., exponential smoothing, linear interpolation, and rolling averages).
- **Synthetic Data Generation**: The system extrapolates plausible demand curves from surrounding data and correlated series to maintain forecast stability, **with explicit user consent**.
- **Performance Assurance**: By filling gaps responsibly, the system ensures forecasts remain accurate and reliable, even with less-than-perfect datasets. This feature allows organizations to achieve good performance without discarding valuable but incomplete demand histories.

2.6 Intuitive Graphical Insights

- Interactive charts compare actual demand vs. multiple model predictions (XGBoost, Prophet, SARIMA, etc.).
- KPIs provided include **MAPE, WAPE, RMSE, Bias, Tracking Signal**.
- Forecast analysis dashboards highlight **selected model performance per item** and provide drill-down capabilities at SKU, region, or channel level.

2.7 Integration & Modes of Operation

- **Integration-less Mode:** Simple **Excel in/out** interface for quick adoption.
- **Integrated Mode:** Seamless two-way integration with ERP/CRM/transactional systems.
- Configurable APIs ensure alignment with enterprise data pipelines.

2.8 Automation & Continuous Learning

- Models recalibrate automatically with each new data cycle.
- Exception handling ensures anomalies (stock-outs, strikes, promotions) do not distort forecasts.
- Closed-loop learning: feedback from **actual vs. forecast** continuously improves accuracy.

3. Advanced Forecast Engine Features

In addition to its AI-driven orchestration, the Agentic Forecaster supports:

- **Seasonality & Trend Detection**: Identifies recurring demand cycles across years.
- **Outlier Management**: Excludes anomalies like strikes or COVID spikes while retaining baseline trends.
- **Hierarchical Forecasting**: Ensures SKU → Region → Channel forecasts roll up consistently.
- **Scenario Planning**: Runs *what-if* simulations on promotions, pricing, and capacity.
- **Uncertainty & Risk Management**: Provides prediction intervals and risk-adjusted forecasts.
- **Industry-Specific Extensions**: Retail promotions, Pharma regulatory shifts, Energy tariffs, E-commerce traffic.

4. Technical Architecture

4.1 Forecasting Algorithms

The forecaster supports both **statistical and ML/DL models**:

- **Statistical**: AutoARIMA, ETS, SARIMA, SBA.

- **Machine Learning**: XGBoost, RandomForest.
- **Deep Learning**: LSTM, GRU, TCN, NBEATS.
- **Hybrid**: Prophet, ensemble pairing.

4.2 Ensemble Layer

- The **ensemble orchestration layer** pairs models when single-model performance is insufficient.
- Example: XGBoost handles short-term volatility, Prophet captures long-term seasonality.

4.3 Data Pipeline

- **Inputs:** Transactional (sales, POS, ERP), External (weather, promotions, competitor pricing), Custom (event calendars, anomalies).
- **Outputs:** SKU-level forecasts, error metrics, scenario analyses, visual dashboards.

5. Performance Benchmarks (Sample – Barns SA Case)

- **Overall Forecast Accuracy:** 88% (N=120 SKUs).
- **Best Model Contribution:**
  o Prophet (95.43% accuracy).
  o XGBoost (91.43% accuracy, lowest RMSE at 5655).
  o SARIMA (90.4% accuracy).
- **Forecast KPIs:**
  o Avg MAPE: ~8–12%.
  o RMSE reduced significantly across SKUs (compared to baseline ETS > 30,000).

6. Business Impact

- **Waste Reduction**: Aligns inventory with actual demand.
- **Profitability Boost**: Reduces stock-outs and overproduction.
- **Rapid ROI**: Deployable in **3–6 months**.
- **Competitive Edge**: Outperforms traditional demand planning by combining AI-driven selection with interpretability.

7. Conclusion

The **OptiU RLA Agentic Forecaster.** is redefining supply chain forecasting. Through **agentic AI orchestration**, it integrates **statistical rigor, machine learning power, and deep learning adaptability** into one platform.

By supporting **integration-less pilots** as well as **enterprise-grade integrations**, organizations can quickly validate, scale, and embed this solution. The result is a supply chain that is **predictive, adaptive, and profitable**.

See the impact for yourself with a **free proof of concept** using your data—and transform your demand planning journey with OptiU.