GHW HEART FAILURE READMISSION PREDICTION

A Machine Learning and Visualization Project

Tools: Python, XGBoost, Streamlit

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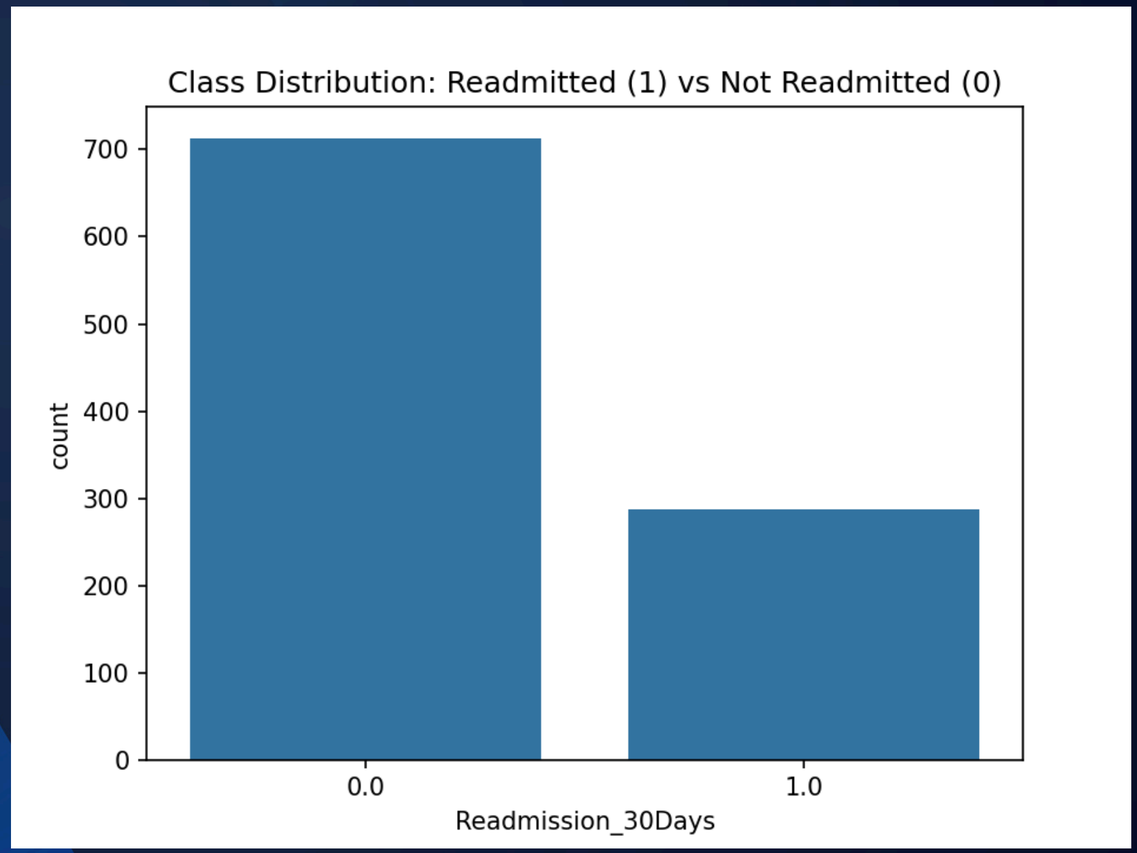
PROJECT OBJECTIVE

- Predict risk of 30-day hospital readmission for heart failure patients.
- Provide clinicians with early warnings for high risk cases.
- Reduce healthcare costs and improve patient outcomes.

