Freie Universität Berlin

Human Centered Data Science SS 2024

Design & Implementation of an Explanation Interface for Maternal Health Care

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About the Project

- **Goal:** Create a comprehensive explanation interface using the techniques learned in class to help our target audience make informed decisions on maternal health.
- **Target Audience**: Medical staff in a maternity hospital, who work in the triage process in the emergency.

An expectant woman arrives in the emergency with symptoms of high blood pressure.

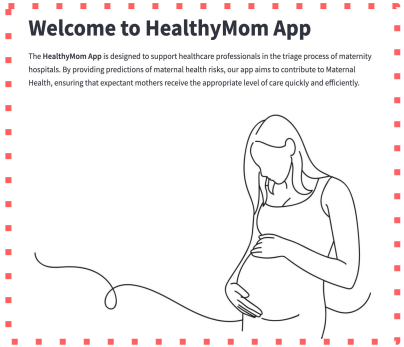
Many other expectant woman are in the waiting room.

How to determine the urgency of treatment for each patient?

How can we approach this problem?

About the Project

Our approach: integrate a **health risk classification App** in the emergency to ensure that mothers receive the **appropriate level of care** quickly and efficiently.



Health data collected → Data entered into the app → App used for health risk assessment and explainability → Priority defined and expectant mothers treated

The Dataset

Maternal Health Risk Dataset

- Patient health data was collected using wearable sensor devices, and risk levels were classified with the help of medical experts and literature review.

Attribute Name	Role	Type	Description	Missing Values
Age	Feature	Integer	Any ages in years when a women during pregnant.	no
SystolicBP	Feature	Integer	Upper value of Blood Pressure in mmHg, another significant attribute during pregnar	no
DiastolicBP	Feature	Integer	Lower value of Blood Pressure in mmHg, another significant attribute during pregnar	no
BS	Feature	Integer	Blood glucose levels is in terms of a molar concentration (mmol/L)	no
BodyTemp	Feature	Integer	Body Temperature (F)	no
HeartRate	Feature	Integer	A normal resting heart rate (bpm)	no
RiskLevel	Target	Categorical	Predicted Risk Intensity Level during pregnancy considering the previous attribute.	no

Ahmed, Marzia et al. “Review and Analysis of Risk Factor of Maternal Health in Remote Area Using the Internet of Things (IoT).” (2020).

Main Questions

#1
How each feature contributed to the prediction of the mother_id 31?

#2
How would the prediction change if we change the feature inputs for the mother_id 31?

#3
How was the data collected?

#4
What are the main features of the classification model?

#5
What is the uncertainty in the prediction?

App Page Structure

Home
Welcomes users and describes the app's purpose.

Individual Prediction
Allows user to select a mother ID and view the health risk prediction.

Prediction Simulator
Enables users to modify input feature values and observe how predictions change

About the Dataset
Provides comprehensive information about the dataset, including data collection, labeling, and attribute distribution.

About the Model
Offers details about the model used and its performance, intended for both medical staff and data scientists.

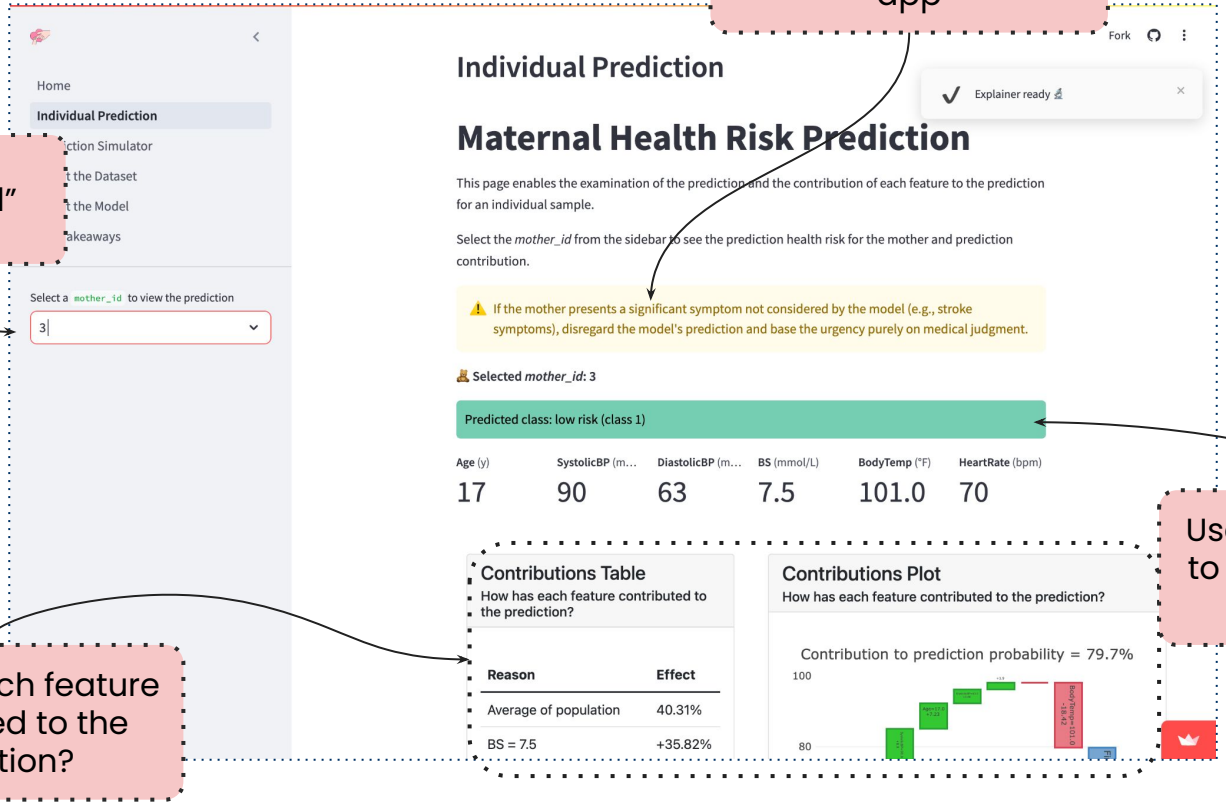
Key Takeaways
Summarizes our reflections on appropriate and inappropriate use cases for the model.

