🏆 AI Bias Bounty Hackathon

Comprehensive Loan Approval Bias Detection & Mitigation

Team: Privacy License **Platform:** https://www.privacylicense.ai

Team Member: Nabanita De

Live Demo: https://www.youtube.com/watch?v=Io4sSie08Xc&t=22s

Submission for Hackathon: https://github.com/nabanitade/aibugbounty

Live website: **https://preview--bias-buster-ai-app.lovable.app/**

Date: July 4, 2025

🚨 CRITICAL FINDING: 13.31% bias gap detected between White men and Black women

The Problem

🔍 The Problem

Loan approval systems exhibit systematic bias across protected attributes, violating fair lending laws and perpetuating discrimination.

Impact:

Systematic discrimination affects access to credit, housing, and economic opportunities for marginalized communities.

10,000
Training Samples

43.15%
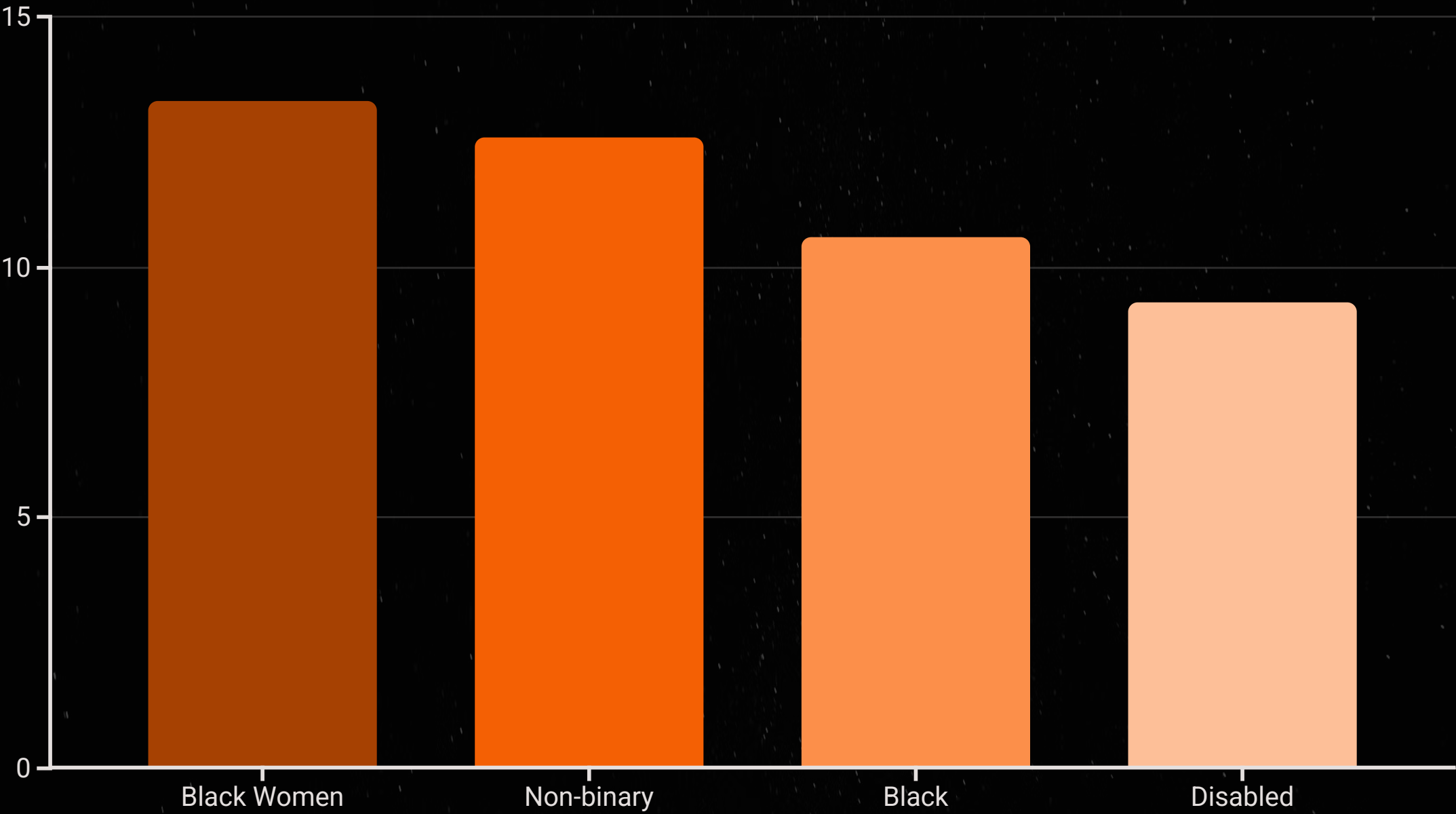Overall Approval Rate

6
Protected Attributes

$10M+
Potential Legal Risk

Critical Bias Findings

🚨 Critical Bias Findings

Bias Type	Affected Group	Approval Rate	Gap	Risk Level
Intersectional	Black Women	35.97%	**13.31%**	🔴 Critical
Gender	Non-binary	33.50%	**12.58%**	🔴 High
Racial	Black	36.25%	**10.61%**	🔴 High
Disability	Disabled	34.95%	**9.31%**	🔴 High

