END TO END MACHINE LEARNING PROJECT

Customer Churn Prediction System

🏛Haldia Institute of Technology

Cluster 3 – Batch 7 | Team:

Panda_UGC

DEVELOPMENT TEAM

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Academic Year: 2025 – 2026

OUR INSTITUTION

Haldia Institute of Technology

Dedicated to excellence in engineering and technology, HIT provides a state-of-the-art infrastructure that fostered the development of our Churn Prediction System.

“Acknowledgement

We express our sincere gratitude to our faculty and mentor Mr. Debasish Sahoo for their constant support and resources provided during this project.

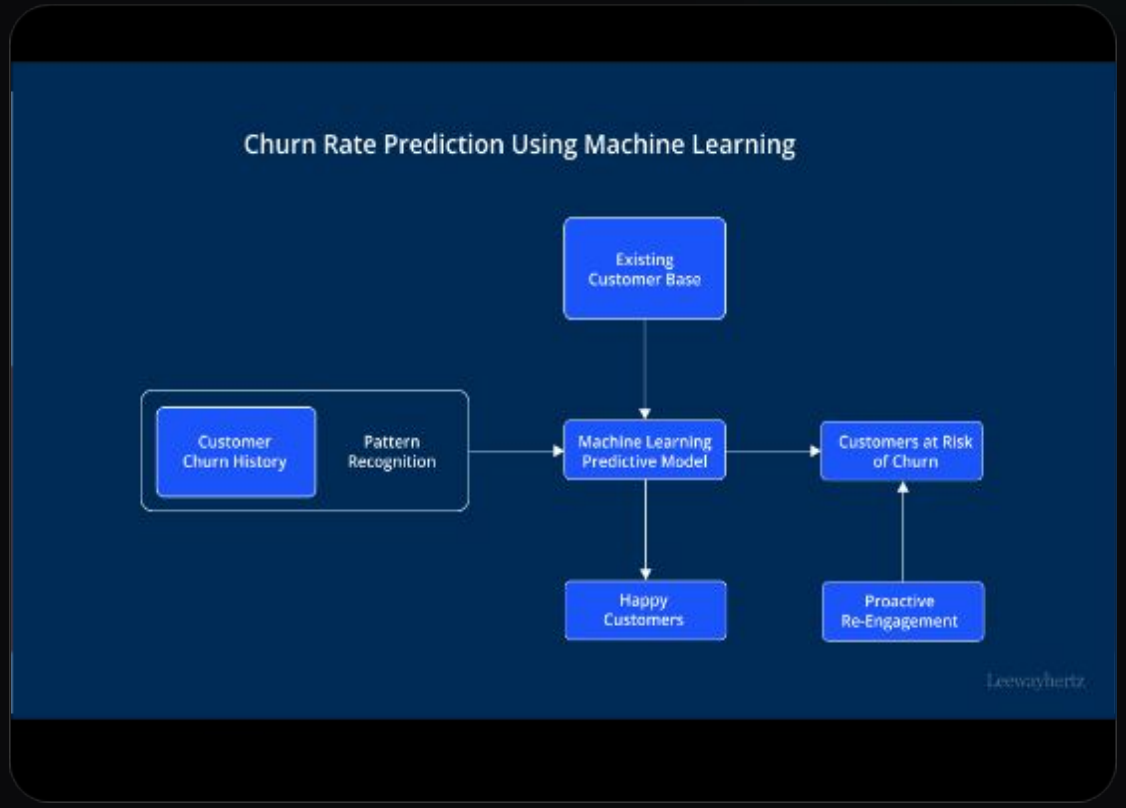
PROJECT ABSTRACT

Retaining existing customers is significantly more cost-effective than acquiring new ones.

This project presents an **End to End Customer Churn Prediction System** that leverages:

- **Machine Learning:** Random Forest Classification
- **Backend:** FastAPI REST Architecture
- **Frontend:** React-based Interactive Dashboard

Deployment-ready for real-time risk classification and business strategy recommendation.



THE CHALLENGE

Problem Statement

Businesses often fail to identify high-risk customers before they stop using a service. Reactive strategies are inefficient and lead to massive revenue loss.

Our Solution

A proactive system that predicts churn probability in advance and provides actionable insights to reduce customer loss through AI-powered analytics.

DATA INSIGHTS

Utilizing the **Telco Customer Churn Dataset** containing real-world customer behavior metrics:

Service Data

Internet service type, Contract category, Tenure months.

Billing Data

Monthly charges, Total charges, Payment methods.

