FAIR AND EXPLAINABLE HEART PREDICTION

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01 Introduction

1 death every 40 seconds from Cardiovascular disease — the leading cause of death (CDC)

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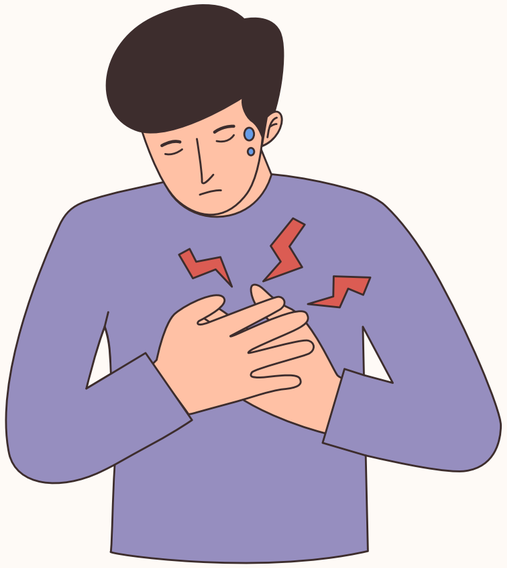
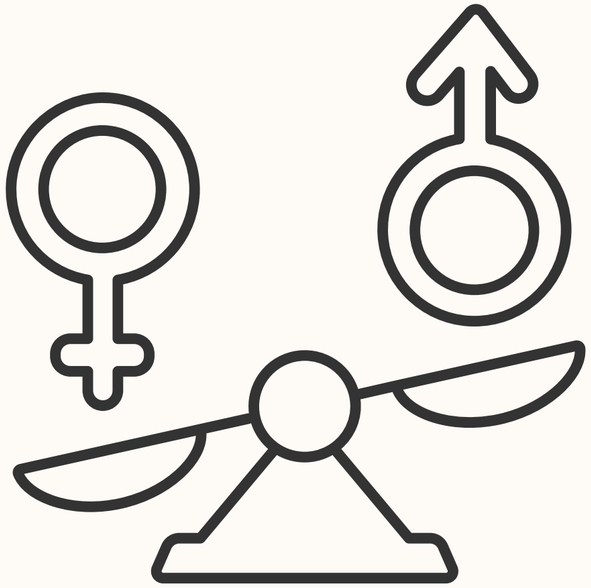
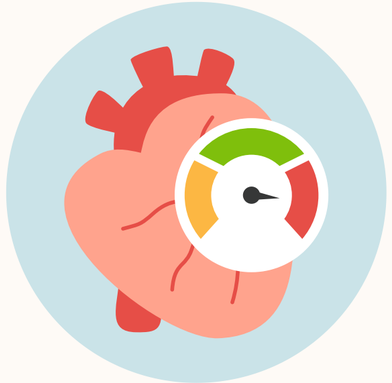
Problem



