Explainable Artificial Intelligence to Predict Clinical Outcomes in Type 1 Diabetes Adults

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1 INTRODUCTION

- Severe hypoglycemia (SH) and diabetic ketoacidosis (DKA) are life-threatening complications associated with type 1 diabetes (T1D).

- The objective of this study is to implement an explainable AI (XAI) to predict SH and DKA events in adult T1D patients over the next year, and to develop a decision support system (DSS) to identify high-risk patients.
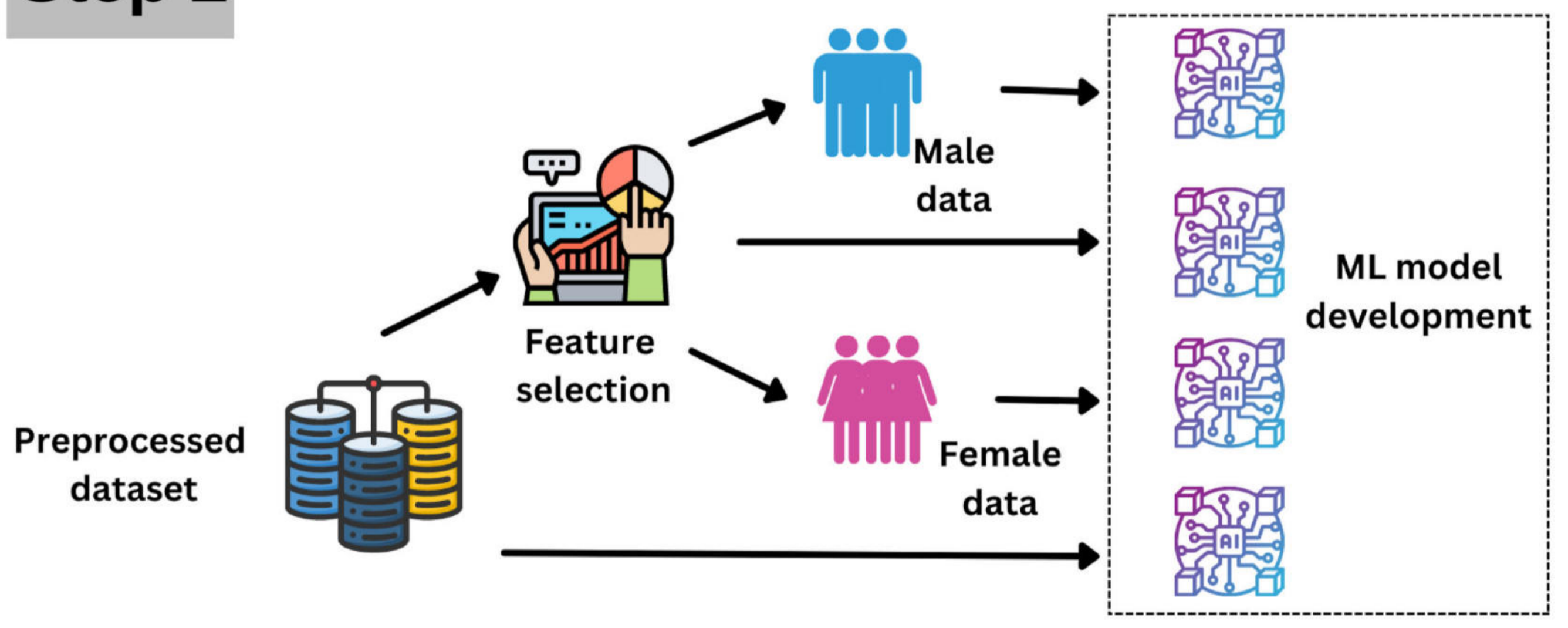
Dataset

- T1D Exchange Clinic Registry open dataset: 25759 T1D patient data from the United States.

