

# **GHW HEART FAILURE READMISSION PREDICTION**

A Machine Learning and Visualization Project

Tools: Python, XGBoost, Streamlit

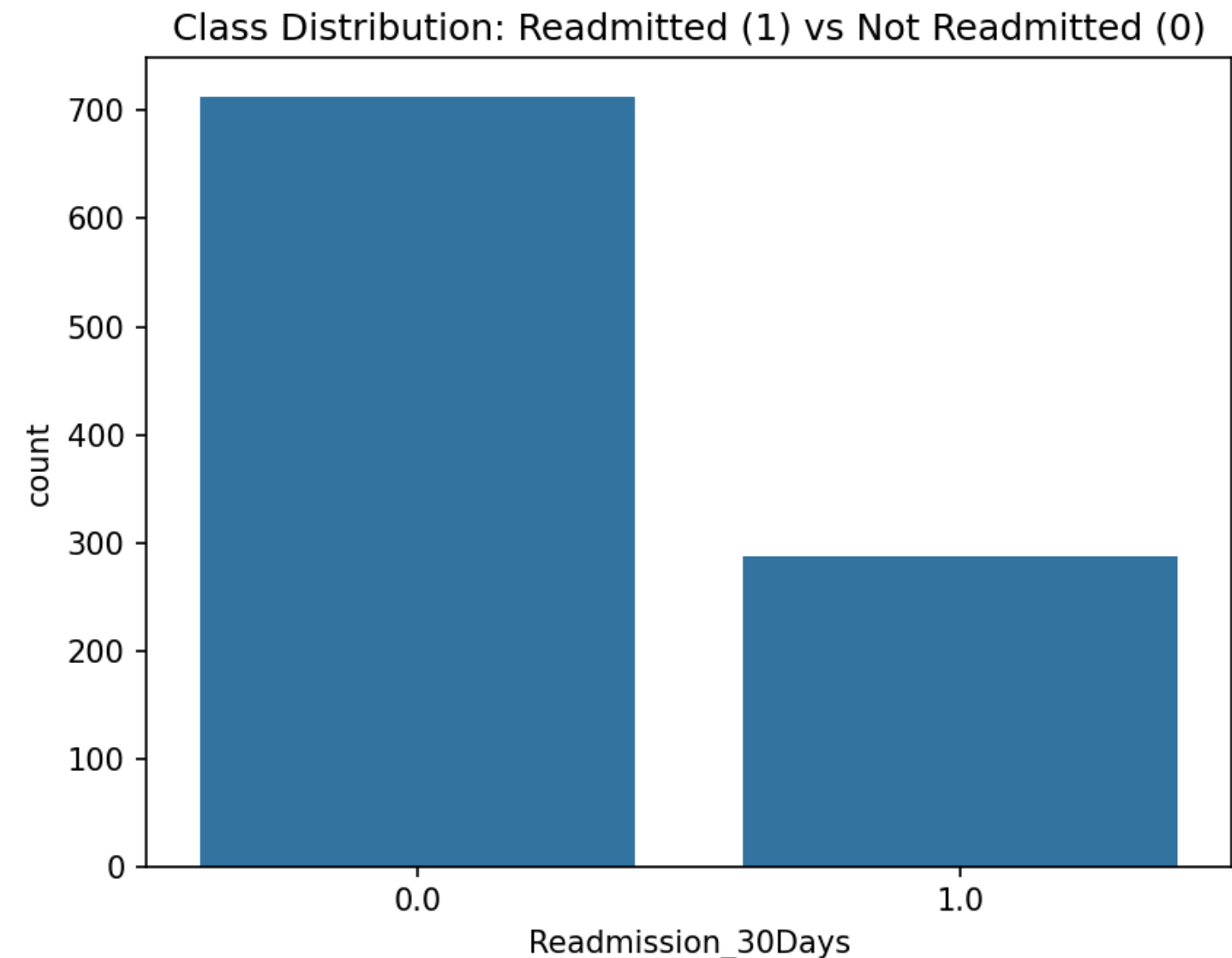
Presented By: Alin Merchant

# 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.

GHW\_HeartFailure\_Readmission.csv (81.34 kB)

Detail Compact Column 10 of 20 columns

About this file [Suggest Edits](#)

