Technical Report – Predictive Analytics Platform

This report provides a comprehensive technical overview of the full production predictive analytics system.

1. System Architecture
The system integrates:
- Machine Learning churn model (Logistic Regression)
- Generative AI explanation engine using GPT
- Streamlit backend UI
- React/Next.js frontend
- SQLite + SQLAlchemy database
- Kubernetes manifests
- Docker containerization
- GitHub Actions CI/CD pipeline
- Advanced analytics dashboards

2. Data Pipeline
The system ingests synthetic customer behavioral data:
- Age
- Months Active
- Average Monthly Spend
- Support Ticket Count

The Logistic Regression model processes these features to produce churn predictions.

3. AI Explanation Engine
The GPT model interprets:
- ML prediction
- Input features

It generates business-friendly explanations for non-technical stakeholders.

4. Frontend Architecture
A Next.js frontend communicates with the backend using JSON.
Two primary pages:
- Home
- Predict (API-connected form)

5. Database Layer
SQLite is used with SQLAlchemy ORM.
All predictions can be saved with customer attributes.

6. Deployment Stack
Docker:
Provides containerized isolated execution.

Kubernetes:
Deployment + Service files enable scalable, cloud-ready deployments.

CI/CD:
GitHub Actions pipeline automates:

- Testing
- Building Docker images

7. Dashboards
Basic and advanced analytics dashboards visualize:
- Churn patterns
- Correlations
- Spend distributions
- Scatterplots

8. Conclusion
This system represents a complete, production-level, multi■layer AI engineering project demonstrating:
- ML
- AI reasoning
- Cloud DevOps
- Web development
- Analytics engineering