

SMARTCLINICAL: INEQUITY-AWARE RESOURCE ALLOCATION MODEL

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ABOUT OUT PROJECT

THE PROBLEM



Overcrowded Hospital

THE SOLUTION



AI Dashboard

Problem

- Hospitals often face shortages of oxygen tanks, nurses, and other critical resources.
 - Deciding who receives care first raises major fairness and equity concerns.
 - Current allocation systems may increase mortality or unintentionally disadvantage certain patient groups.

Project Goal

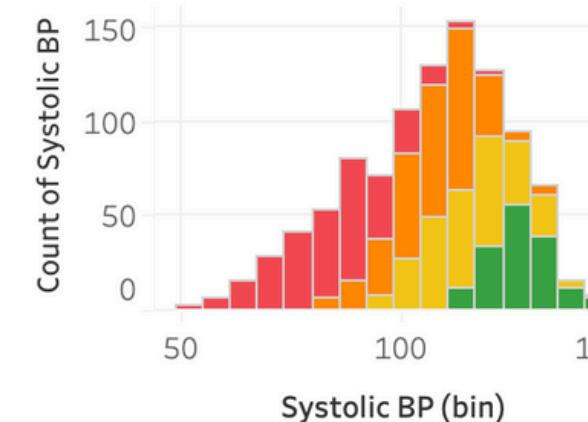
- Build a predictive, fairness-aware tool that identifies high-risk patients early.
 - Use micro-simulations and fairness algorithms to allocate limited resources more effectively.
 - Reduce mortality while ensuring equitable treatment across patient populations.

EXPLORATORY DATA ANALYSIS

Heart Rate Risk Distribution

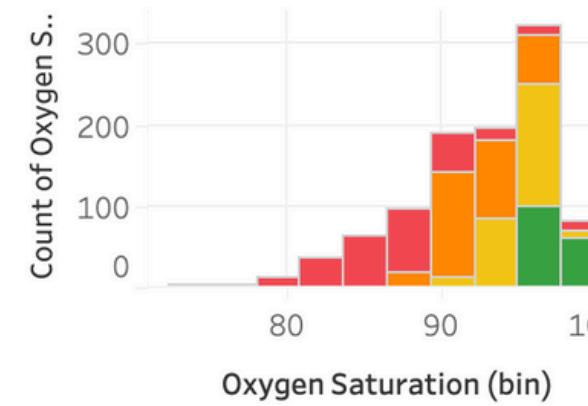


Systolic BP Risk Distribution

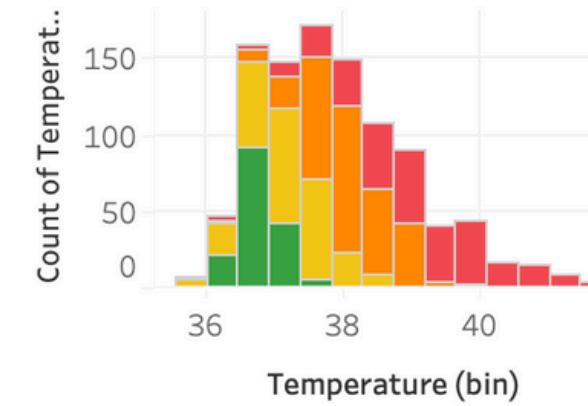


Risk Level
High (Red)
Medium (Orange)
Low (Yellow)
Normal (Green)

