A SMART RECOMMENDER-BASED HEART ATTACK WARNING SYSTEM

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INTRODUCTION

According to Statistics Canada, heart diseases are a significant cause of death and illness with 53,704 heart diseases in Canada in 2020 alone. Early detection and treatment of these potentially life-threatening conditions can help save lives and prevent long-term disabilities

THE METHODOLOGY

We developed an automated smart recommender system using Explainable Artificial Intelligence (AI) for heart attack prediction. We focused on a novel recommender approach to identify key risk factors impacting risk stratification for a particular patient. We used CatBoost Classifier to build the model and SHAP to interpret its results. The system collects both dynamic and static risk factors to predict a heart attack risk. We created an online application that uses the Patient Data object to update patient conditions about critical patient heart attack risk.

13 heart attack risk factors that were used: age, gender, chest pain type, resting blood pressure, cholesterol, fasting blood sugar, resting electrocardiographic result, maximum heart rate achieved, exercise-induced angina, ST depression induced by exercise relative to rest, number of major vessels and thalassemia
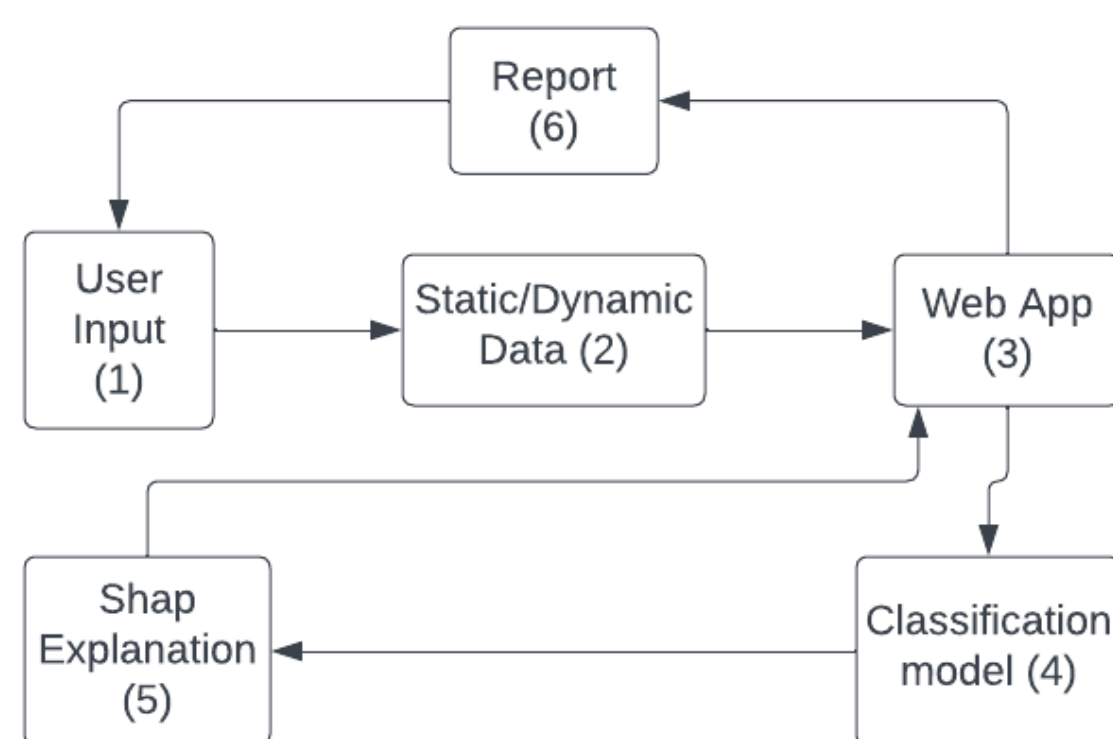
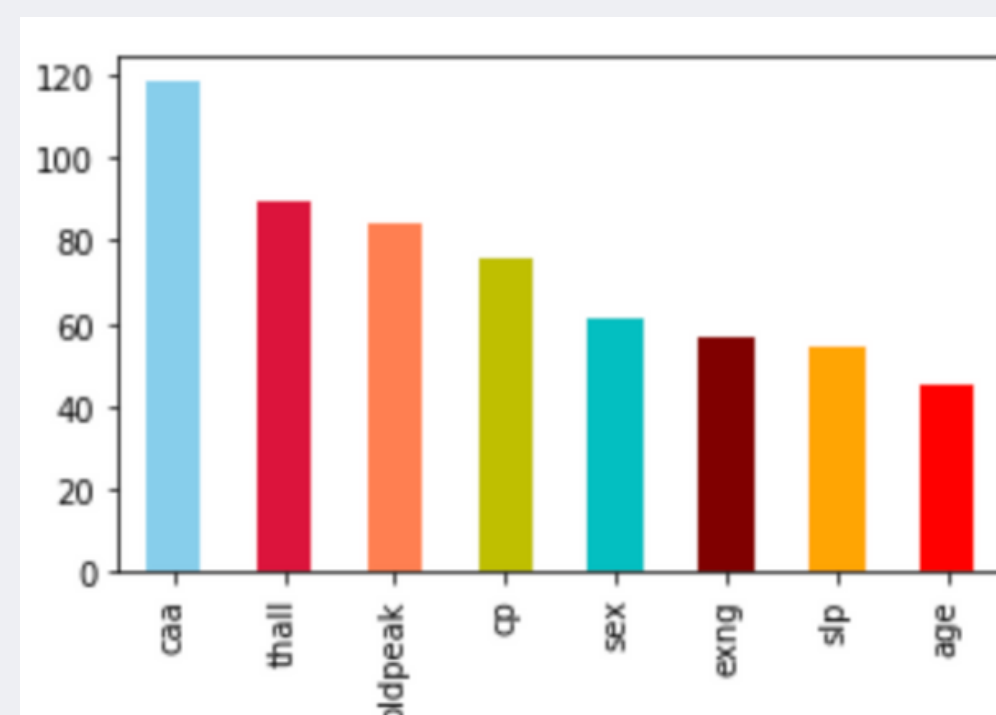