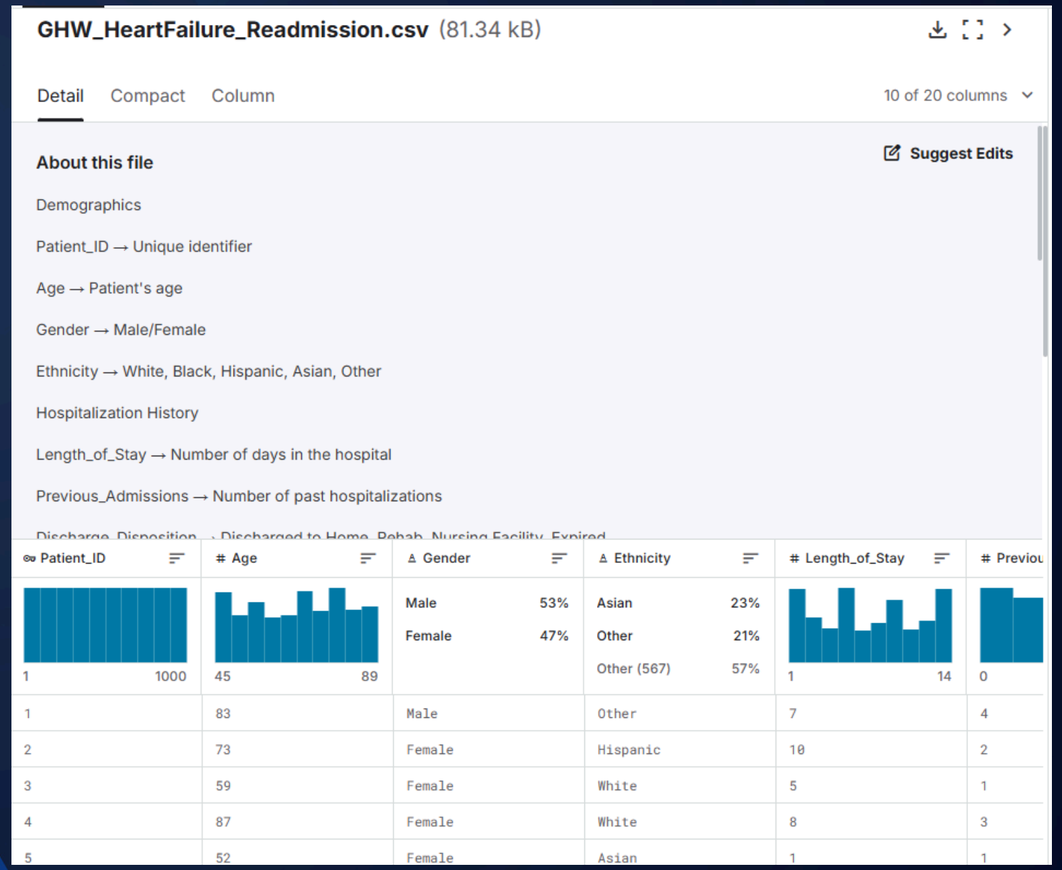
DATASET OVERVIEW

- Records patient demographics, vitals, labs, and prior admissions.
- Features: Age, Gender, Sodium, NP-proBNP, etc
- Target: Readmission_30Days (1 = Yes, 0 = No.
- Challenges: Missing values, class imbalance

