

# Stroke Risk Stratification and Prevention Using Machine Learning and Explainable AI

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## Objective

Develop an explainable AI (XAI) model capable of providing recommendations with an F1 score of at least 0.85.

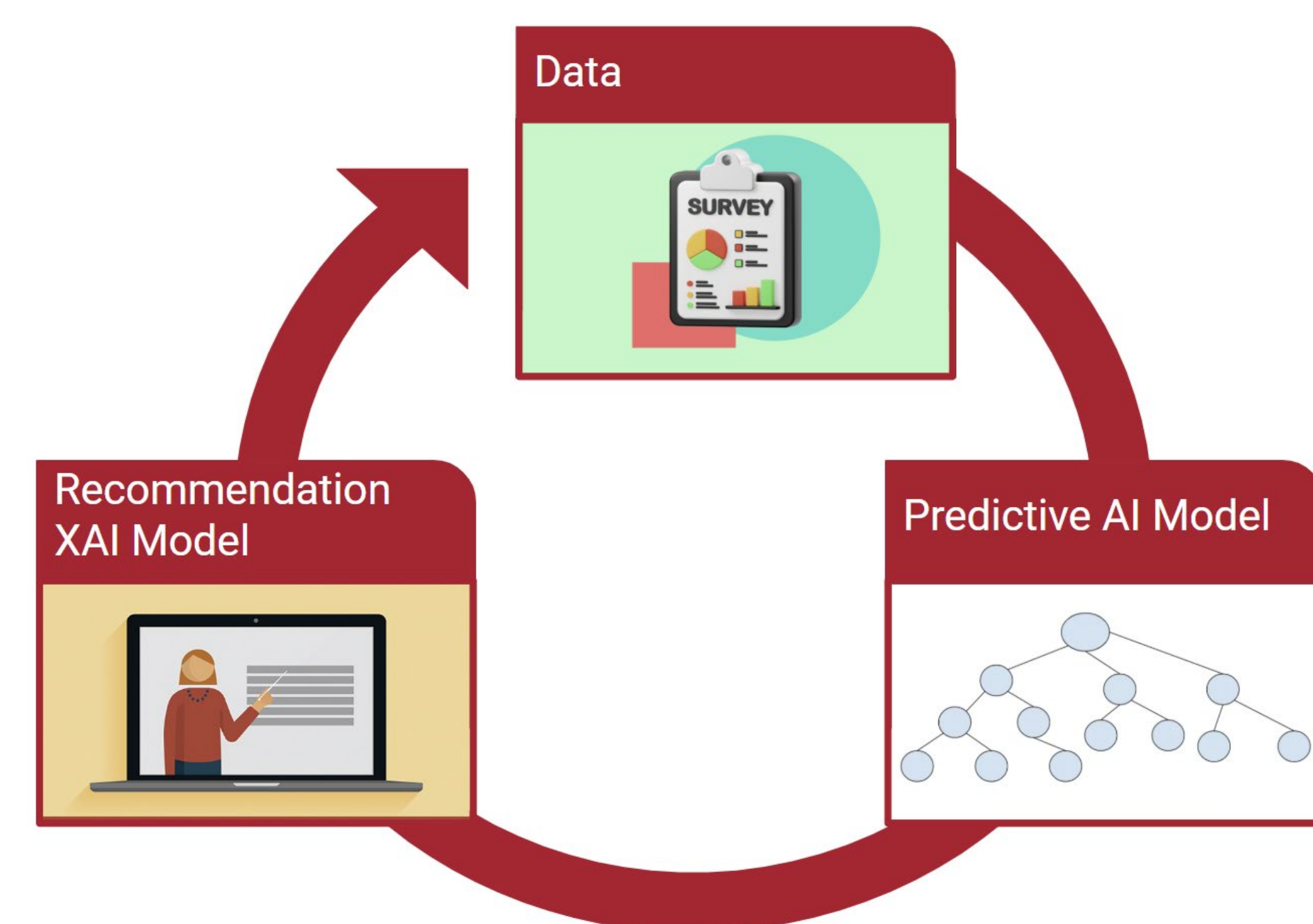
## Background

Problem: Stroke is the 5<sup>th</sup> leading cause of death in the US, but up to 80% of strokes are preventable [1,2].

Current Solution: There are currently many machine learning and statistical models available for stroke prediction, but lack of interpretability undermines user trust and confidence in the models.

Proposed Solution: Develop an accurate XAI model to predict stroke risk and provide personalized recommendations to reduce risk.

