

Assignment 4: User Interface for ML Models

CS698H – Human-Centered AI

IIT Kanpur

Project Title: Absenteeism Risk Prediction Dashboard

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1 Overview and Motivation

Employee absenteeism can impact productivity, morale, and workforce planning. Predicting absenteeism helps HR teams take proactive measures to support employees rather than penalize them. This project presents a **Human-Centered Absenteeism Risk Dashboard** that enables HR managers or team leaders to assess absenteeism risk for employees based on relevant features such as age, education, service time, and work habits.

The dashboard combines:

- A trained **Machine Learning model (Logistic Regression + Fairness Mitigation)** hosted on **Render (FastAPI backend)**.
- A user-friendly **Streamlit front-end** hosted on **Hugging Face Spaces**.

It aims to make AI predictions **interpretable, fair, and responsible** for non-technical HR professionals.

2 Target User and Use Context

Target User: HR analysts or managers in an organization who monitor employee attendance and wish to identify patterns leading to absenteeism.

Usage Context:

- HR managers enter employee details such as education, service time, or drinking/smoking habits.
- The system predicts the probability of absenteeism.
- HR uses this insight to initiate support or policy measures.

The goal is not punishment but **proactive well-being support**, ensuring fairness and transparency.

3 System Design

3.1 Architecture

The system consists of two connected components:

- **Backend:** A FastAPI server hosted on Render.
 - Loads trained model and preprocessor pipeline.
 - Handles prediction and returns explanations.
 - Provides model info and fairness metrics.
- **Frontend:** A Streamlit web app hosted on Hugging Face.
 - Simple, human-readable interface for non-technical HR staff.
 - Sends input data to backend and displays results with clear labels.
 - Emphasizes interpretability over technical complexity.

Links: *Note: Before using the frontend, ensure the backend is live and upon clicking on which wait until you see something like something like: `{"detail": "Not Found"}` Only then open the frontend (Hugging Face link). For deployment, step-by-step instructions are provided clearly in the README file in the GitHub repository.*

- Backend (FastAPI): <https://absenteeism-fairness-a3-1.onrender.com>
 - Frontend (Streamlit UI): <https://huggingface.co/spaces/chukey7277/absenteeism-fairness-ui>
 - GitHub Repository: <https://github.com/Chukey7277/absenteeism-fairness-a3>
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3.2 Features and Input Design

The input section was designed for HR users using simple dropdowns and radio buttons. Technical column names were replaced with descriptive text:

- Reason for absence → e.g., Injury, Illness, Consultation
- Education → High school, Graduate, Postgraduate, PhD
- Season → Summer, Autumn, Winter, Spring
- Social habits → Smoker / Drinker (Yes/No)

Default average values are used for non-user-facing features (e.g., workload, transportation cost) to simplify interaction.

3.3 Prediction Display and Explanation

After submitting, the system shows:

- **Predicted Absenteeism Risk:** High or Low
- **Probability:** e.g., “High Risk — 82% probability”
- **Top Influencing Factors:** Up/down arrows showing feature impact

A clear color scheme communicates outcomes:

- Red = High Risk (needs HR attention)
 - Green = Low Risk (stable attendance)
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4 Fairness and Transparency

The model was trained with fairness-aware preprocessing to ensure balanced outcomes across groups. Protected attribute considered: **Age** (≥ 40 years). *Applied mitigation techniques :*

Feature removal: Age excluded from model inputs.

Reweighting: Adjusted training samples to reduce bias.

Calibration: Balanced decision threshold (0.48).