Key Design Choices

Key Design Choices

Important warning of when NOT to use the app

"Select mother_id"



Use traffic light colors to highlight main info (health risk)

How has each feature contributed to the prediction?

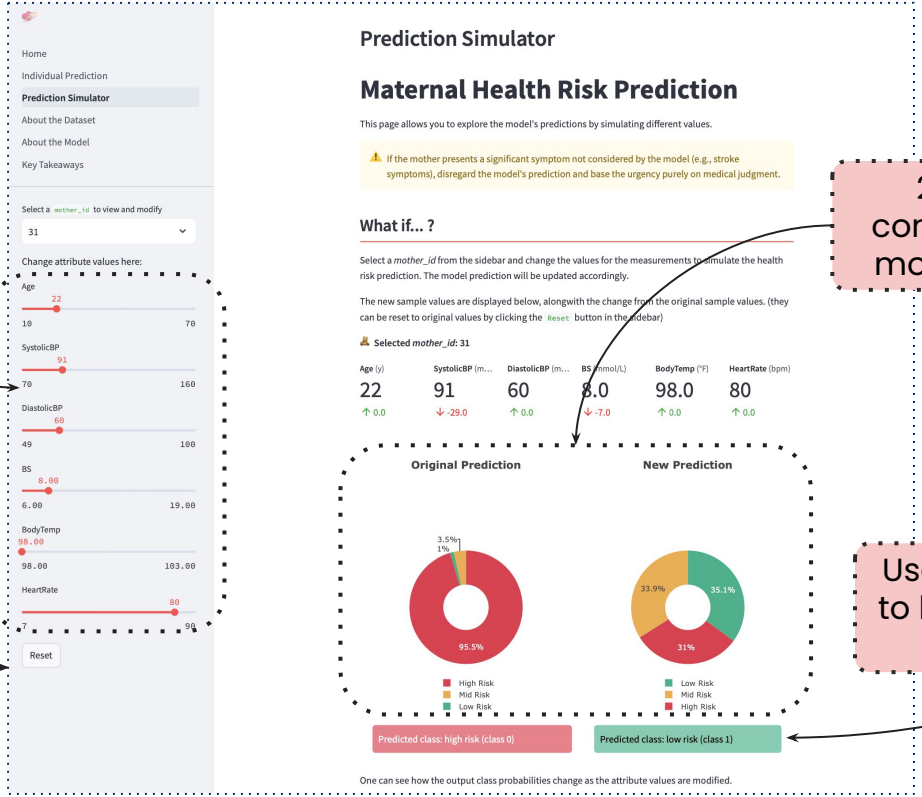
Key Design Choices

Select bars on the sidebar to change the input features

Reset button to return to original values

2 Pie Charts to compare original vs modified prediction

Use traffic light colors to highlight the health risk

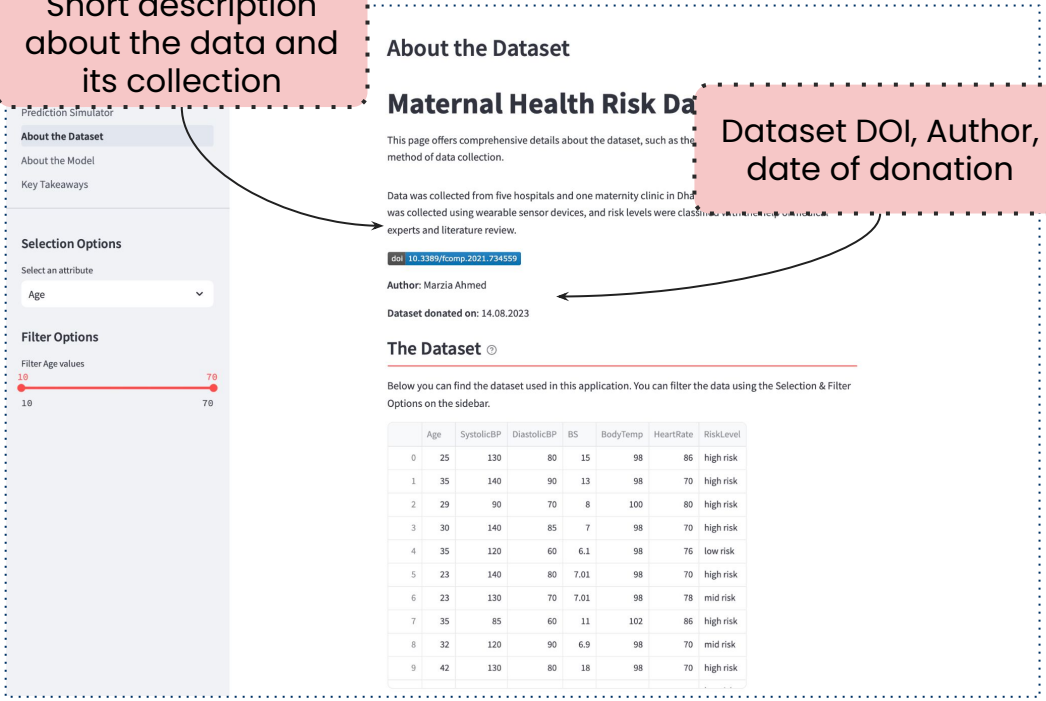