## Methods



## References

1. Ahmad FB, Cisewski JA, Anderson RN. Mortality in the United States — Provisional Data, 2023. MMWR Morbidity and Mortality Weekly Report [Internet]. 2024 Aug 8;73(31):677–81. Available from: [https://www.cdc.gov/mmwr/volumes/73/wr/mm7331a1.htm?s\\_cid=mm7331a1\\_w](https://www.cdc.gov/mmwr/volumes/73/wr/mm7331a1.htm?s_cid=mm7331a1_w)  
2. George MG, Fischer L, Koroshetz W, Bushnell C, Frankel M, Foltz J, et al. CDC Grand Rounds: Public Health Strategies to Prevent and Treat Strokes. MMWR Morbidity and Mortality Weekly Report. 2017 May 12;66(18):479–81.  
3. S. B. Akter, S. Akter and T. S. Pias, "Stroke Probability Prediction from Medical Survey Data: AI-Driven Analysis with Insightful Feature Importance using Explainable AI (XAI)," 2023 26th International Conference on Computer and Information Technology (ICCI), Cox's Bazar, Bangladesh, 2023, pp. 1-6, doi: 10.1109/ICCI60459.2023.10441480.

## Results

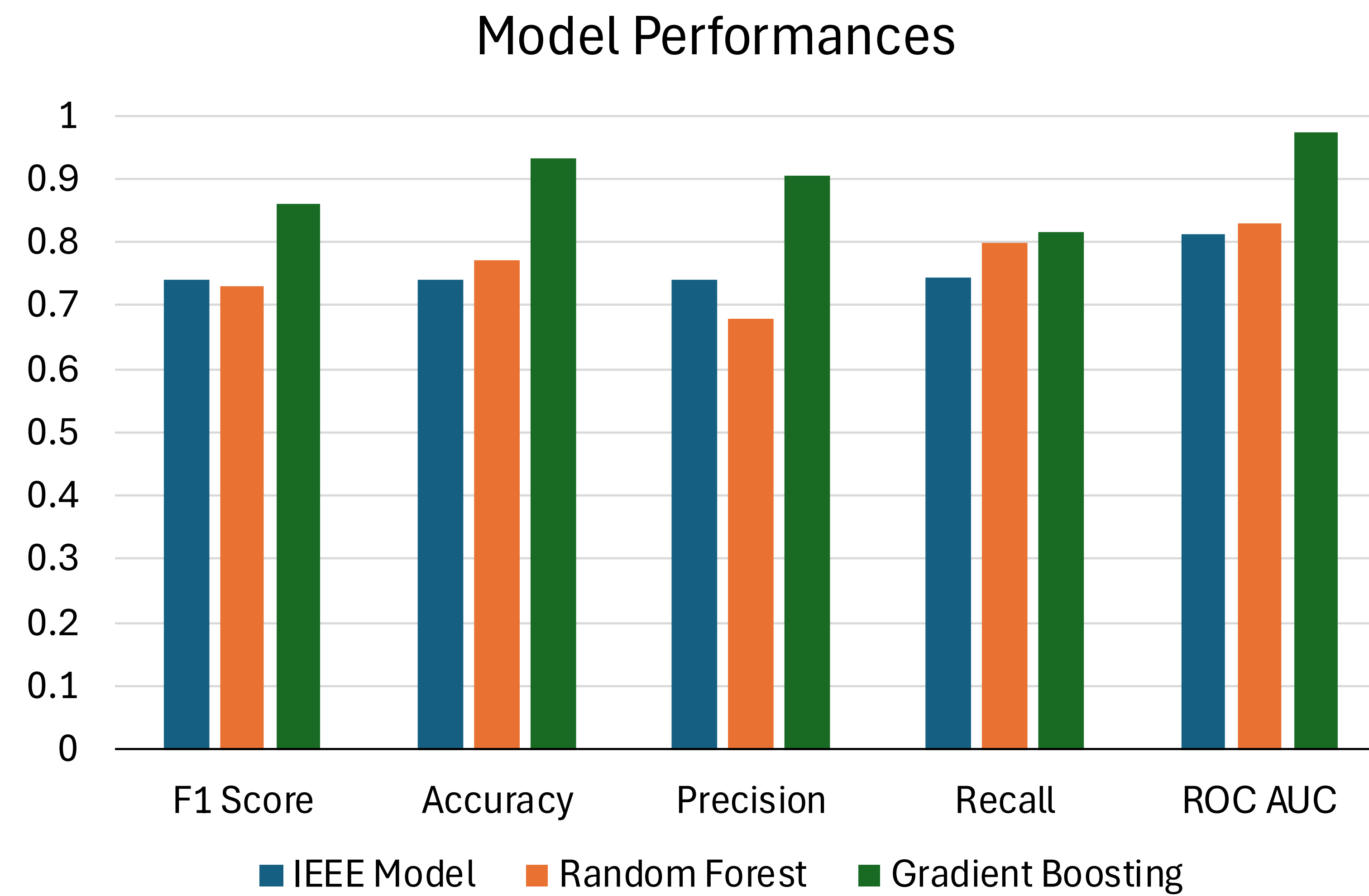


Figure 1. Metrics of highest performing model compared to intermediate model and model found in literature [3].