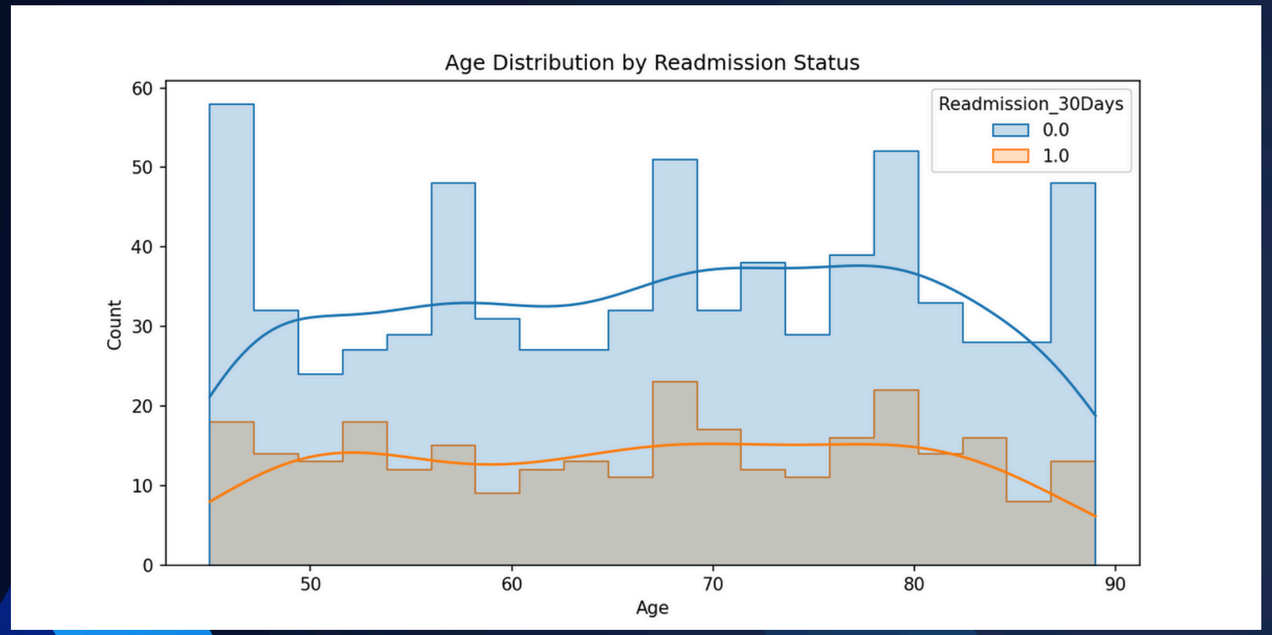


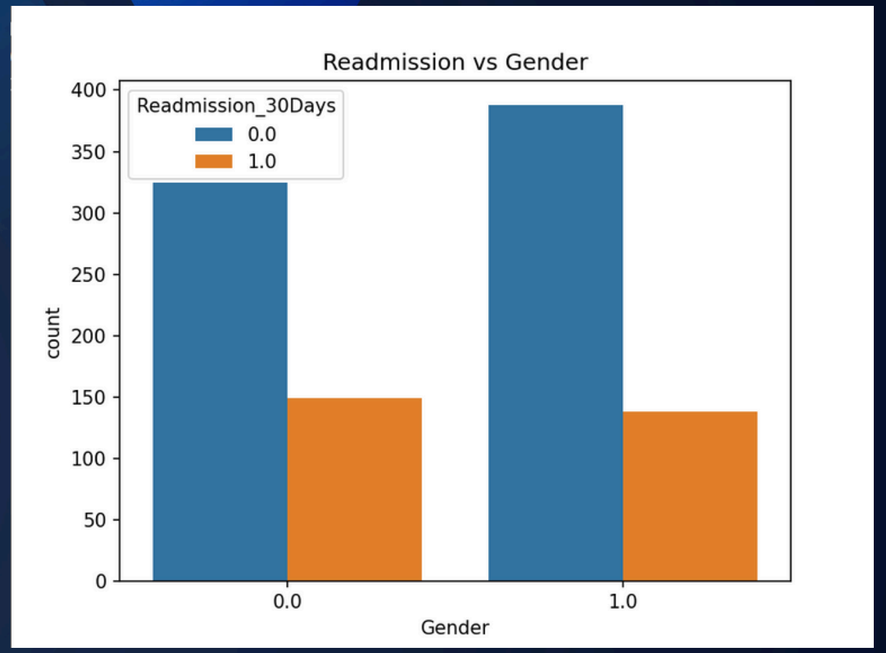
DATA PREPROCESSING

- Handled missing values using mean imputation.
- Encoded categorical features using LabelEncoder.
- Scaled numerical data with StandardScaler.
- Applied SMOTE to address class imbalance.