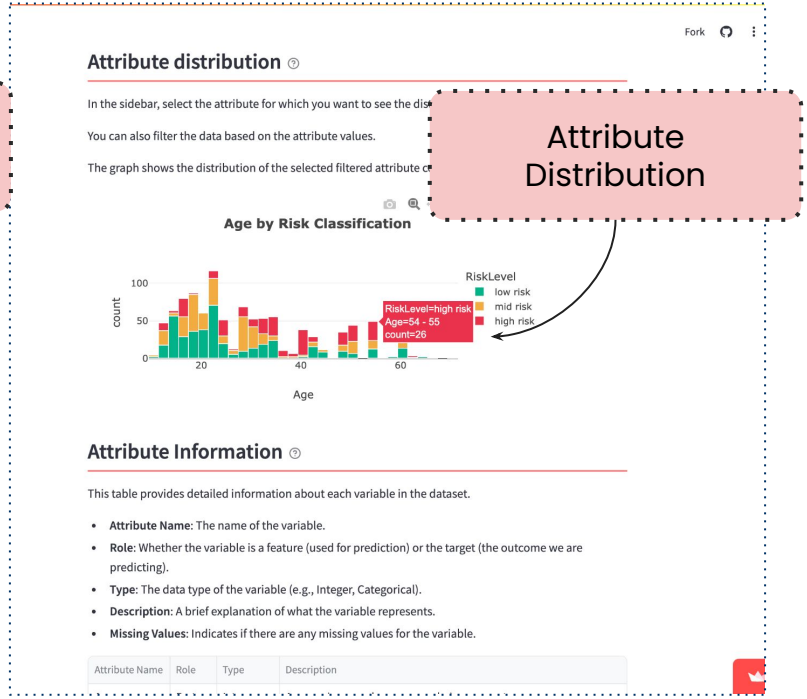
Key Design Choices

Short description about the data and its collection

Dataset DOI, Author, date of donation

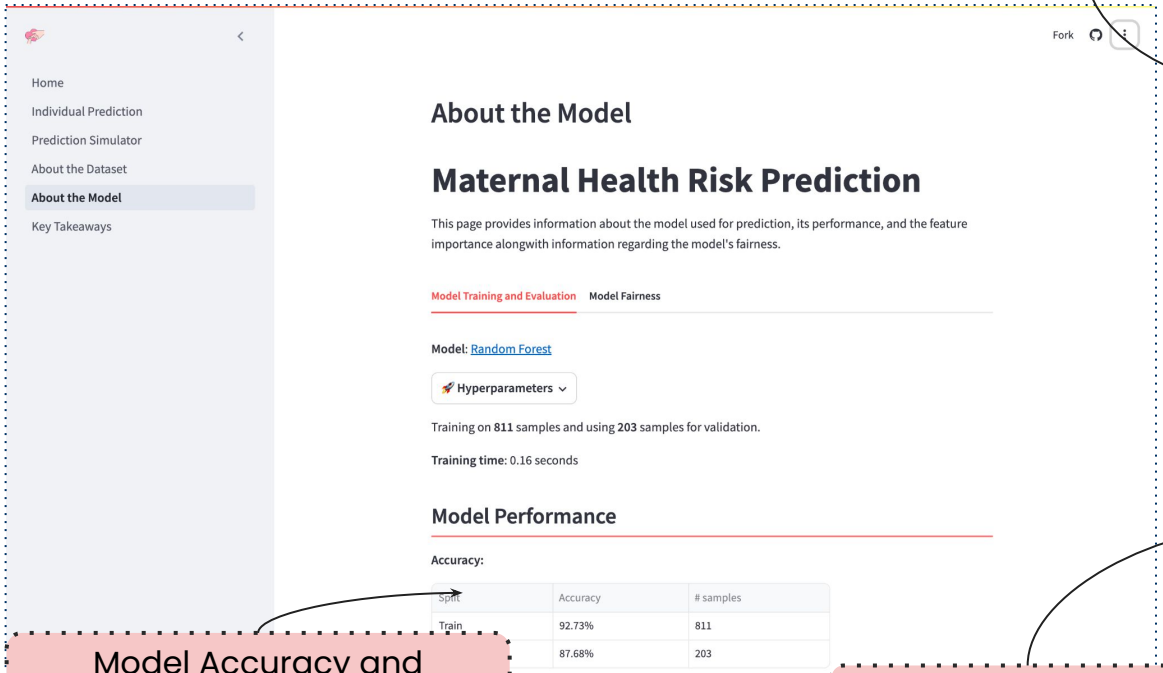
Attribute Distribution



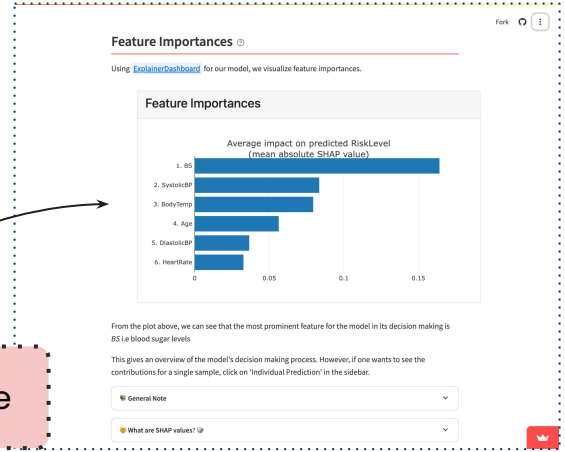


Key Design Choices

Confusion Matrix

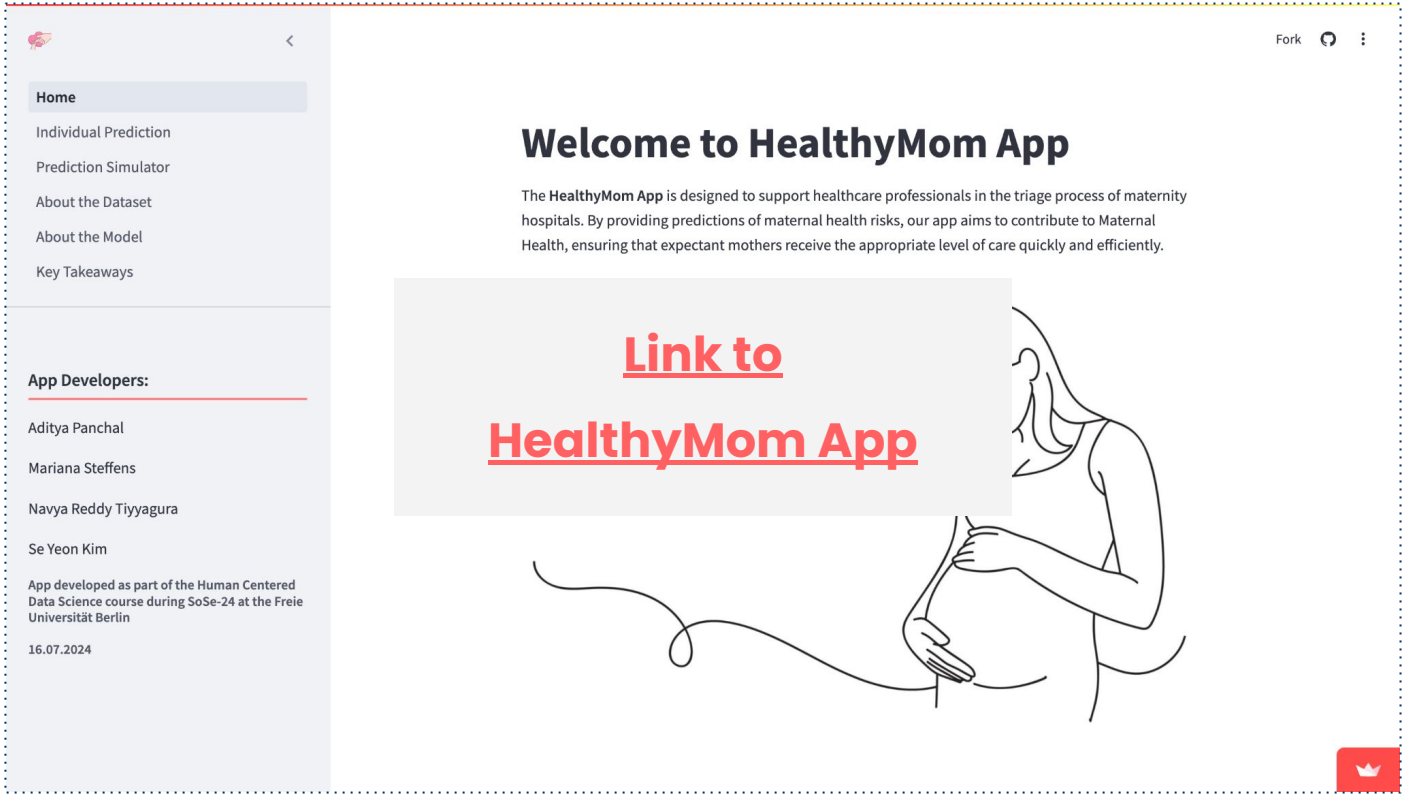


Model Accuracy and number of samples used for training / test



Feature Importance

Live Demo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About the Model
Key Takeaways
App Developers:
Aditya Panchal
Mariana Steffens
Navya Reddy Tiyyagura
Se Yeon Kim
App developed as part of the Human Centered Data Science course during SoSe-24 at the Freie Universität Berlin
16.07.2024
Fork
Welcome to HealthyMom App
The HealthyMom App is designed to support healthcare professionals in the triage process of maternity hospitals. By providing predictions of maternal health risks, our app aims to contribute to Maternal Health, ensuring that expectant mothers receive the appropriate level of care quickly and efficiently.
Link to
HealthyMom App