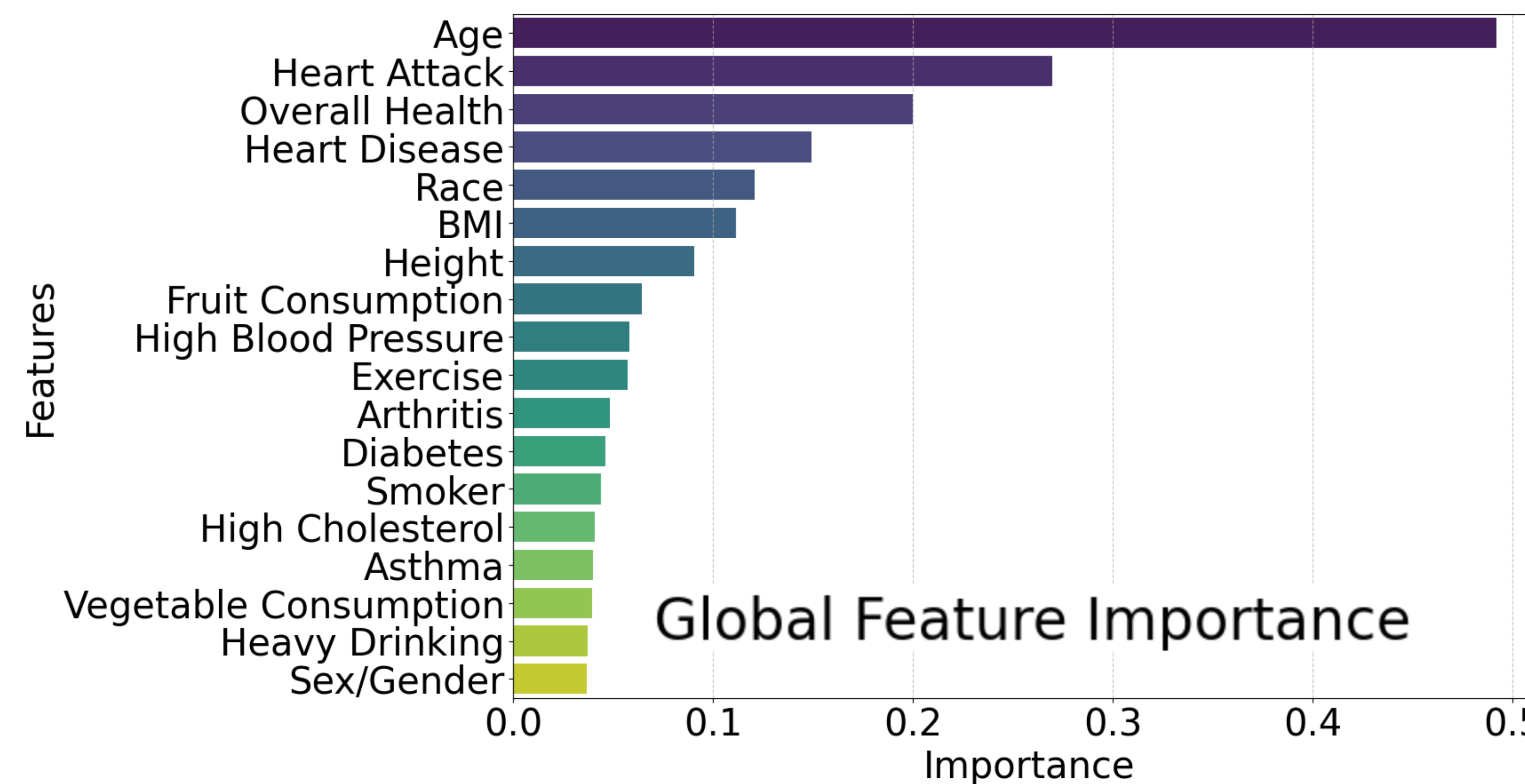


Figure 2. Global feature importance of the best model using Diverse Counterfactuals (DiCE).