EXPLORATORY DATA ANALYSIS



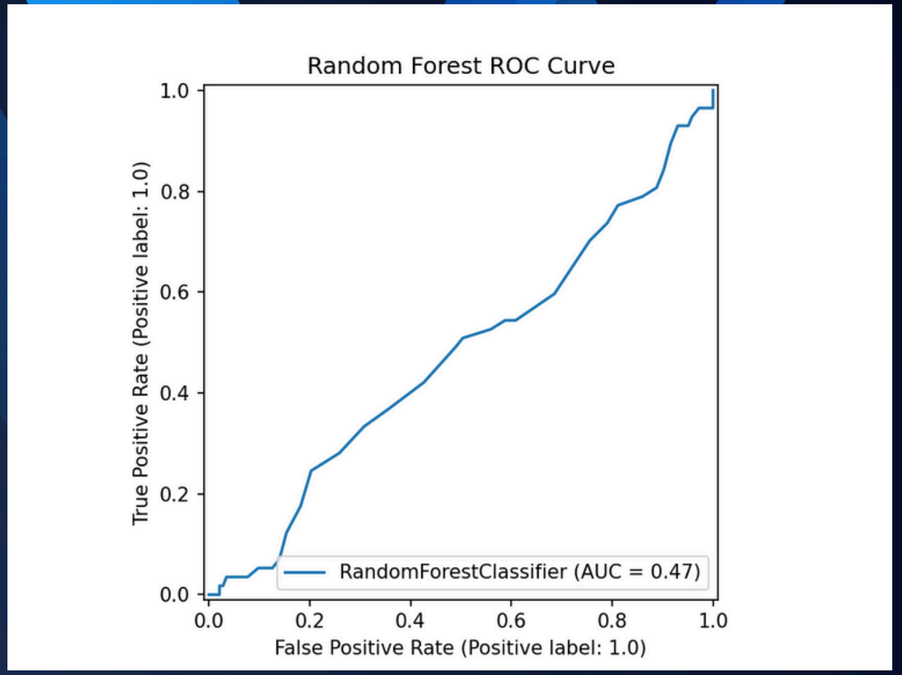


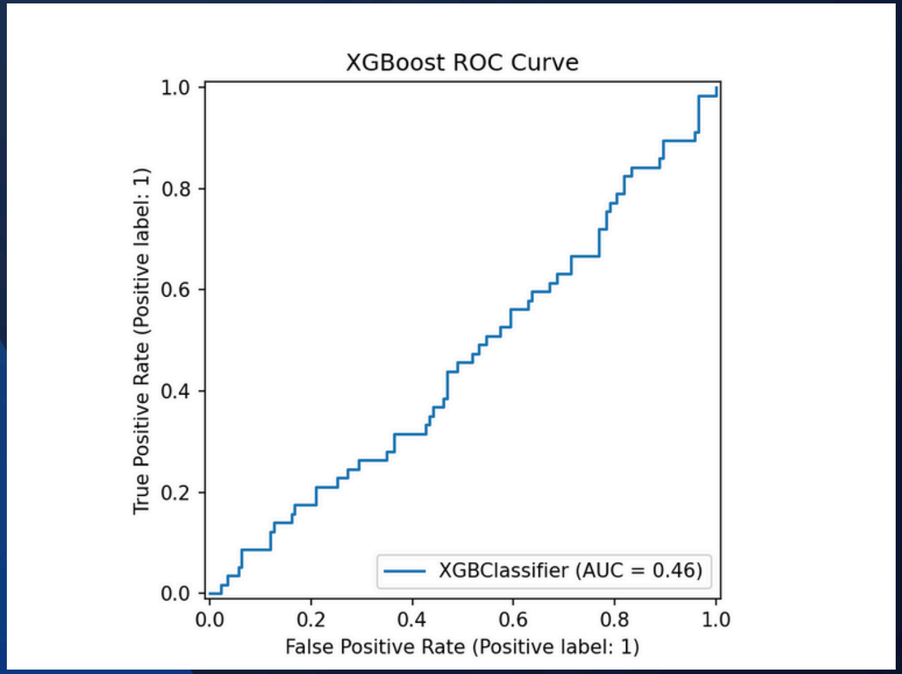
AGE AND NT-PROBNP SHOW STRONG CORRELATION WITH READMISSION

GENDER SLIGHTLY AFFECTS RISK

MODEL BUILDING