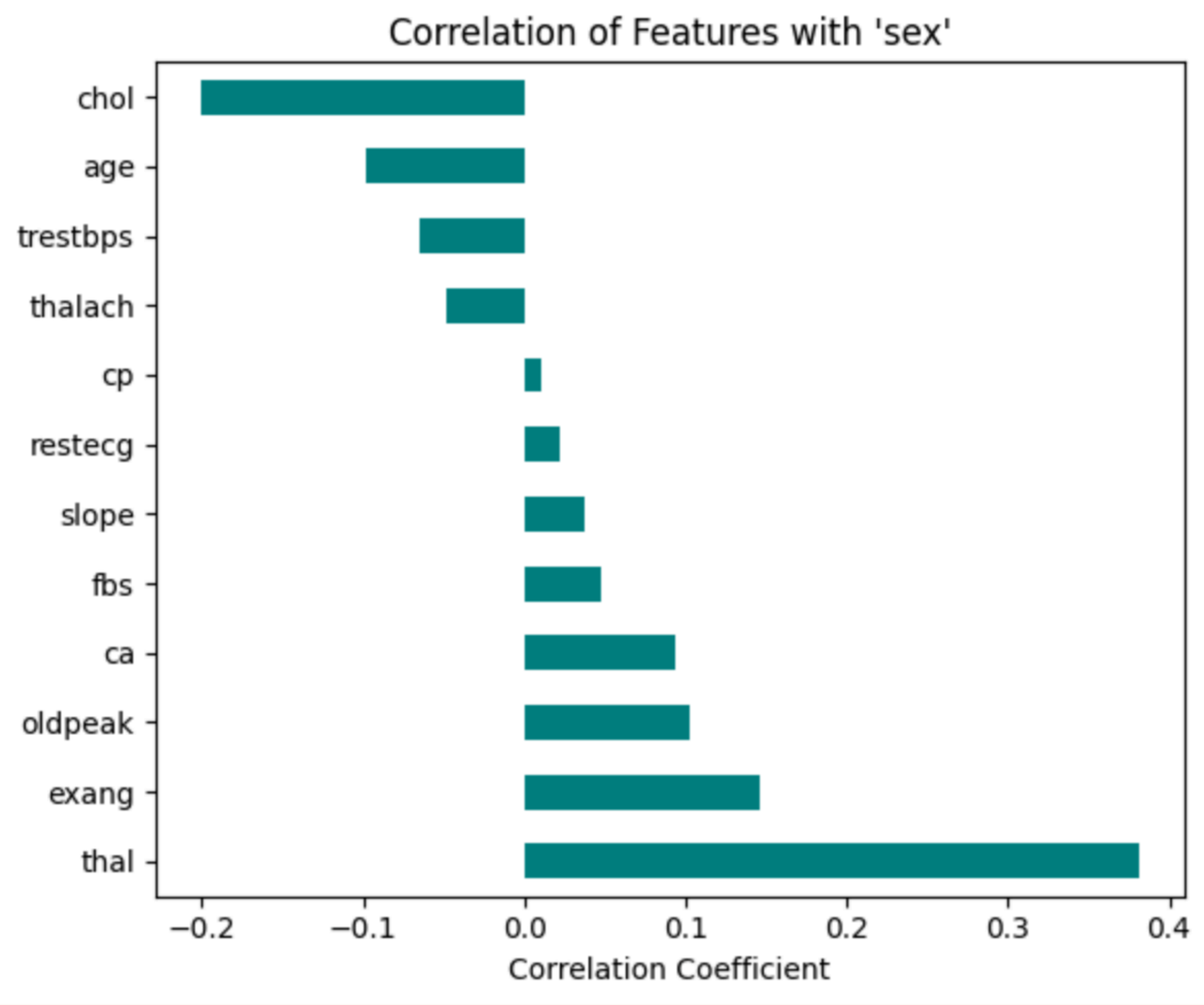
The Bias Problem in Healthcare AI

Imbalanced Data: 68% male & 32% female

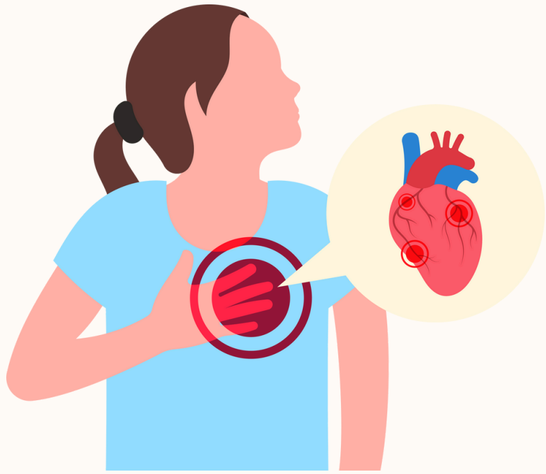




03 Data & Discovery



- 303 patients
- Bias scan score: 47.0
- Baseline model
  EOD: 0.312



04 Methods

Pre-processing:

- MinMaxScaler normalization
- 70% train / 15% val / 15% test split

Models:

- Logistic Regression, KNN, Random Forest, SVM, XGBoost
- Threshold optimized to 0.35 (maximize recall)

Bias Mitigation:

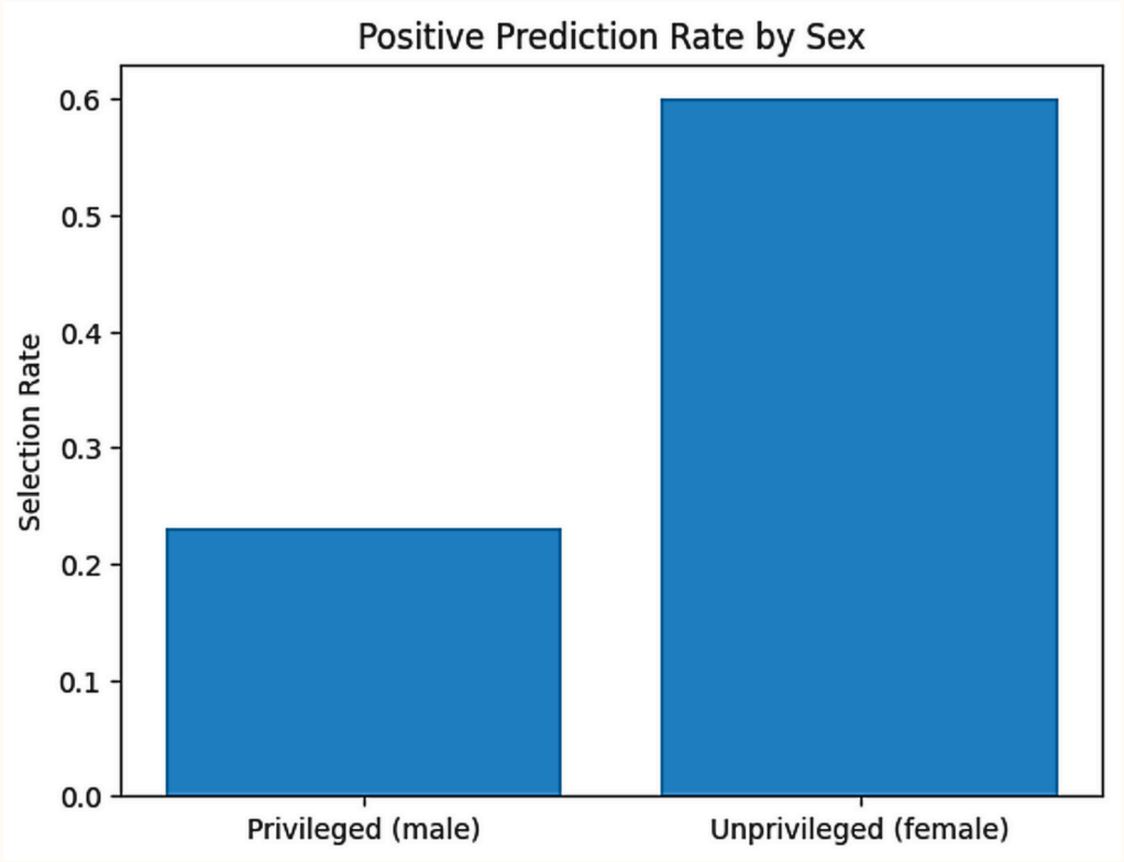
- Reweighting (AIF360)