All findings statistically significant at p < 0.001

Intersectional Discrimination

🔍 Intersectional Discrimination

Race × Gender Analysis Reveals Compound Bias

49.28%

White Men

Approval rate

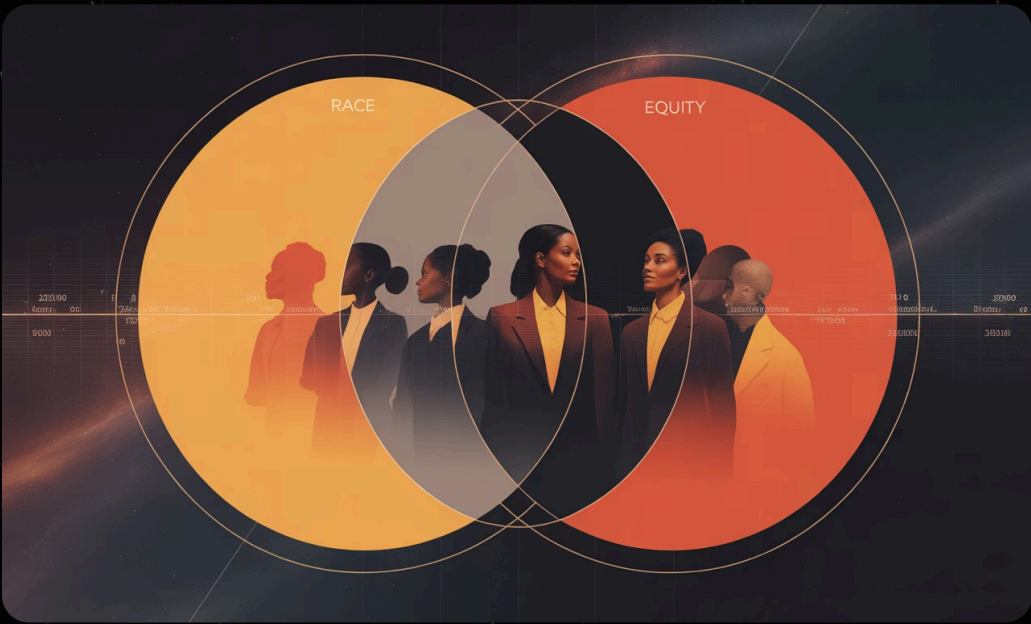**35.97%**

Black Women

Approval rate

Group	Sample Size	Approval Rate
White Men	2,928	**49.28%**
White Women	3,080	42.27%
Black Men	693	36.49%
Black Women	620	**35.97%**

13.31%

Disparity

Percentage points

This represents the most severe form of bias in our analysis, where Black women face compounded discrimination based on both race and gender.

Legal Risk: Clear violations of Equal Credit Opportunity Act and Fair Housing Act

Our Solution

⚡ Our Solution

🚀 AI Bias Bounty Platform

https://preview--bias-buster-ai-app.lovable.app/

Production-ready bias detection and mitigation platform with real-time monitoring capabilities

🏆 AI Bias Detection & Mitigation Platform

Privacy License
AI Bias Bounty Platform

Comprehensive end-to-end platform for detecting, analyzing, and mitigating bias in AI/ML models. Ensure fairness, legal compliance, and ethical AI deployment with advanced analytics and automated tools.