- The study focuses on 7155 patients aged 26 to 93 years with a T1D duration of at least two years.
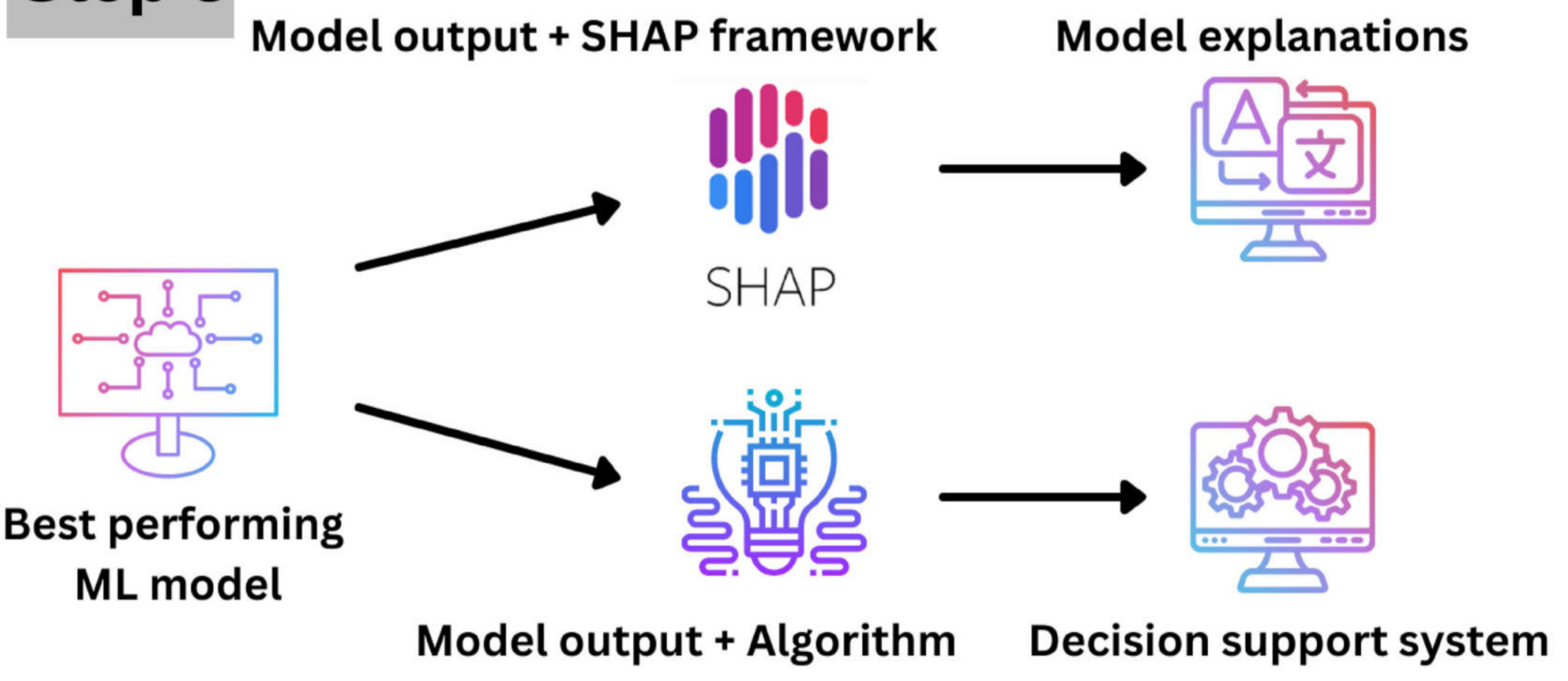
2 METHODOLOGY