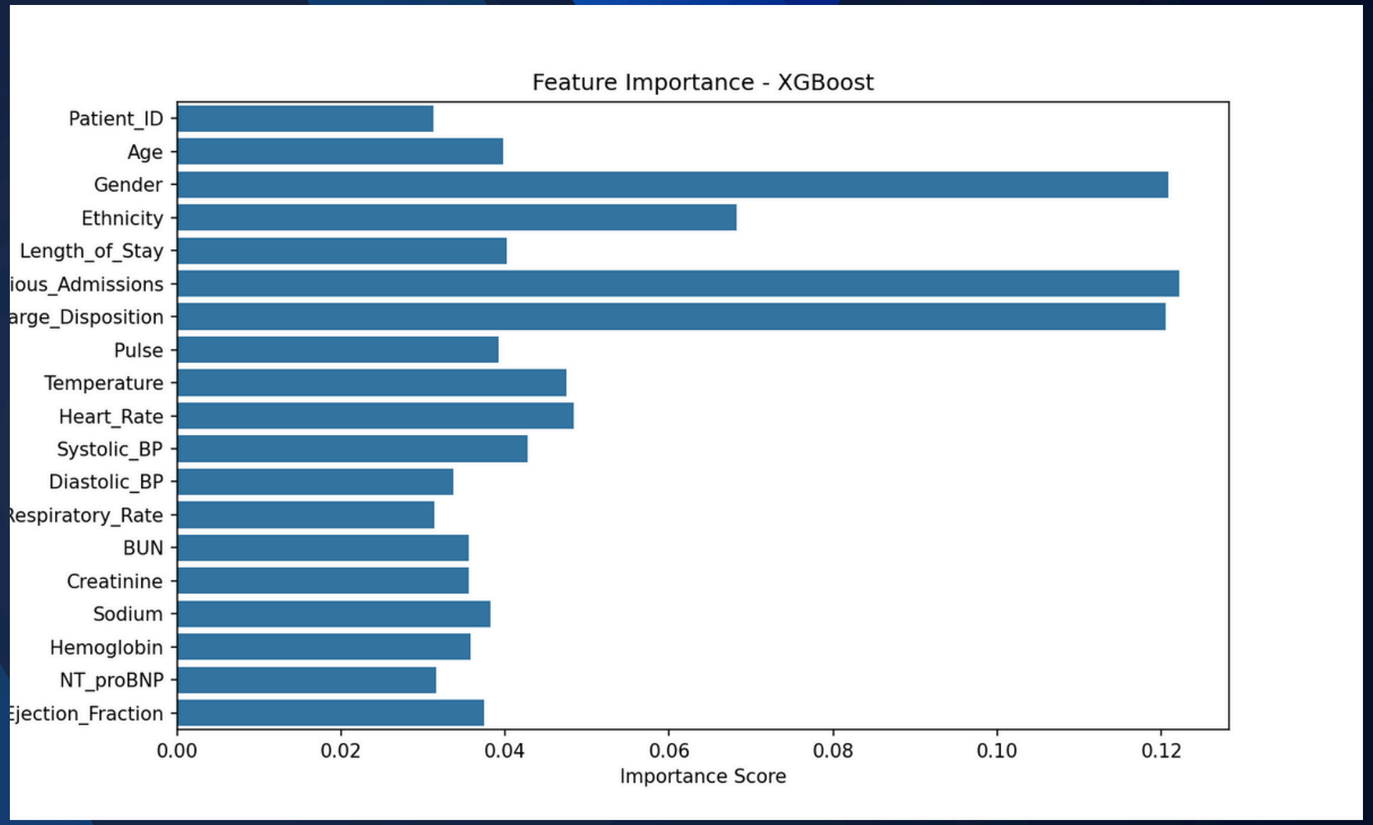
- Models Tried: Random Forest, XGBoost.
- Tuned XGBoost with GridSearchCV.
- Final model trained with SMOTE-balanced data.
- Saved as joblib file for use in the app.