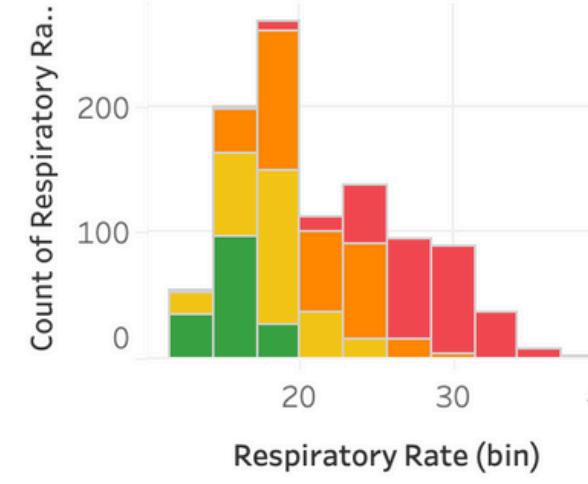
Oxygen Saturation Risk Distribution



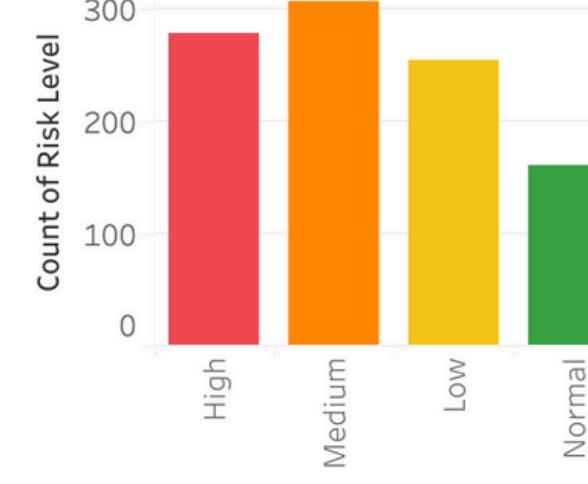
Temperature Risk Distribution



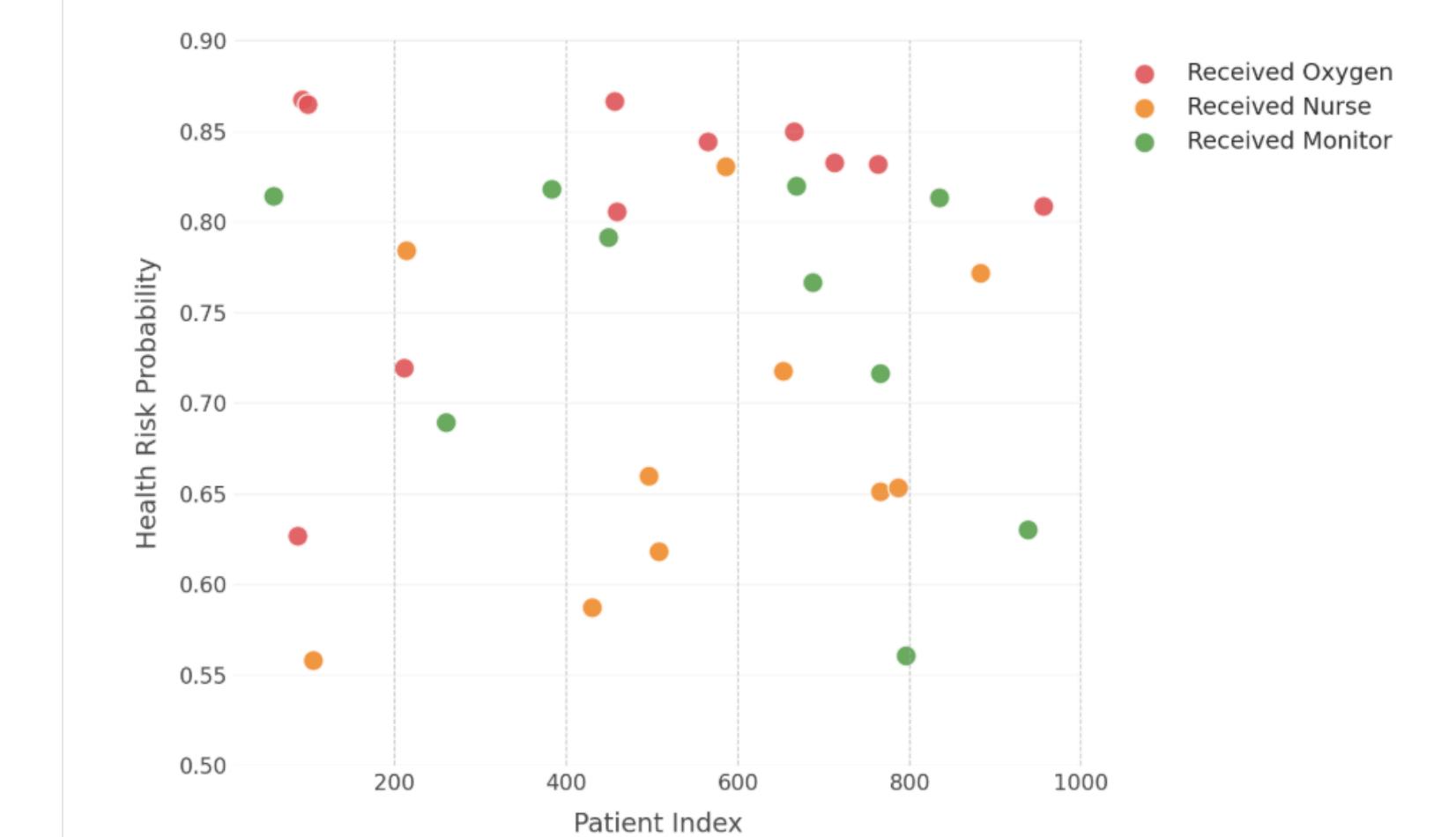
Respiratory Rate Risk Distribution



Risk Level Bar Graph



Resource Allocation for Patients at Risk



TECHNICAL METHODOLOGY

Backend

- Built Random Forest Classifier to predict if an individual is High, Medium, Low, or Normal Risk
- Coded optimization algorithm that determines patients to allocate resources to under user-defined resource constraints