## Conclusion

- XAI model with F1 score of 0.86 achieved
- Recommendations are generated on a per-case basis and appear reasonable
- Future Directions: Obtain hospital data to ensure data validity and model generalizability



XAI Recommendations Below

Alright, I crunched the data. Here's what I found that will reduce your stroke risk  
Do you exercise at least 3 times a week: No → Yes  
Does the person have high cholesterol: Yes → No

Predict Stroke Risk

Lower My Stroke Risk with XAI

High Risk of Stroke

It is recommended to consult a healthcare provider for further evaluation.

Figure 3. Sample responses and recommendations to reduce stroke risk using our developed Stroke XAI online app.

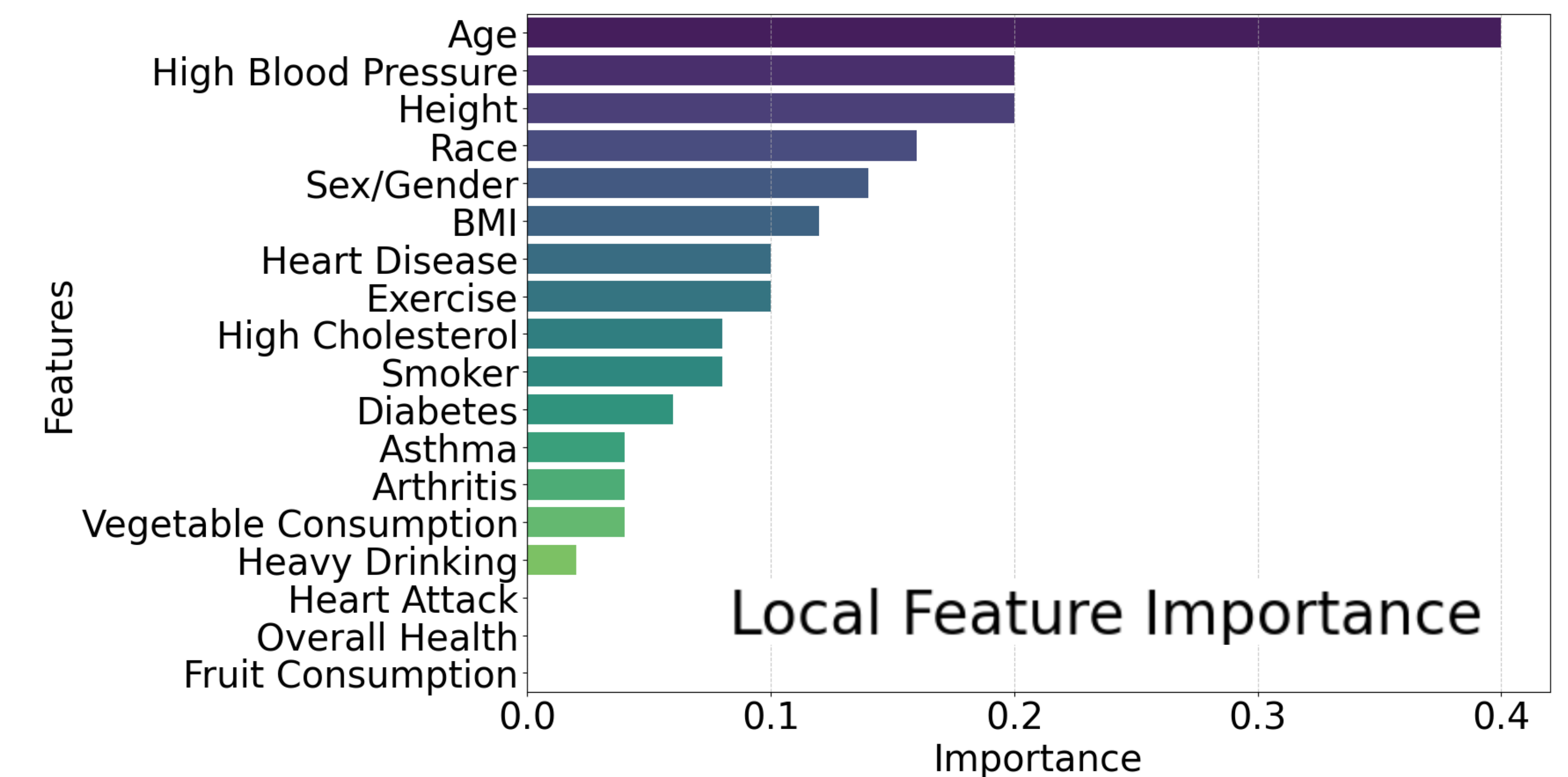


Figure 4. Local feature importance for case in Figure 3 of the best performing model using DiCE.

## Acknowledgments

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