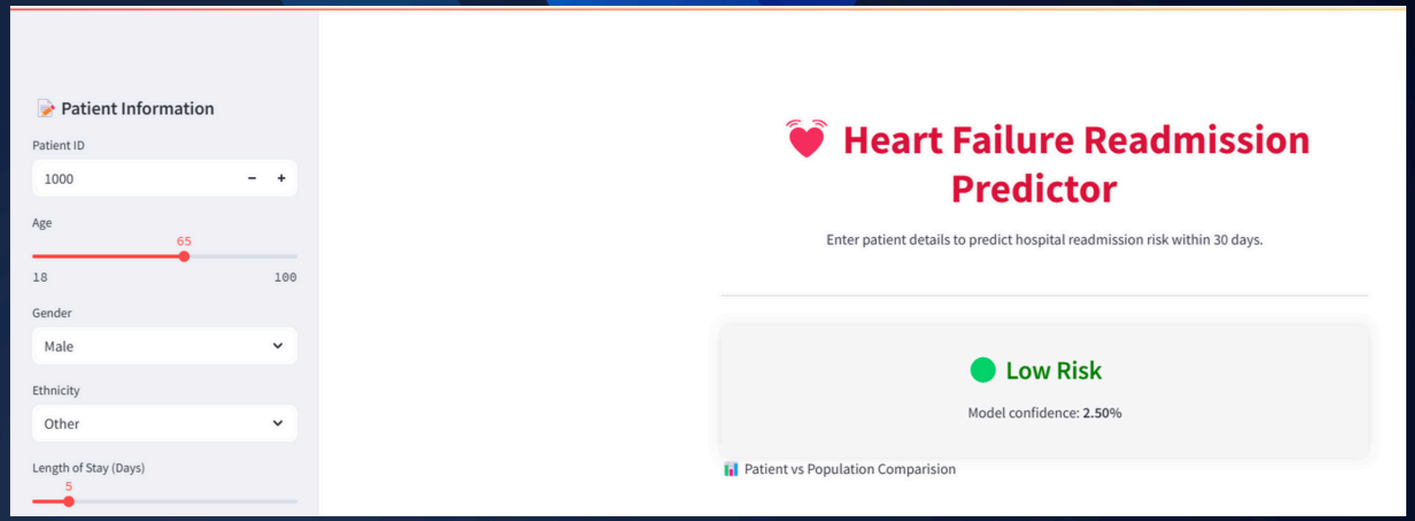
MODEL PERFORMANCE

- Accuracy: ~89%
- ROC AUC: 0.93.
- High Recall: Ensures fewer missed readmissions



STREAMLIT APP FEATURES

- User inputs patient details in sidebar.
- Predicts readmission risk with probability.
- Displays color-coded bar chart: Patient vs Population.
- Generates risk summary table with severity levels



RECOMMENDATIONS

- Deploy Streamlit app using Streamlit Cloud or GCP.
- Scale the dataset with real-world clinical sources.
- Integrate with hospital EMR (Electronic Medical Records).
- Add SHAP explainability for transparency.

CONCLUSION

- End-to-End project from preprocessing to UI.
- Model achieves high accuracy and interpretability.
- Visual dashboards aid medical decisions.
- A scalable foundation for predictive healthcare.

THANK YOU