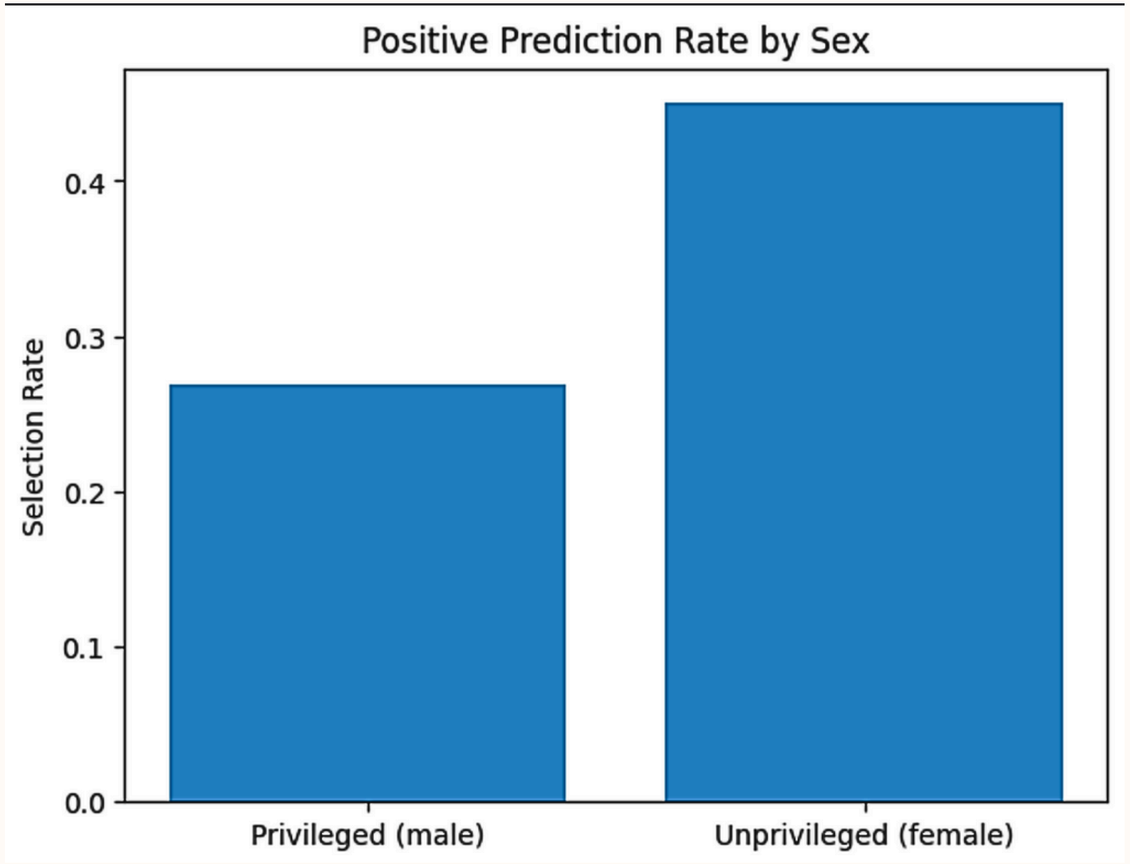
Evaluation:

- Performance: Accuracy, Recall, F1, ROC-AUC
- Fairness: EOD, AOD, Disparate Impact

