

■ Project Proposal: AI-Powered Retail Demand Forecasting & Inventory Optimization

1. Business Goals

■ Primary Goal

Build a SaaS-based AI platform that helps retailers and distributors forecast demand and optimize inventory, reducing waste and stockouts, while improving profit margins.

■ Specific Objectives

- Automate demand forecasting using AI-driven predictions.
- Enable proactive inventory planning with reorder recommendations.
- Offer plug-and-play integration for sales data (CSV/API/ERP).
- Provide a cost-effective solution for SMEs.
- Develop a scalable SaaS Model from single-tenant MVP to multi-tenant.

■ Success Metrics

- MVP deployed in 4 months.
- First pilot customer onboarded in Month 5.
- Forecast accuracy $\geq 80\%$ (MAPE $< 20\%$).
- Clients reduce stockouts by $\geq 20\%$ within 3 months of use.
- Achieve 5+ SME pilot users in the first 6 months.

2. Technical Plan

■ System Architecture

The platform consists of 5 layers: Frontend (React), Backend (FastAPI), ML/AI (Prophet, LightGBM), Data Pipelines (Prefect), Infrastructure (Docker, K8s).

■ Tech Stack

Component	Tools
Frontend	React, TailwindCSS, Recharts
Backend	FastAPI, PostgreSQL, SQLAlchemy
ML/AI	Prophet, LightGBM, PyTorch, MLflow
Pipelines	Prefect/Airflow
Infra	Docker, Kubernetes, AWS/GCP/Azure
Monitoring	Prometheus, Grafana, EvidentlyAI

■ Development Phases & Deliverables

- Phase 0: Setup (Week 1): Repo structure + baseline dataset ready.
- Phase 1: Baseline ML Model (Weeks 2–3): Prophet model + MLflow tracking.
- Phase 2: Backend API (Weeks 4–5): FastAPI endpoints for upload & forecast.
- Phase 3: Frontend MVP (Weeks 6–7): React dashboard with upload & forecast charts.
- Phase 4: Infra & Deployment (Weeks 8–9): CI/CD, cloud deployment.
- Phase 5: Advanced ML (Weeks 10–12): LightGBM, inventory optimizer.
- Phase 6: Scaling & Monitoring (Weeks 13–16): Multi-tenant SaaS, monitoring, pilot deployment.

■ Risks & Mitigation

Risk	Impact	Mitigation
Poor data quality	Low model accuracy	Add validation + cleaning pipeline
Model accuracy < 80%	Customer trust issue	Use ensembles + fallback heuristics
Integration challenges	Onboarding delays	Start with CSV/API uploads
Scaling issues	Performance bottlenecks	Kubernetes + DB partitioning
Competition	Market risk	Focus on SMEs with simple UX & low pricing

■ Future Roadmap

- ERP/eCommerce integrations (Shopify, SAP, WooCommerce, Amazon).
- Real-time forecasting (streaming).
- Pricing optimization (dynamic pricing).
- Marketplace expansion in India & SE Asia SMEs.
- AI-driven recommendations (promotions, bundling).