95%
ACCURACY

5
OPTIMIZATION
POLICIES

OPTIMIZATION POLICIES

First Come-First Serve

- Sort by Patient ID to allocate resources to **earliest patients**
- Ignores **vitals and risks**, only prioritizing FCFS
- **Con:** Very simple and inequitable

High-Risk & Oxygen

- Oxygen tanks given to low oxygen, nurses given to highest risk, and monitors given to moderately risk
- Prioritizes moderately high-risk individuals

High-Risk

- Sorts by high risk probability and resources given to **highest risk** in order

Oxygen-first

- Sorts by **deviation from normal oxygen saturation**
- Ignores other vitals

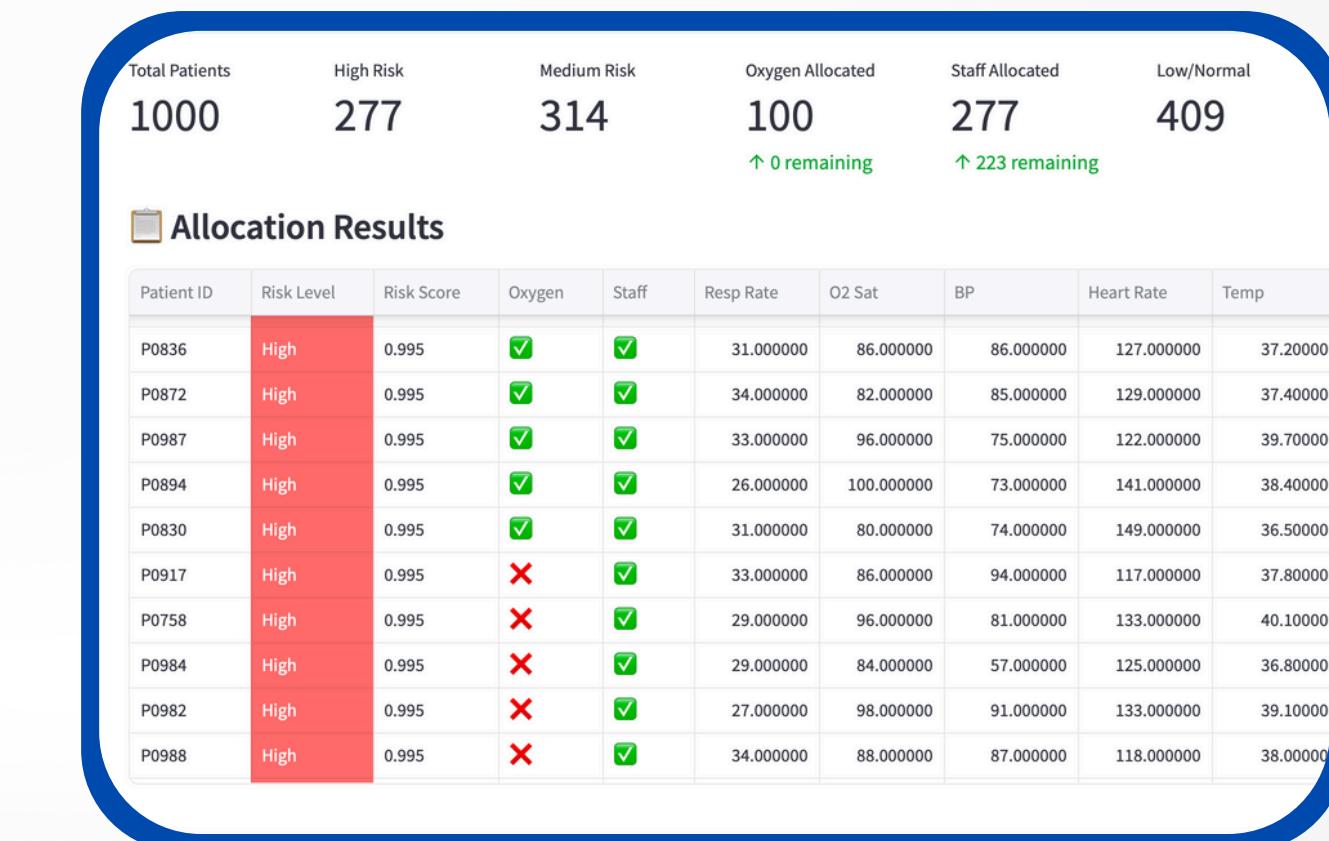
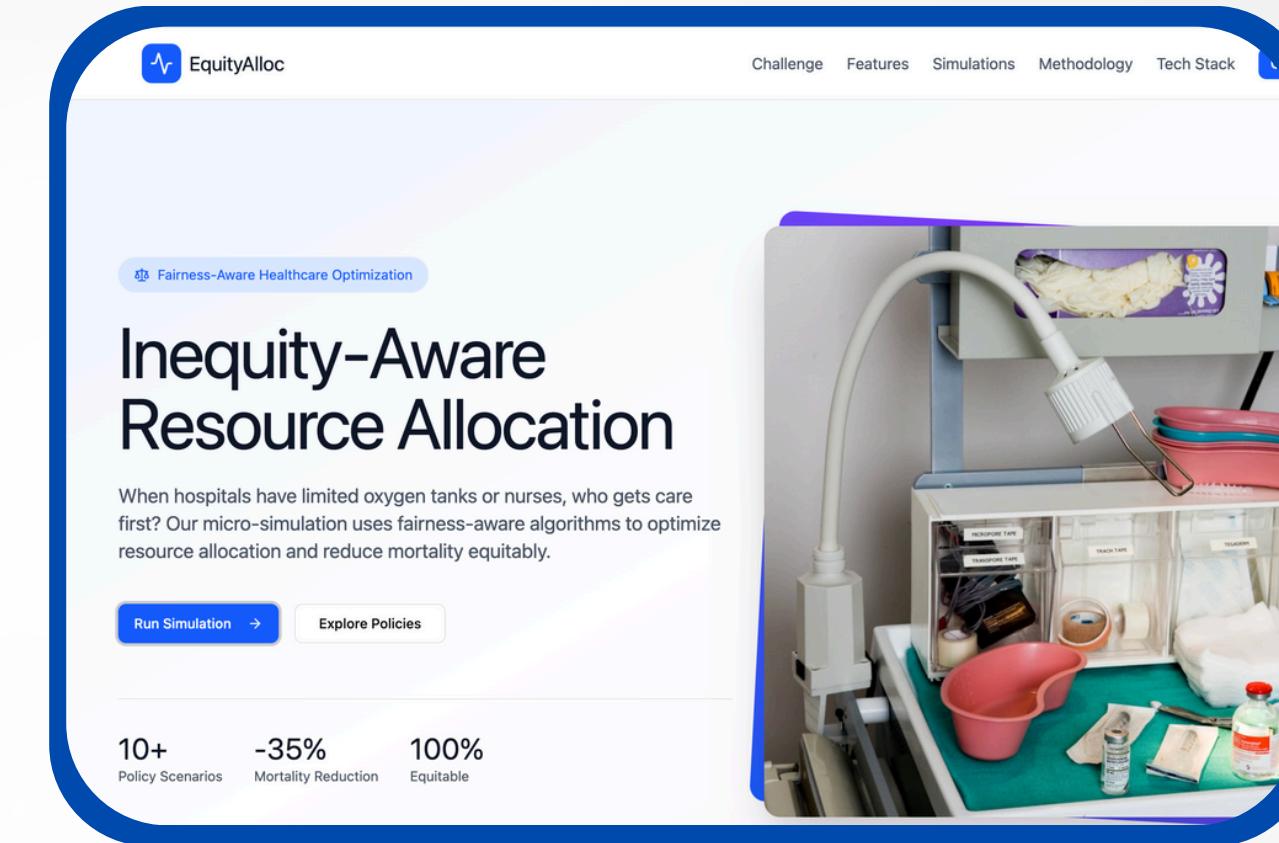
Fairness-based

- Patients **clustered** into resp. & circ. issues based on deviations of vitals from normal
- Each **cluster** sorted by health risk probability
- **Allocates equitably** but may not optimize health outcomes

TECHNICAL METHODOLOGY

Frontend

- Used Figma to design a landing page
- Used Streamline to build frontend that allows hospitals to input patient vitals and resources (oxygen units, staff members, and monitors)



Figma Landing Page

- Intro to the website
- Make the tool intuitive for clinicians

Allocation Results Dashboard

- Rows per patient
- Risk level
- Contains what resources we need

DEMO

SOCIAL GOOD **IMPACT**

IMPROVING STAFF EFFICIENCY

Automated allocation **increases efficiency and load** on internal administration, allowing staff to **visualize prioritization of patients** instead of administrative triage decisions.

EQUITY IN HEALTHCARE ACCESS

Our system uses **objective data** (vitals and risk prediction) to ensure that resources go first to those who need them most, **reducing preventable deaths** and ensuring fair access to care regardless of socioeconomic or demographic factors



THANK YOU!