Recommender System flow chart

RESULTS

Model evaluation:

The classification model had an average AUC of 0.87, a Cohen Kappa score of 0.705, and a weighted average f1 score of 0.85.
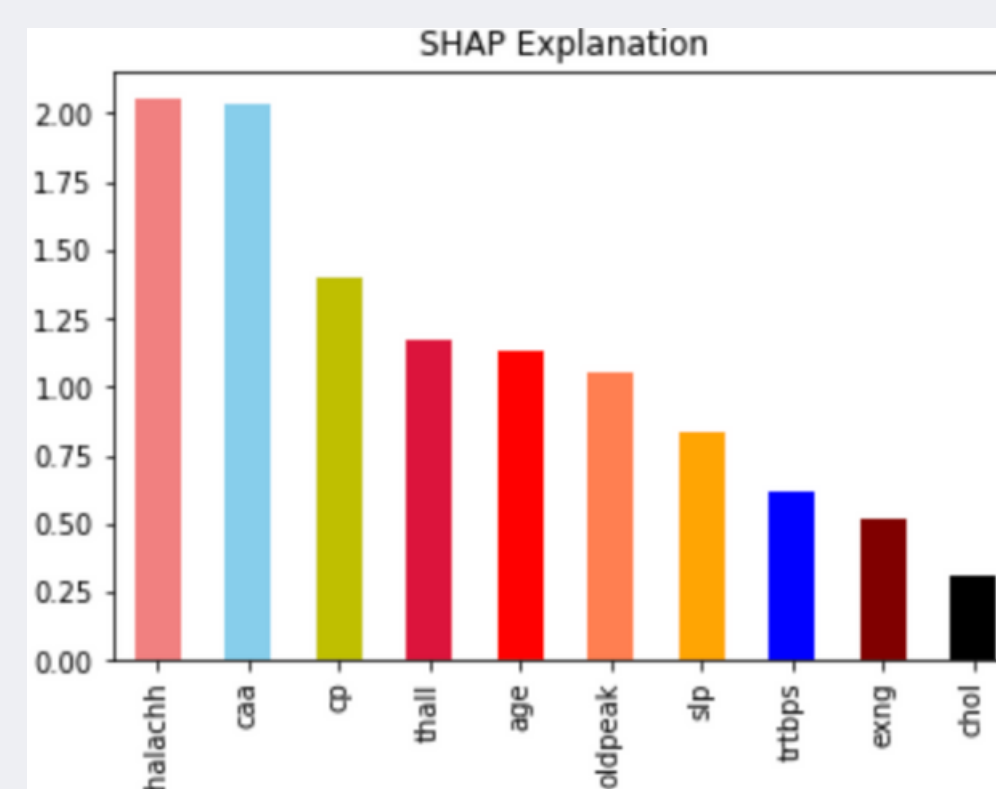
Global explanation:

Ranking risk factors for the whole patient in the dataset. The bars show how each risk factor contributes to the final prediction for the whole dataset

Local explanation:

Ranking risk factors for the whole patient in the dataset. The bar shows how each risk factor contributes to the final prediction for specific patient

CONCLUSION

Through this research project, we created a system that can help clinicians significantly predict heart attack risk in patients. We created a web application that can employ the recommender system machine learning model that we created to predict heart attack risk levels and rank them and display them to the users in an interactive interface thereby this system can help decrease the mortality caused by heart attack

The smart recommender-based heart attack warning system can be used by both clinicians and patients to predict heart stroke risk and identify patient-specific risk factors.