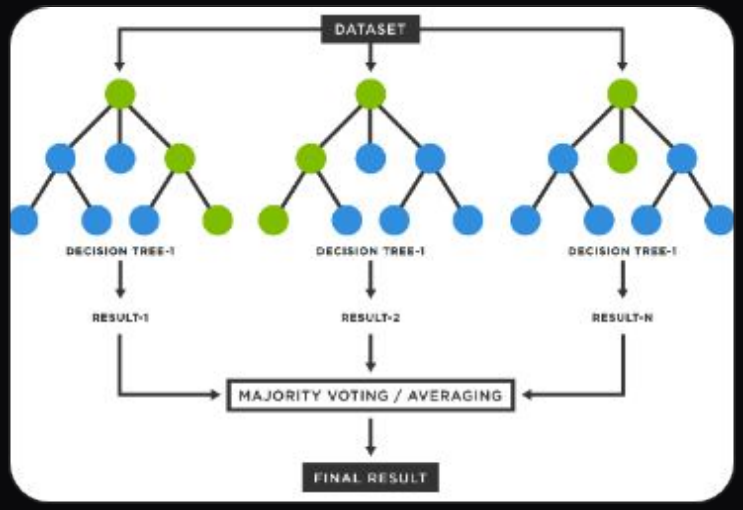
Target

Churn Label (Binary Classification: Yes / No).

METHODOLOGY

Pre-processing

Scaling & Encoding Categorical variables.



Classification

Random Forest Ensemble modeling.

Thresholding

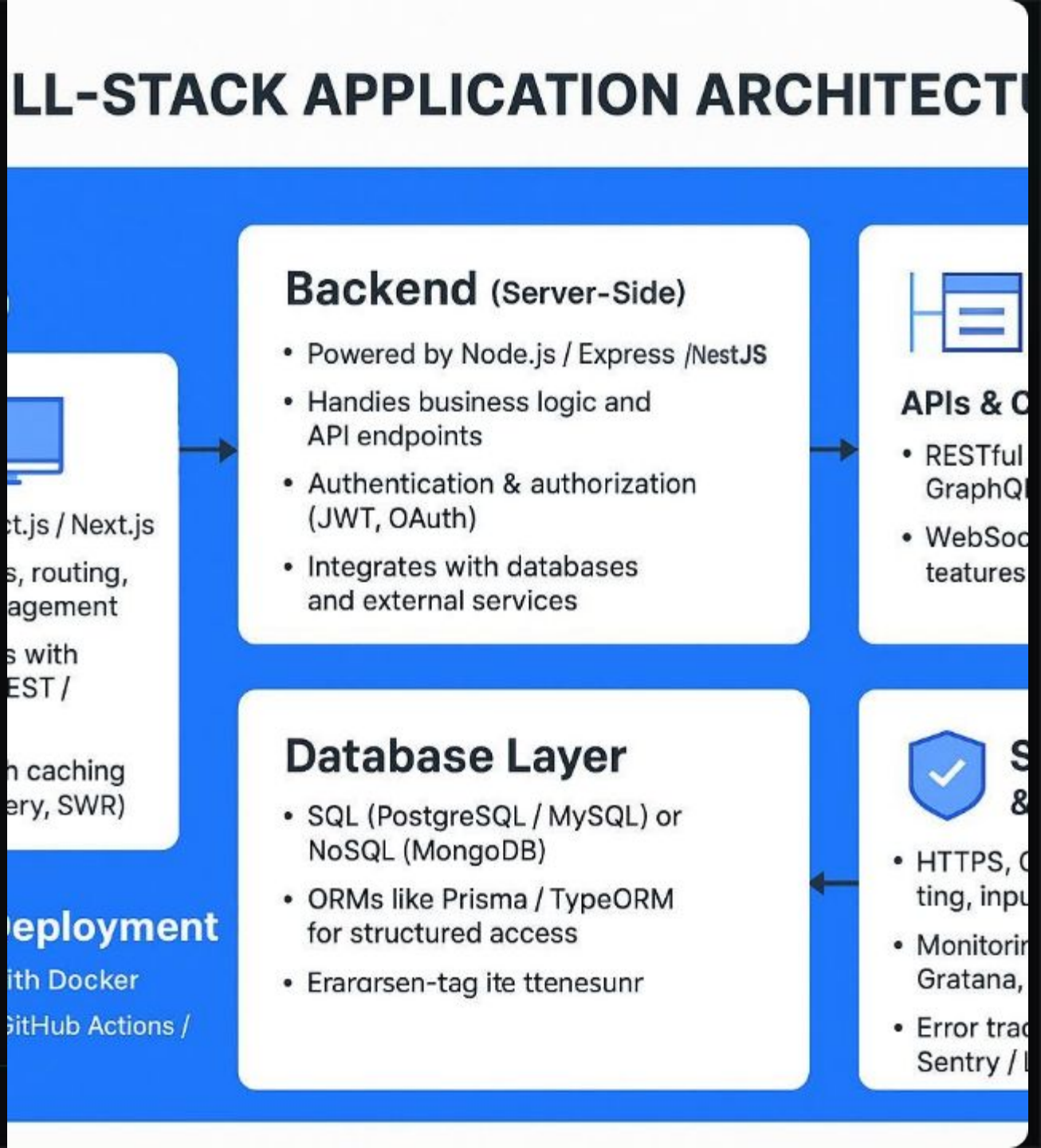
Optimized 0.4 threshold for maximum recall.