Demographics

Patient\_ID → Unique identifier

Age → Patient's age

Gender → Male/Female

Ethnicity → White, Black, Hispanic, Asian, Other

Hospitalization History

Length\_of\_Stay → Number of days in the hospital

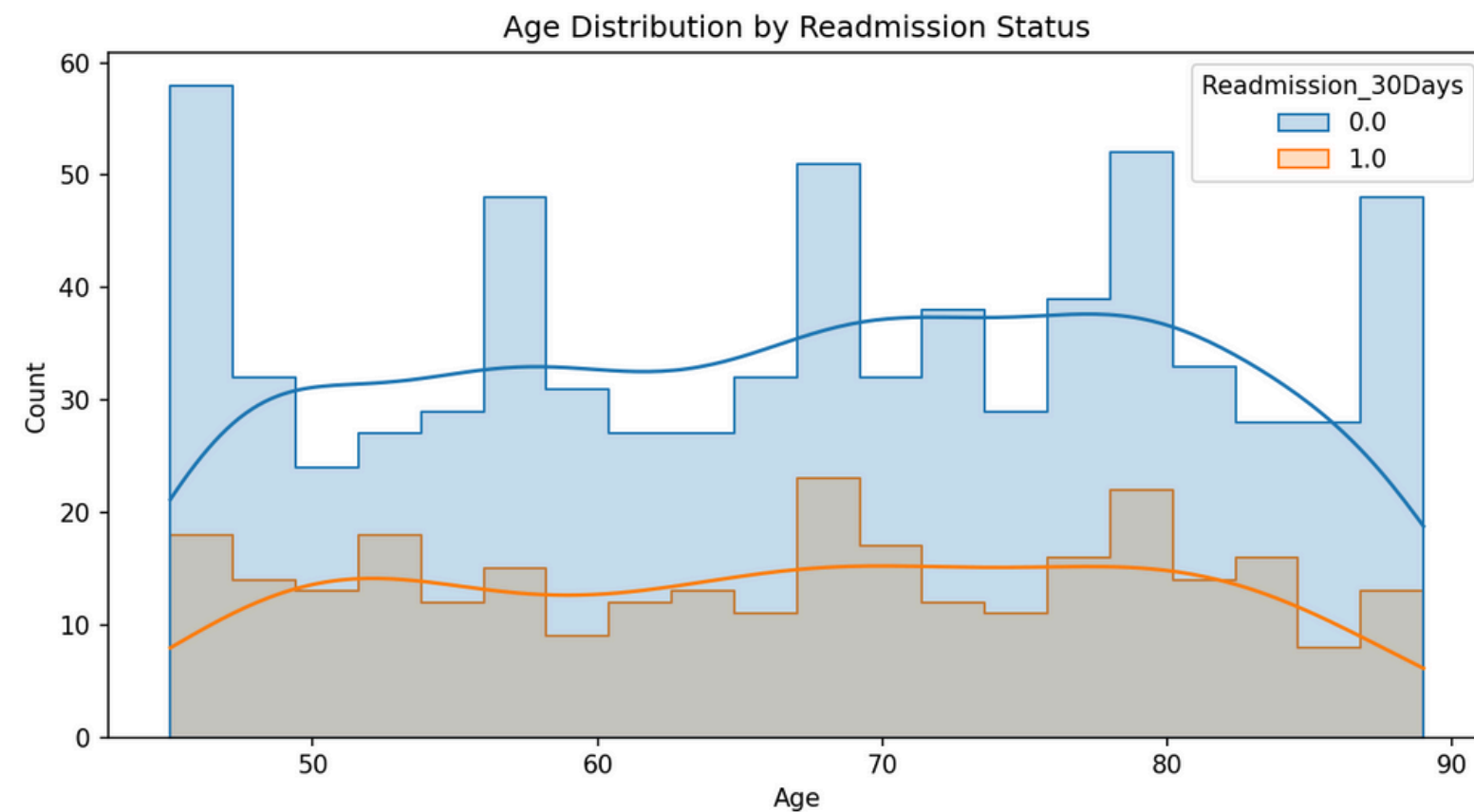
Previous\_Admissions → Number of past hospitalizations

