

Title: Predicting and Preventing 30-Day Hospital Readmissions

Subtitle: AI-Powered Risk Scoring & Post-Discharge Care Coordination

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Problem Statement

- **Heading:** The Challenge Hospitals Face
- 30-day readmissions cost Medicare **\$26B annually**, leading to financial strain.
- CMS penalizes hospitals with high readmission rates under **HRRP (Hospital Readmissions Reduction Program)**.
- Hospitals often rely on manual review or reactive care, lacking **real-time actionable insights**.
- High-risk patients may not be identified before discharge, increasing chances of readmission.

Solution Overview

- **Heading:** AI-Driven Risk Prediction & Proactive Care
- Predicts patient risk for **30-day readmission in real-time**.
- Generates **risk scores** with actionable insights for medical staff.
- Reduces readmission costs by **15%** through early interventions.
- Integrates with hospital workflow to support **personalized post-discharge care**.

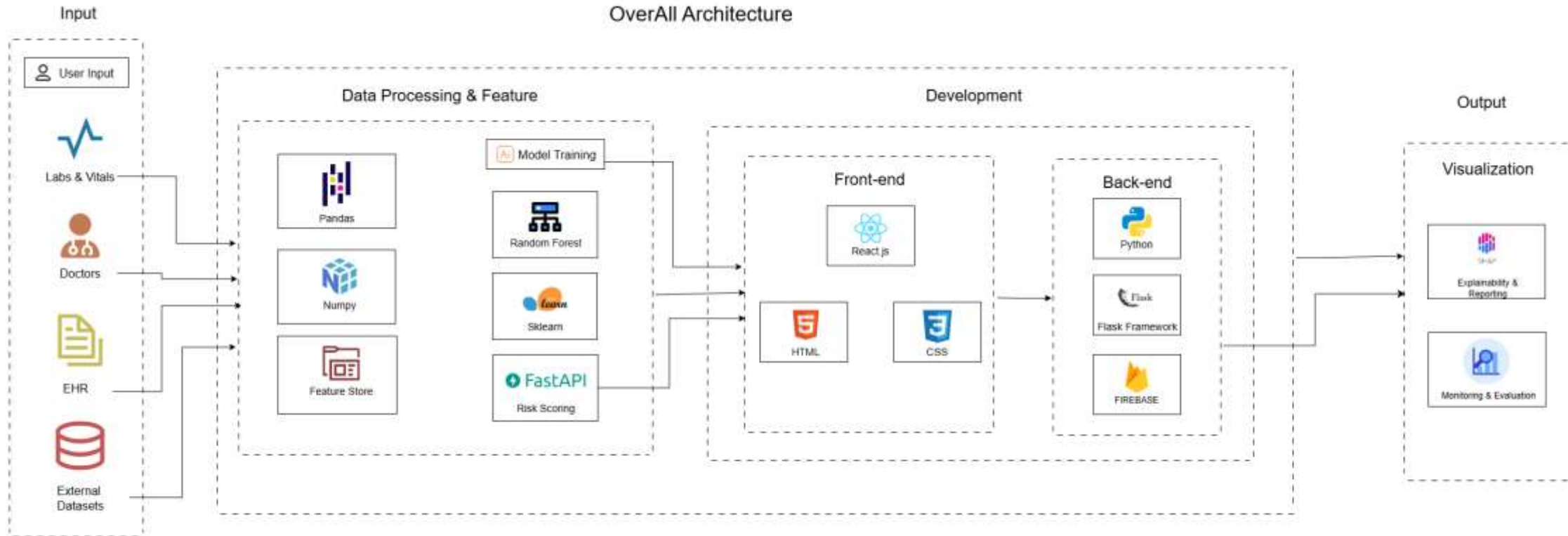
Input Data & Features

- **Heading:** Comprehensive Patient Data
- **Demographics:** Age, gender, socio-economic status
- **Medical History:** Previous admissions, chronic conditions, comorbidities
- **Vital Signs & Lab Results:** Heart rate, blood pressure, lab tests, biometrics
- **Medication & Treatment:** Prescriptions, adherence, surgeries
- **Post-Discharge Information:** Follow-ups, home care, readmission history
- **External Datasets:** CMS readmission data for benchmarking

ML Architecture

- **Heading:** Predictive Model Pipeline
- **Data Preprocessing:**
 - Missing value imputation (median/mode)
 - Normalization and scaling of numeric features
 - Encoding categorical variables (one-hot / label encoding)
- **Models Used:**
 - XGBoost – gradient boosting for structured data
 - Random Forest – ensemble learning for interpretability
 - LightGBM – fast, scalable boosting for large datasets
- **Model Evaluation:**
 - Metrics: Accuracy, Precision, Recall, F1-Score, ROC-AUC
 - Cross-validation with train/test split to avoid overfitting
- **Retraining Mechanism:**
 - Model retrains weekly with new patient data
 - Ensures up-to-date predictions for changing patient trends

Overall System Architecture



Tech Stack & Tool Roles

- **Heading:** Tools & Technologies Behind the Solution
- **Frontend:** React
 - Interactive dashboards
 - Color-coded risk levels and patient summary charts
- **Backend:** Flask
 - REST API endpoints for predictions and dashboard data
 - Handles real-time data processing
- **Database:** Firebase
 - Stores patient info and prediction logs securely
 - Handles authentication and access control
- **Machine Learning:** XGBoost, LightGBM, Random Forest
 - Predictive models for readmission risk scoring
- **Visualization:** Plotly / D3.js
 - Real-time charts for risk trends, department-level analytics


AI Agent in Action

- **Heading:** Real-Time Monitoring & Alerts
- AI agent monitors **incoming patient data in real-time**.
- Calculates **risk scores automatically**.
- Sends **alerts for high-risk patients** to medical staff.
- Suggests **personalized interventions** like follow-ups, medication review, or home care recommendations.

User Workflow

- **Heading:** Stepwise Patient Journey
- Patient admitted → data captured in EHR
- AI agent analyzes data and calculates risk score
- Dashboard displays risk level and suggested care interventions
- Doctor implements preventive measures (medication adjustment, follow-up scheduling)
- Outcome monitored and fed back for retraining

Results & Impact

- **Heading:** Benefits of Our Solution
 - **15% reduction in 30-day readmissions**
 - Improved patient outcomes and satisfaction
 - Data-driven decisions for hospital staff
 - Scalable across departments and hospitals
 - Compliance with CMS HRRP guidelines
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Thank You

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