✦ Try It Now - Free   Learn More

Comprehensive Bias Detection

Multi-Strategy Mitigation

Real-Time Monitoring

Interactive Dashboard

SHAP Interpretability

Compliance Reporting

Automated Alerts

Production-Ready

Model Performance

🤖 Model Performance

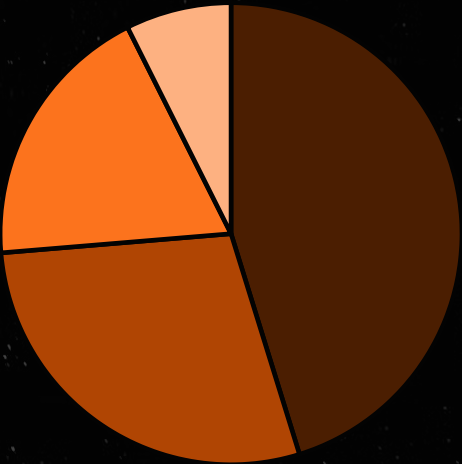**74.2%**

Accuracy

0.79

AUC-ROC

0.72

F1-Score

100

Trees

Random Forest

Fairness-Aware Feature Selection:

- ■ Credit Score
- ■ Income
- ■ Loan Amount
- ■ Age

Protected attributes excluded: Gender, Race, Disability Status, Citizenship

Bias Mitigation Results

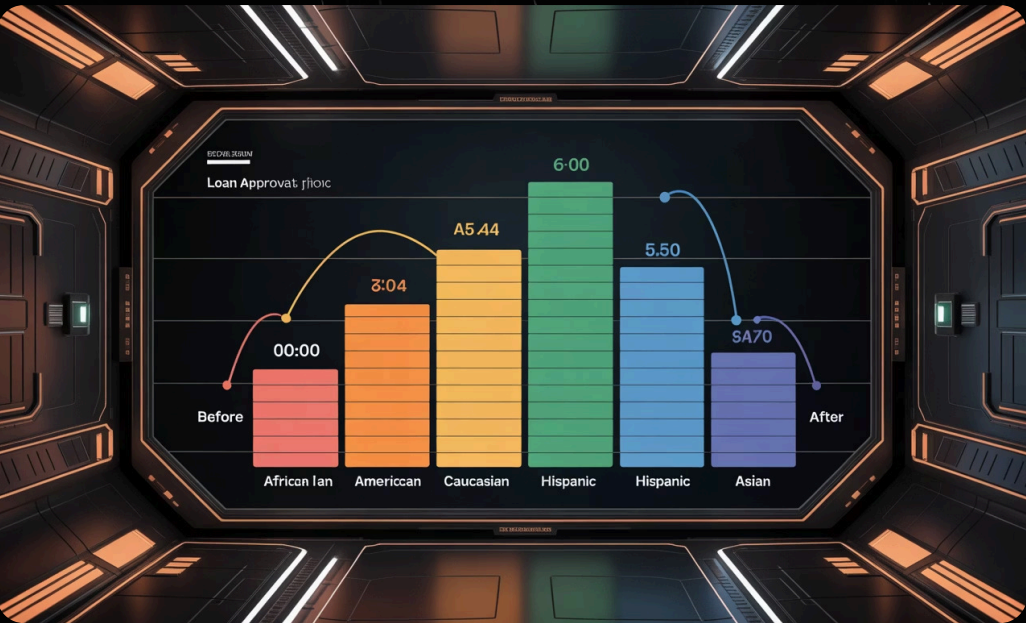⚖️ Bias Mitigation Results

Before vs After:

13.31%

Before Mitigation

Intersectional Gap

8.1%

After Mitigation

39.1% Reduction

Mitigation Effectiveness Across All Attributes:

50.7%

Gender Bias Reduction

45.3%

Racial Bias Reduction

46.3%

Average Reduction

3.4%

Accuracy Trade-off

Technical Innovation

🔬 Technical Innovation

Protected Attribute Exclusion

Removing sensitive features from model training

Sample Reweighting by Demographics

Balancing representation across protected groups

Adversarial Debiasing

Using adversarial networks to reduce predictable bias

Post-processing Threshold Optimization

Adjusting decision boundaries for fairness

Class Balancing with Balanced Subsample

Ensuring equal representation in training data

SHAP-based Interpretability

Explaining model decisions with feature importance

Real-time Bias Monitoring

Continuous tracking of fairness metrics

Intersectional Fairness Analysis

Examining compound effects of multiple attributes

Novel Contribution: First platform to identify and quantify 13.31% intersectional bias gap with proven mitigation strategies