Discharge\_Disposition → Discharged to Home, Rehab, Nursing Facility, Expired

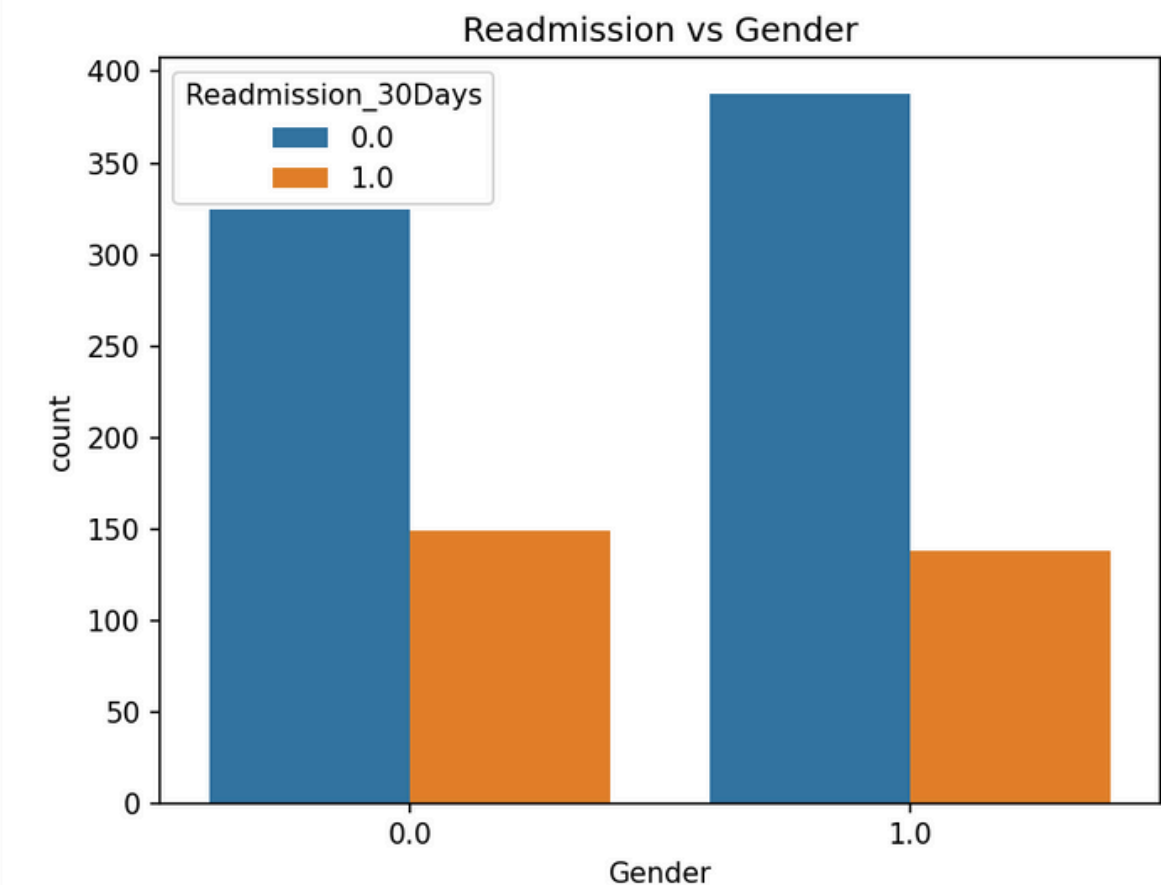
Patient_ID	Age	Gender	Ethnicity	Length_of_Stay	Previous_Admissions
1	45	Male	Asian	1	0
1	83	Male	Other	7	4
2	73	Female	Hispanic	10	2
3	59	Female	White	5	1
4	87	Female	White	8	3
5	52	Female	Asian	1	1