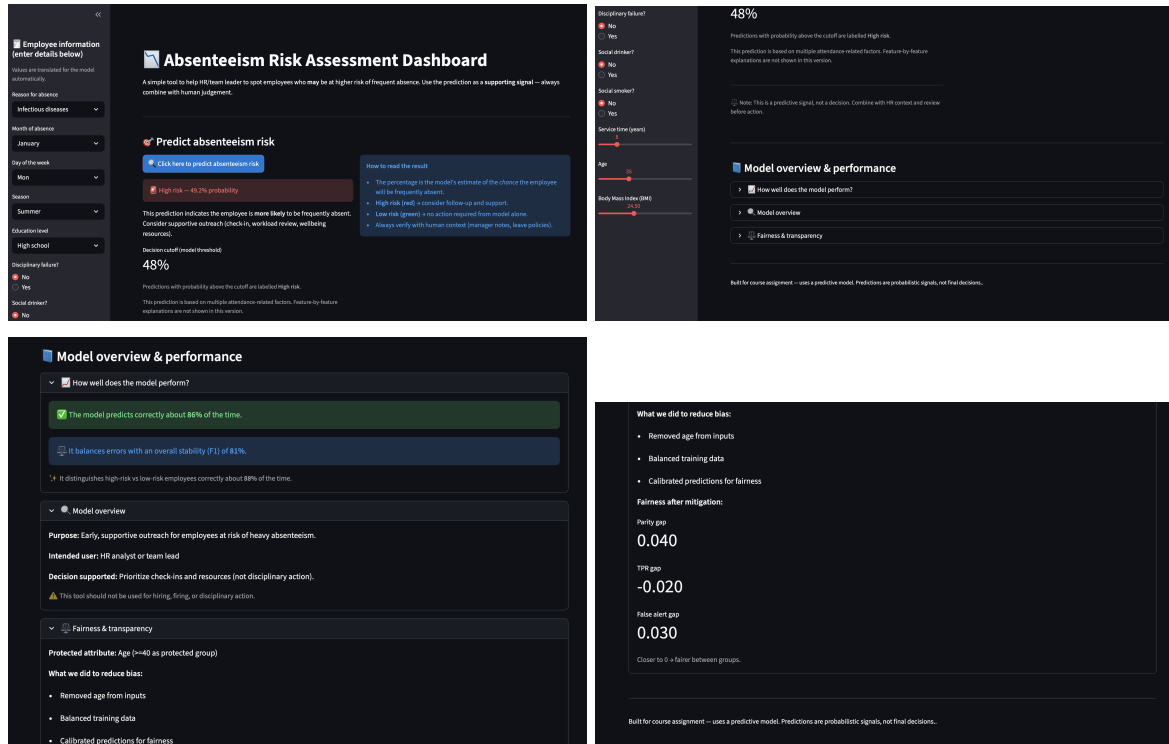


Figure 1: User interface showing: input form, prediction output, fairness information, and model usage guidance.

Displayed fairness indicators in the interface include:

- Statistical Parity Difference (SPD)
- Equal Opportunity Difference (EOD)
- False Positive Rate Difference (FPR)

The interface explains that fairness metrics closer to zero indicate more equitable performance.

5 Evaluation Using HAX Principles

The dashboard was evaluated using the Microsoft **Human-AI eXperience (HAX)** principles.

5.1 HAX Evaluation Summary

Principle	How Addressed in Design
Make clear what the system can do	The landing page explains that the tool predicts absenteeism risk and not employee behavior or performance.
Show how well the system can do	Displays probability and threshold for transparency; fairness metrics are also shown.
Clarify scope and limitations	Expander sections describe data sources, assumptions, and ethical boundaries (“not for hiring/firing”).
Support efficient correction	HR can adjust input features (e.g., age, workload) to simulate different scenarios.
Encourage appropriate trust	Uses color-coded, natural-language explanations instead of raw numbers.
Show contextually relevant explanations	Displays top contributing features with visual indicators (↑/↓).
Support graceful failure	If model info or explanations are missing, the system shows fallback messages instead of errors.

6 Conclusion

This project demonstrates how to design a **responsible, fair, and interpretable AI system** for HR decision support. The interface communicates predictions clearly, uses human-friendly terminology, and presents fairness information transparently. It aligns closely with HAX principles by supporting **understanding, trust, and responsible use** of AI.

Future Improvements:

- Include trend-based absenteeism visualization over time.
- Provide more granular fairness analytics for different age and education groups.
- Integrate feedback loop for HR to report incorrect predictions.

7 Appendix: Deployment Links

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