Alleviating Bias In Trauma Patient Disposition Using Interpretable Machine Learning
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Understanding the Problem

- Difficulty of Prediction
- Heterogeneity of Problem
- Alleviating Bias

80,000 Penetrating Trauma Patients

800,000 Blunt Trauma Patients

More On Alleviating Bias

1. Patient subpopulation restricted to white and black/african american patients with penetrating trauma injuries
2. Post Acute Care referring to trauma rehabilitation centers
3. About 21.3% of white patients go to post acute care, whereas only 12% of black/african american patients do

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Objective To Achieve

- ML solution that has high predictive power (0.8 AUC), as well as being interpretable
- Prescriptive modeling pertaining to alleviating bias in subpopulations
- Visual tool to tackle disparities in patient subpopulations
- HTML applications that also encode for morbidity in patients

Methods & Considerations

Predictive Power

Robustness To Heterogeneity

Interpretability

Final Model Choice

Parameters

- OCTs
- Depth 10
- 5-fold cv

Predictors

- Morbidities
- Biostatistics
- Injury Severity

Impact

63K Penetrating Trauma patients correctly diagnosed with their original outcome of home or post acute care

656K Blunt Trauma patients correctly diagnosed with their original outcome of home or post acute care

4.5% Percentage of patients whose outcome could have been changed in an effort to alleviate bias

Exploratory Data Analysis

Shapley plots and feature coefficients to identify pertinent features in trauma patient disposition. Also used to inform weighted severity metric for the fairness adjustment model, where we rank the relative importance of varying severities of different injuries

Final Model Results

Penetrating Trauma AUC

Blunt Trauma AUC

Pre-Adjustment AUC

Post-Adjustment AUC

Av AUC Increase of 8%

In these trees, we purposely leave race in as a variable to visualize disparity in trauma disposition of patients. Predict positive here refers to flipping the outcome of a patient from home to post acute care and predict negative is the opposite. Notice how the predict positive percentages are markedly higher

Race Inclusive Trees

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