# EXPLORATORY DATA ANALYSIS



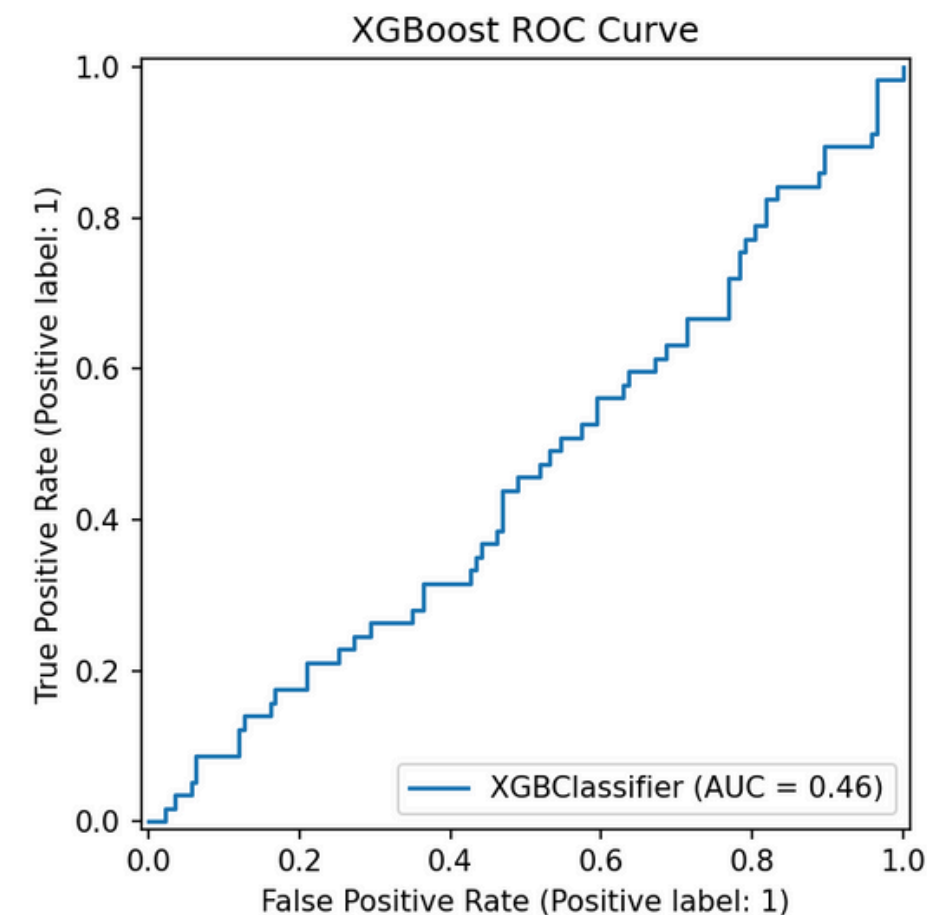
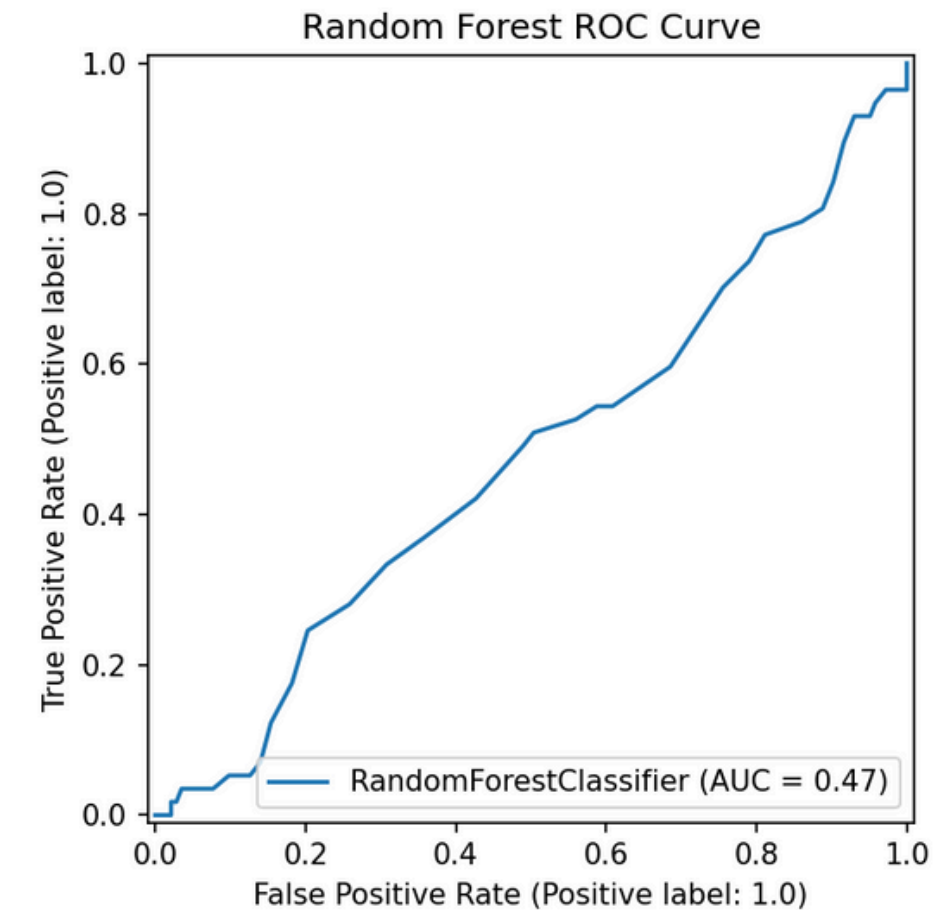
**AGE AND NT-PROBNP SHOW STRONG CORRELATION WITH READMISSION**