Step 1
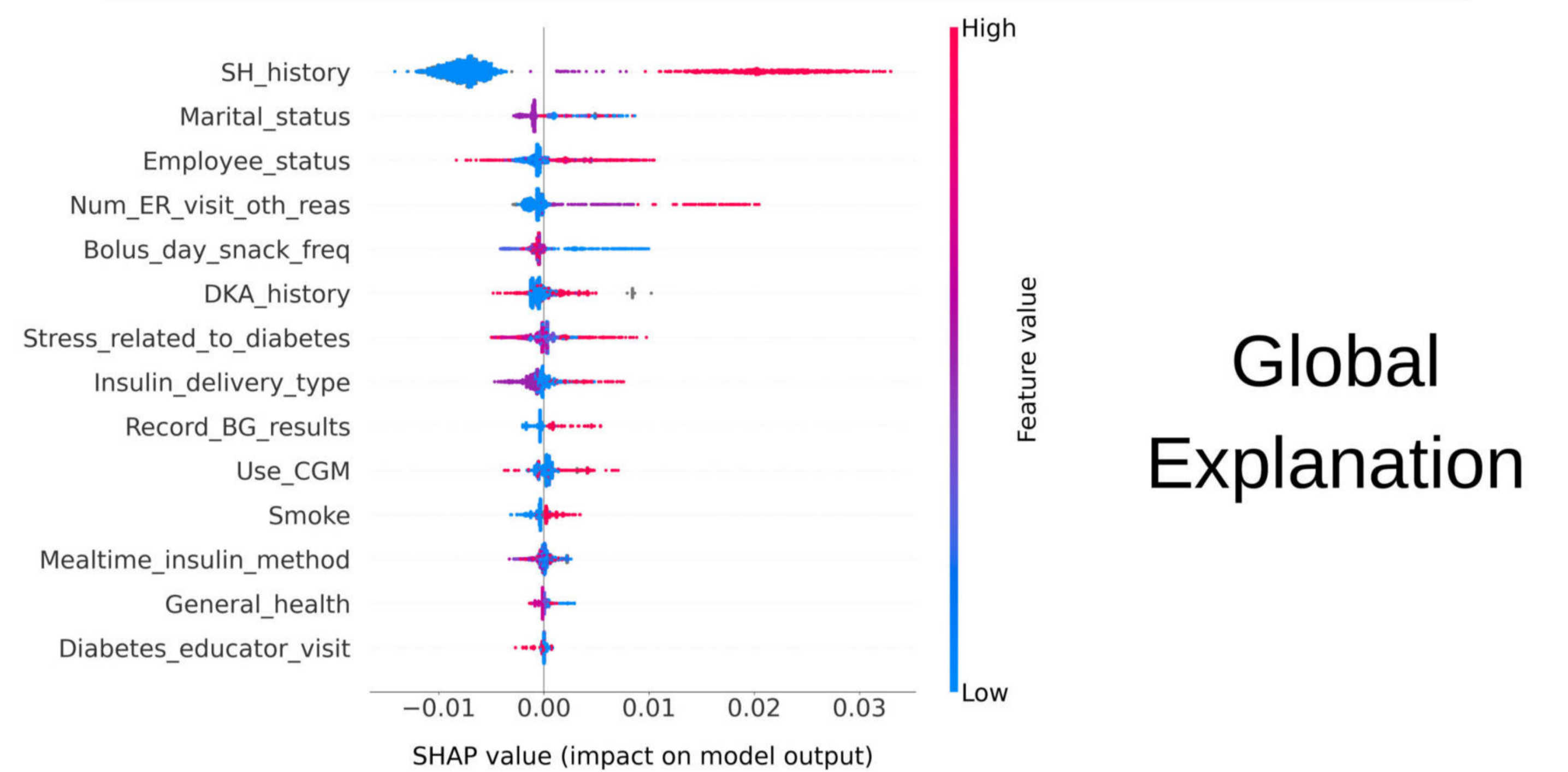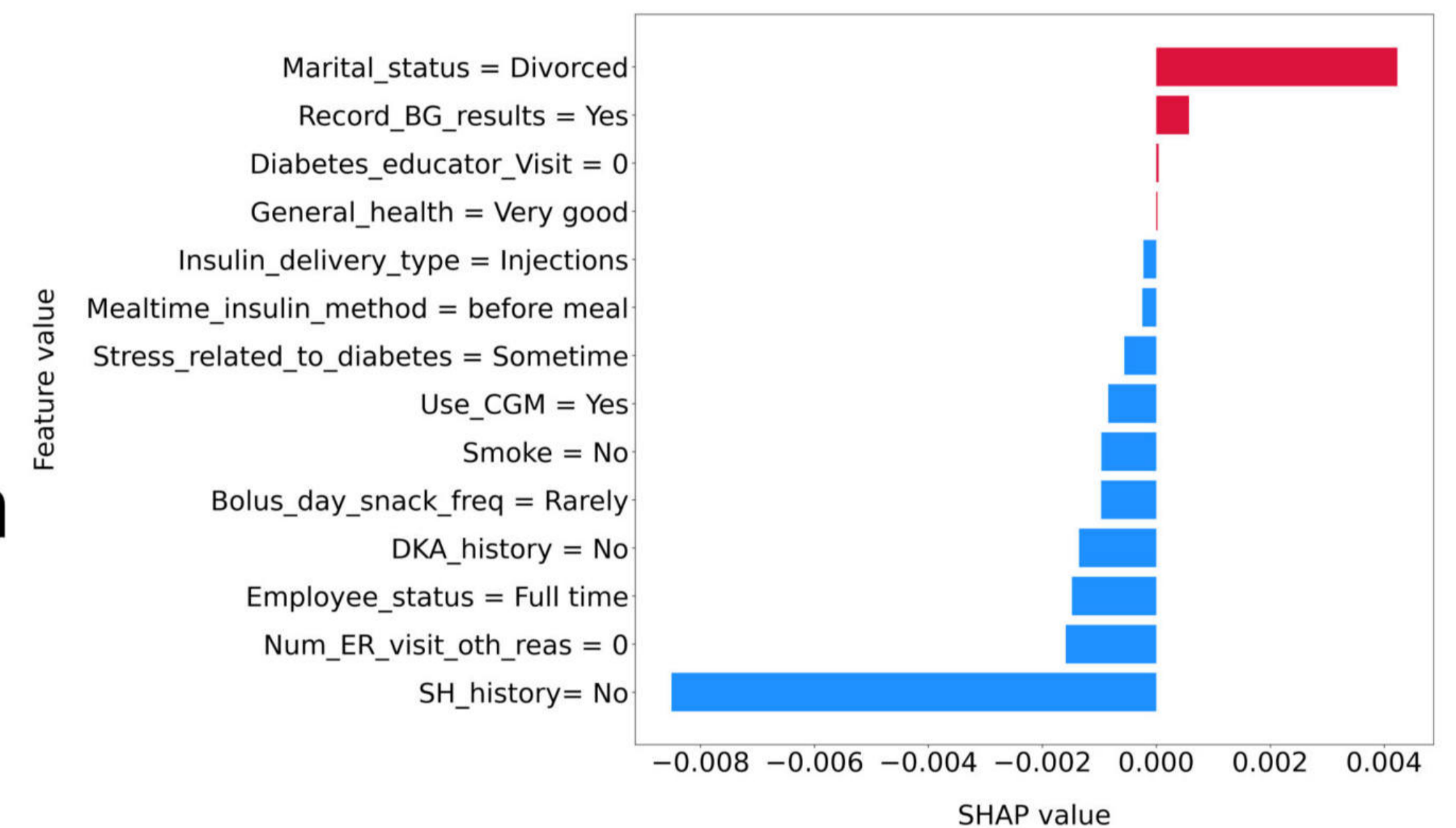

Preprocessed dataset → Baseline features → ML model development

Step 2

Preprocessed dataset → Feature selection → Male data / Female data → ML model development

Step 3

Best performing ML model → Model output + SHAP framework → Model explanations

Best performing ML model → Model output + Algorithm → Decision support system

3 RESULTS - MODEL PERFORMACE

Model (XGBoost)	Balanced accuracy	F1 score	AUC
Male - SH	85.9	84.0	88.3
Female - SH	79.6	84.9	82.0
DKA	83.1	78.6	85.3

4 RESULTS - XAI & DSS

SH prediction model for males

Global Explanation

Local Explanation

Decision Support System

5 CONCLUSION

- Boosting ML algorithms are more effective in predicting SH and DKA outcomes.

- Gender differences, socioeconomic factors, and physical and mental health are important in T1D outcome prediction.

- The performance of ML models is limited when they entirely rely on information from prior statistical studies to identify predictors.