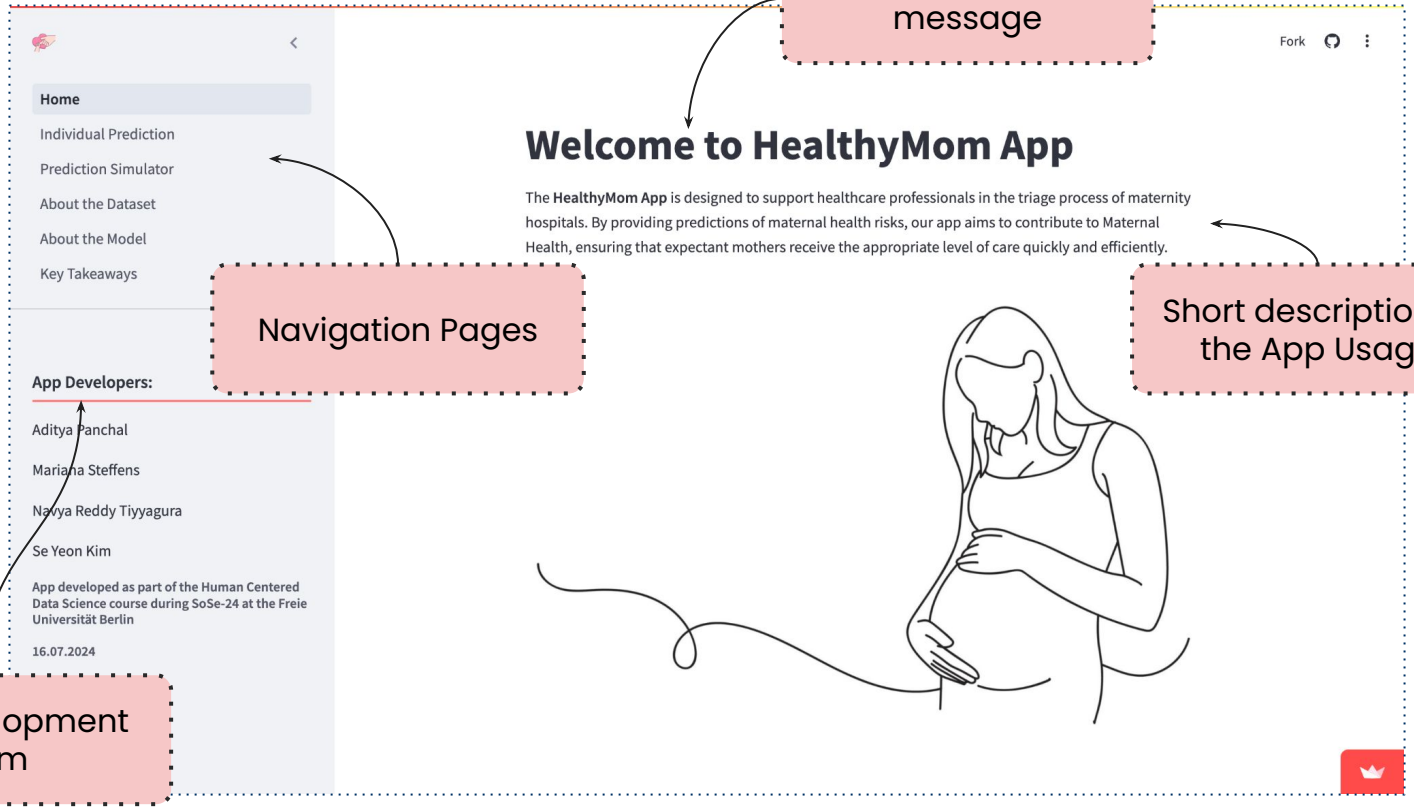
Discussion

- Reflection on ethical aspects of data science practice.
- Reflection on the design process of a explainability user interface.
- User Think Aloud test was essential to identify problems on the app.
- Limitations of the app.