05

Results


Positive Prediction Rate by Sex
Selection Rate
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Privileged (male)
Unprivileged (female)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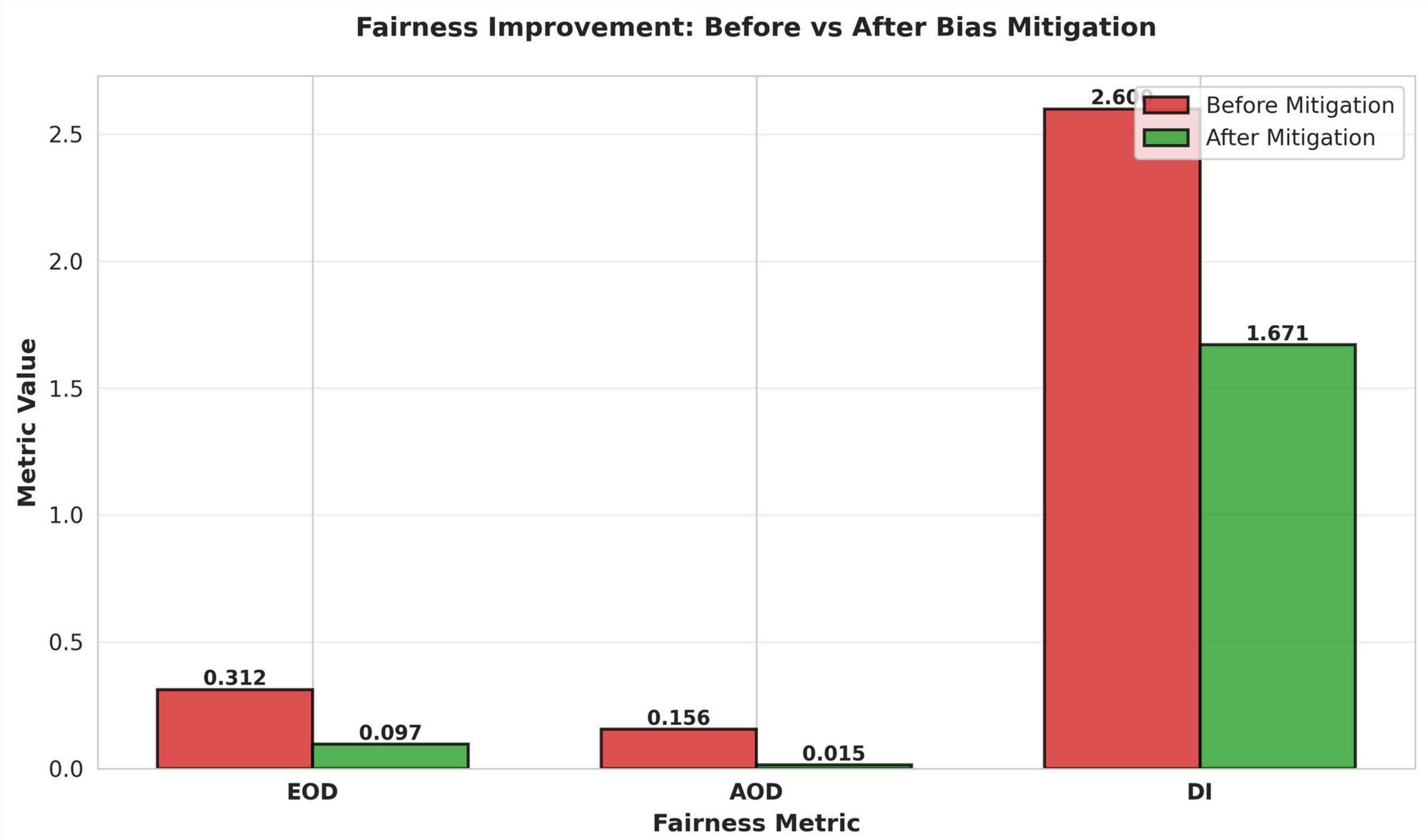
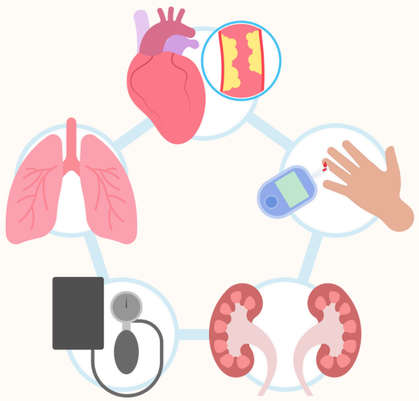
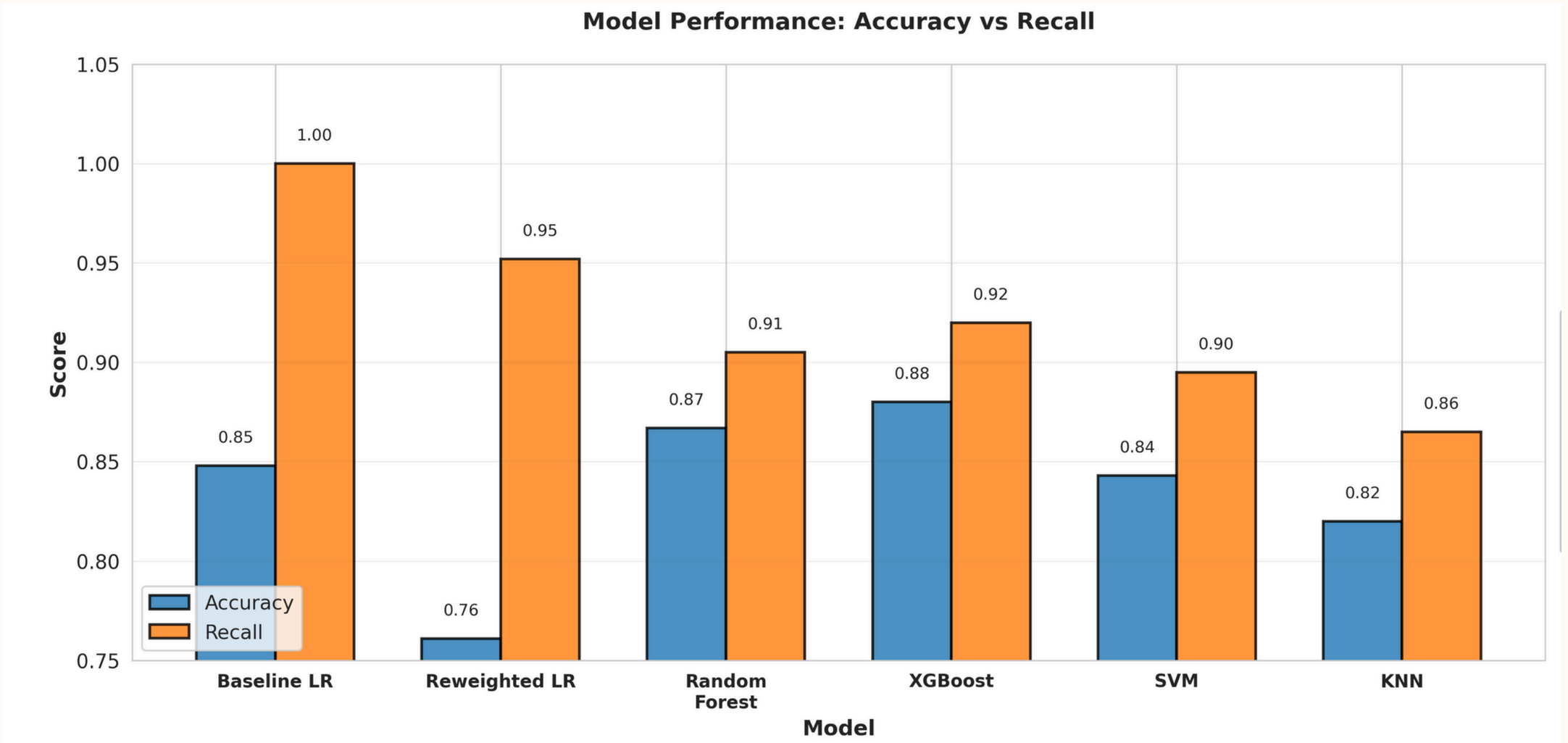
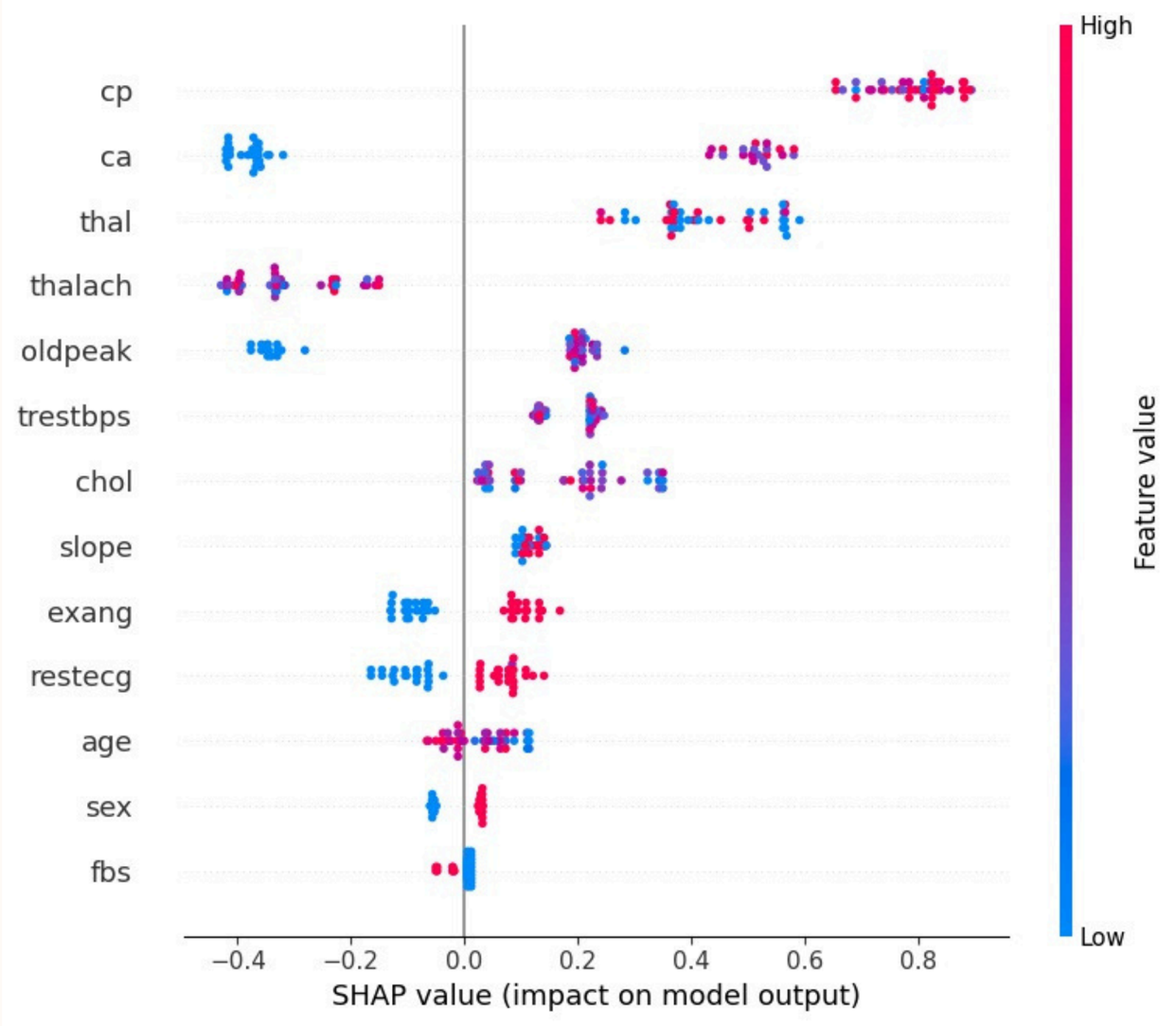