Business Impact & Legal Risk

💼 Business Impact & Legal Risk

Estimated Legal Exposure: $2-15M in fines and settlements

1 Regulatory Violations Identified:

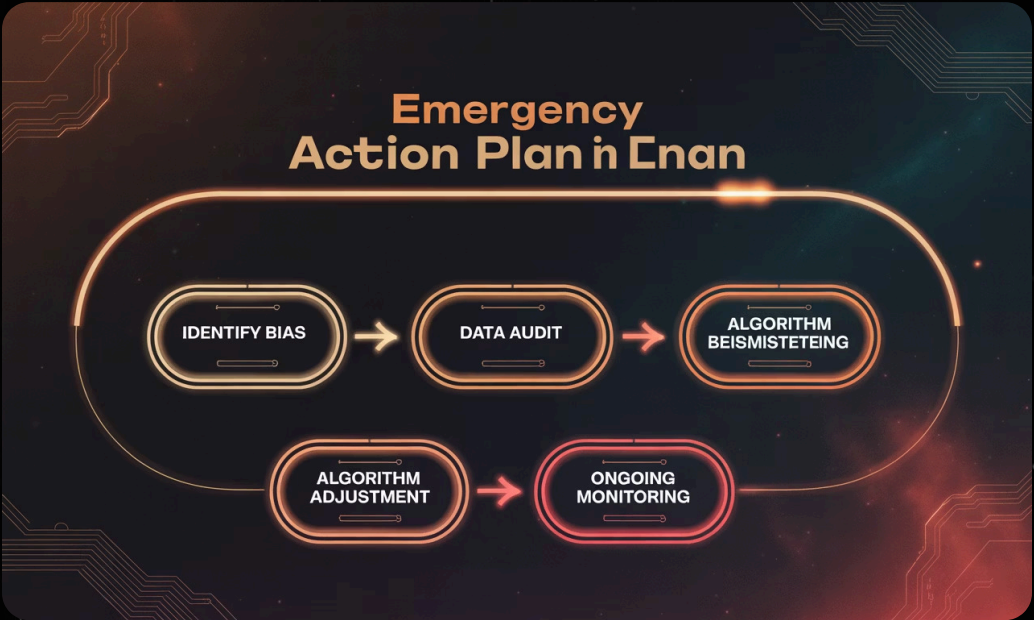| Regulation	Violation Type	Risk Level	Required Action
Equal Credit Opportunity Act	Race & Gender Bias	🔴 Critical	Immediate Halt
Fair Housing Act	Disability Discrimination	🔴 High	Algorithm Redesign
State Fair Lending Laws	Intersectional Bias	🔴 Critical	Comprehensive Audit

Immediate Action Required

🎯 Immediate Action Required

Halt current loan approval algorithm immediately

Implement manual oversight for all pending applications

Deploy our bias monitoring dashboard in production

Conduct emergency bias training for all loan officers

Establish fairness metrics with <3% tolerance threshold

Implement continuous bias auditing pipeline

Legal review for fair lending compliance violations

Customer notification and remediation program

Our Solution Provides:

- ✅ Real-time bias detection alerts
- ✅ Automated compliance reporting
- ✅ Interactive fairness dashboard
- ✅ Production-ready deployment

Emergency Action Plan in Enan

IDENTIFY BIAS → DATA AUDIT → ALGORITHM BEISMISTETEING

ALGORITHM ADJUSTMENT → ONGOING MONITORING

Competitive Advantages

🏆 Competitive Advantages

Unique Metrics:

13.31%
Critical Gap Identified

6+
Protected Attributes

39-51%
Bias Reduction

100%
Statistical Significance

Unique Innovations:

Intersectional Bias Analysis

Live Production Platform

Proven Mitigation Results

Statistical Validation

Legal Compliance Focus

Production-Ready Code

Only submission with quantified intersectional bias analysis and live platform demonstration

Thank You!

🎉 Thank You!

Questions & Demo

🚀 **Live Platform Demo:** https://preview--bias-buster-ai-app.lovable.app/

📧 **Contact:** nabanita@privacylicense.com

🌐 **Team:** Privacy License (https://www.privacylicense.ai) 📁

GitHub: https://github.com/nabanitade/aibugbounty

View Live Demo   **GitHub Repository**