Backup Slides

Pages with more details on Design Choices

Key Design Choices



Key Design Choices

Important warning of when NOT to use the app

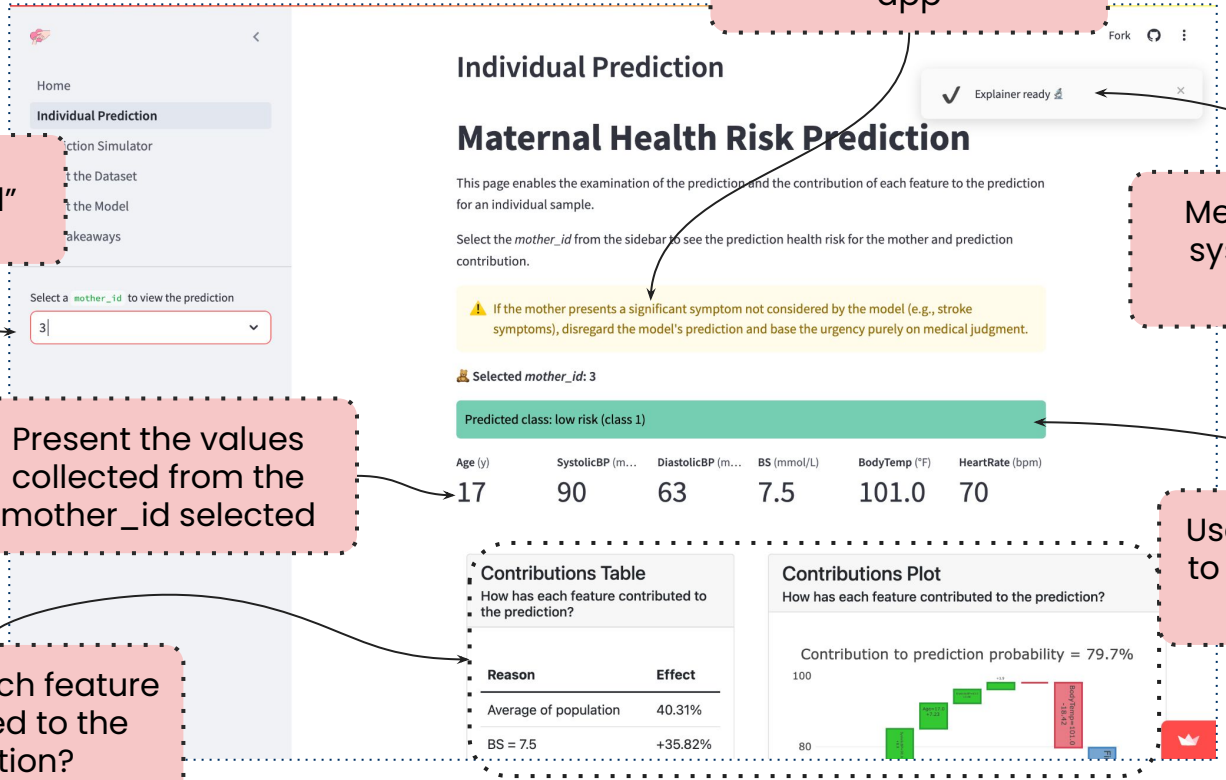
"Select mother_id"

Message from the system "Explainer ready"

Present the values collected from the mother_id selected

Use traffic light colors to highlight main info (health risk)

How has each feature contributed to the prediction?



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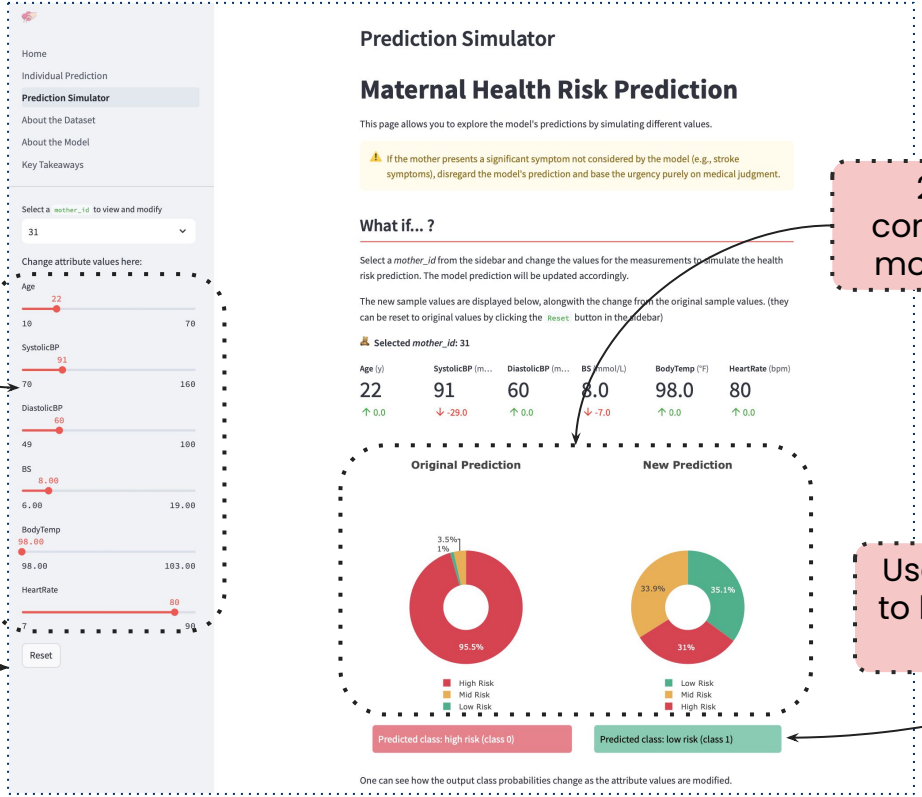