Fairness Improvement: Before vs After Bias Mitigation
Before Mitigation
After Mitigation
Metric Value
2.5
2.0
1.5
1.0
0.5
0.0
0.312
0.097
0.156
0.015
2.60
1.671
EOD
AOD
DI
Fairness Metric




Model Performance: Accuracy vs Recall
Score
1.05
1.00
0.95
0.90
0.85
0.80
0.75
1.00
0.95
0.91
0.92
0.90
0.86
0.85
0.87
0.88
0.84
0.82
0.76
Accuracy
Recall
Baseline LR
Reweighted LR
Random Forest
XGBoost
SVM
KNN
Model

06 Explainability

- Top predictors: Thalassemia, Chest Pain, # of Vessels
- Sex ranks low in feature importance
- Model relies on clinical features, not gender



07 Takeaways

Fairness and accuracy are compatible
Bias won't fix itself — systematic evaluation matters
Explainability validates that improvements are real

Limitations:

- Small dataset (303 patients)
- Binary gender only — no non-binary representation
- Single bias mitigation technique (reweighting)

Future Work:

- Test on larger, more diverse datasets
- Add more protected attributes (age, race)
- Try advanced techniques (Disparate Impact Remover, adversarial debiasing)

THANK YOU!

www.reallygreatsite.com

Citations

- https://www.cdc.gov/heart-disease/data-research/facts-stats/index.html