ARCHITECTURE

Production Architecture

- **Frontend (Vercel):** React + Tailwind CSS Dashboard
- **Backend (Render):** FastAPI service for prediction
- **Model Layer:** Pickle-serialized Pipeline

Our three-tier architecture ensures real-time inference with low latency and decoupled scalability.



FEATURE IMPLEMENTATION

Frontend UI

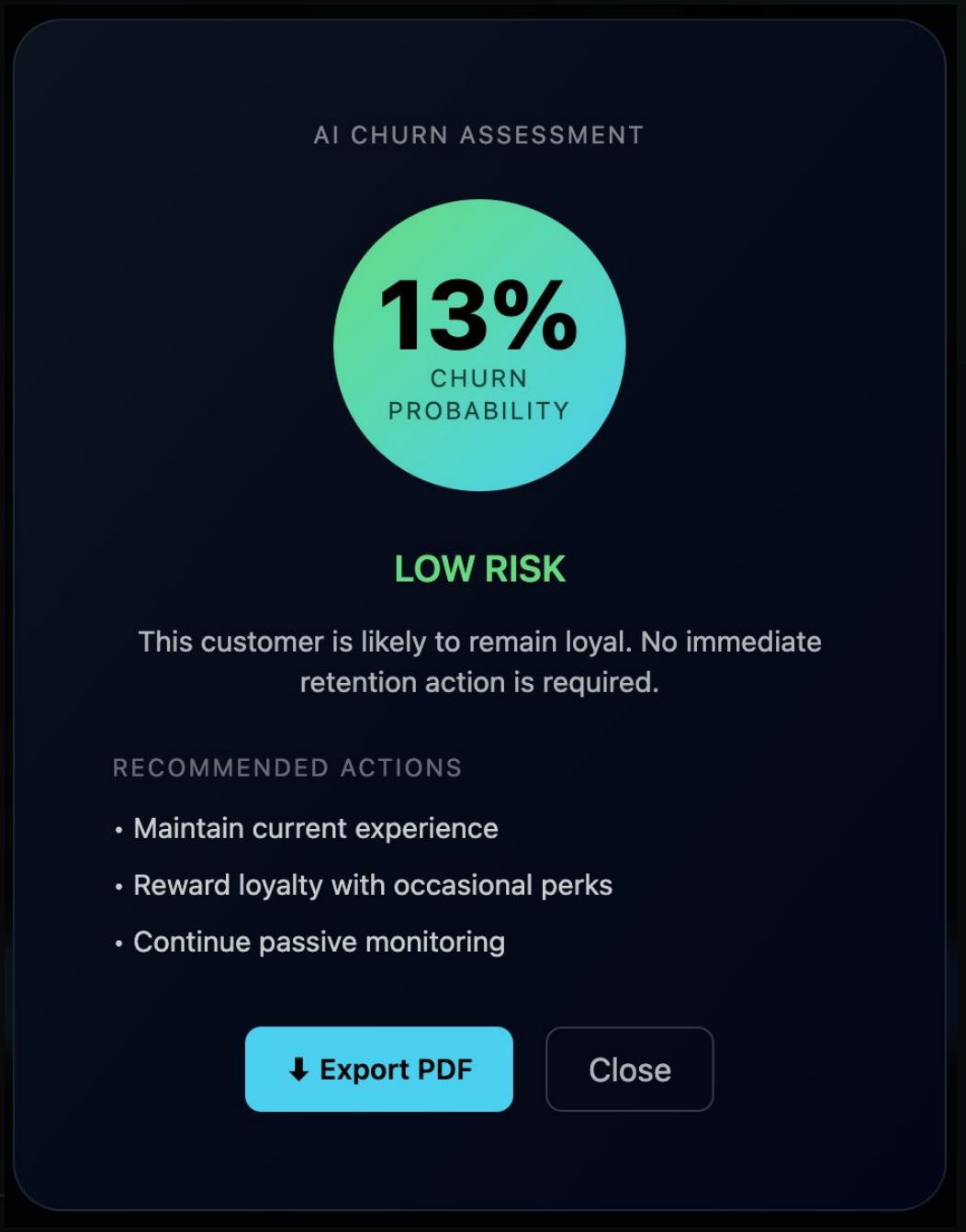
Futuristic Glassmorphism design with Neon hover effects and Framer Motion animated transitions for AI status indication.

Backend API

FastAPI /predict endpoint with built-in CORS support and automated pipeline loading for seamless web integration.

Live Interface: Customer Input

Live Interface: Customer Output



SYSTEM METRICS

"System provides risk classification into Low, Medium, and High categories with specific business interventions."

FUTURE SCOPE

Explainability

Integration of SHAP/LIME for model decision transparency.

Automation

Automated retraining pipelines as new data flows in.

CRM Sync

Direct integration with Salesforce or HubSpot CRMs.

Thank You

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