**GENDER SLIGHTLY AFFECTS RISK**

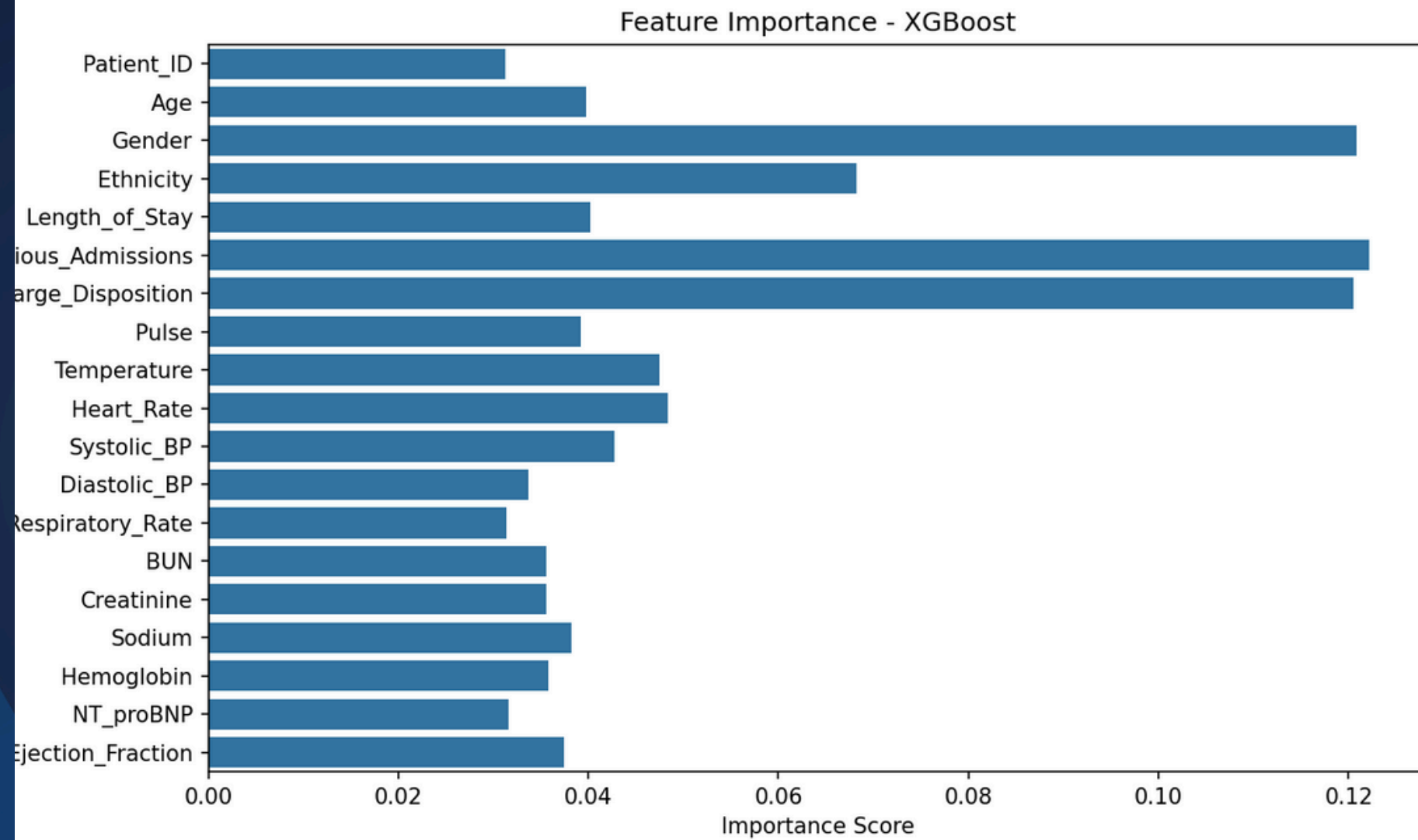
# MODEL BUILDING

- 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

 Patient Information


Patient ID

Age

Gender

Ethnicity


Length of Stay (Days)

 **Heart Failure Readmission Predictor**

Enter patient details to predict hospital readmission risk within 30 days.

Low Risk

Model confidence: 2.50%

 Patient vs Population Comparison





# 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.

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**THANK  
YOU**