Key Design Choices

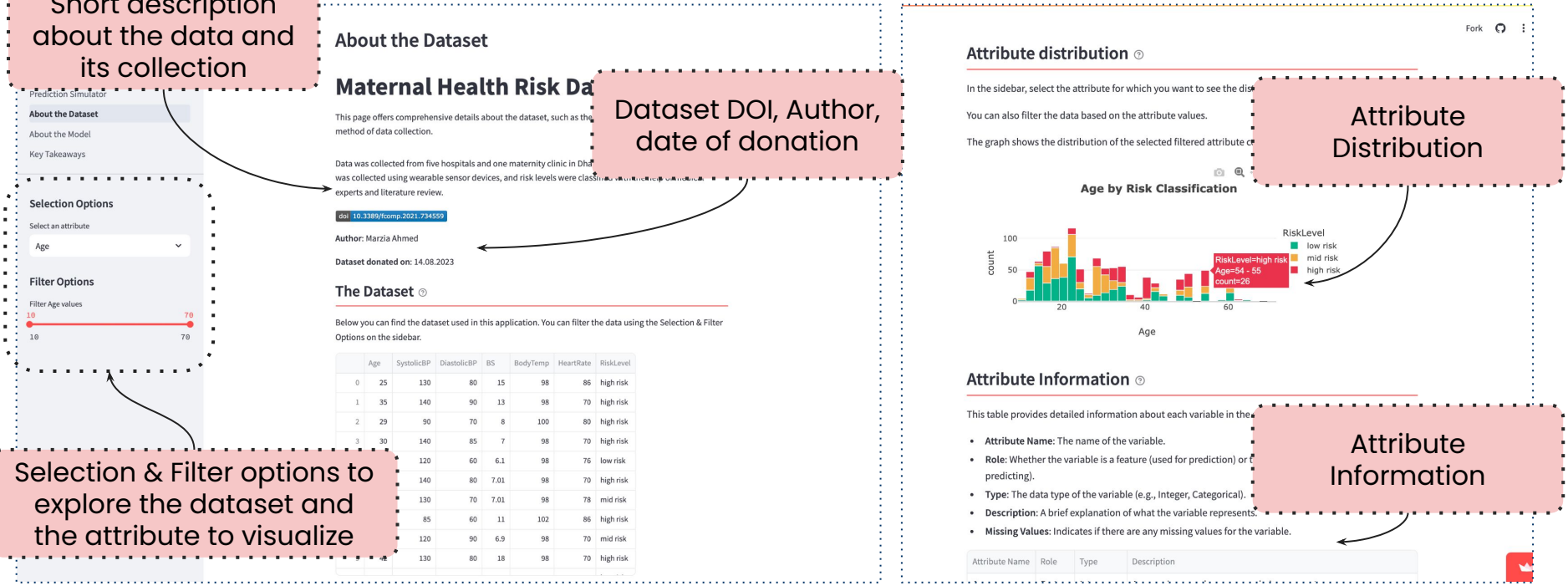
Short description about the data and its collection

Selection & Filter options to explore the dataset and the attribute to visualize

Dataset DOI, Author, date of donation

Attribute Distribution

Attribute Information



Key Design Choices

Confusion Matrix

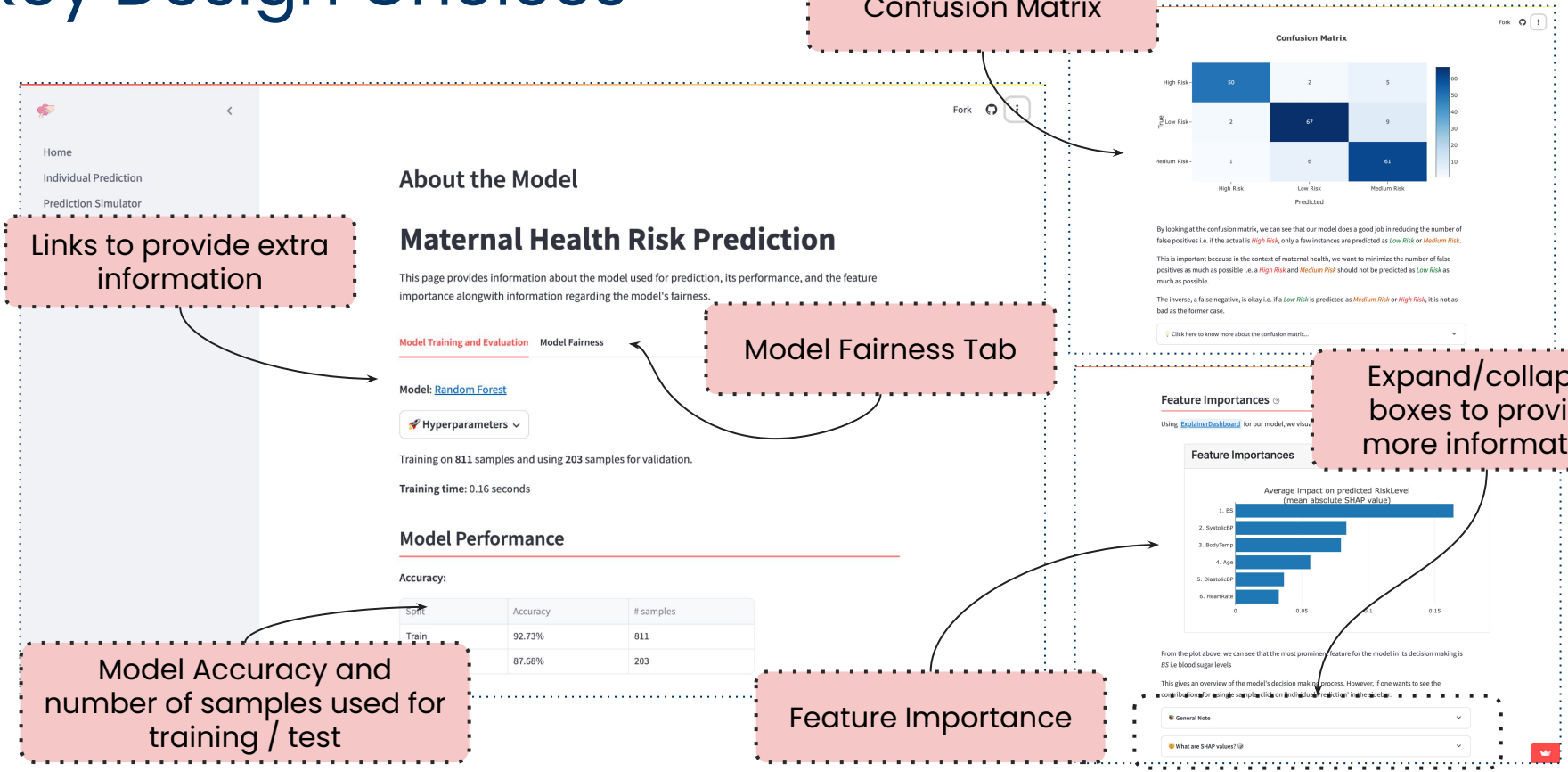
Links to provide extra information

Model Fairness Tab

Expand/collapse boxes to provide more information

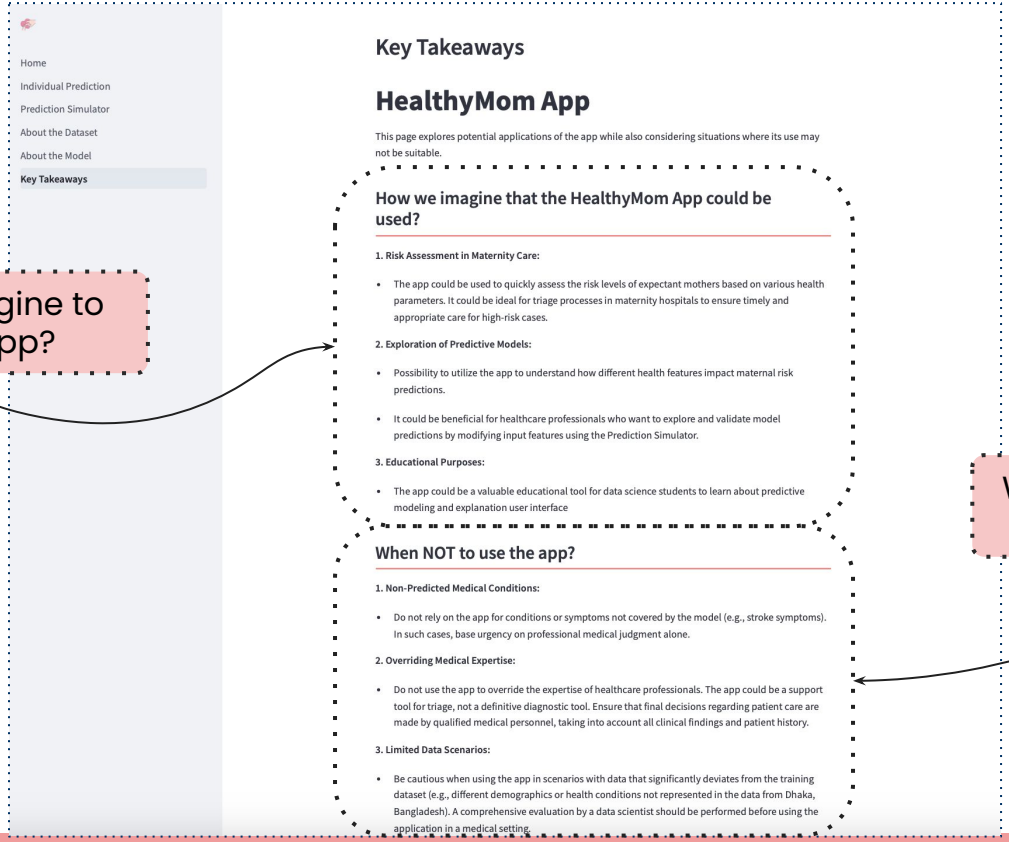
Model Accuracy and number of samples used for training / test

Feature Importance



Key Design Choices

How we imagine to use the app?



When NOT to use the app?