**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.

**METHODOLOGY**

**Step 1**
- Preprocessed dataset
  - Baseline features
  - ML model development

**Step 2**
- Preprocessed dataset
  - Male data
  - Female data
  - Feature selection
  - ML model development

**Step 3**
- Model output + SHAP framework
  - Model explanations
  - SHAP
  - Best performing ML model
  - Model output + Algorithm
  - Decision support system

**RESULTS - XAI & DSS**

**SH prediction model for males**

**RESULTS - MODEL PERFORMANCE**

<table>
<thead>
<tr>
<th>Model (XGBoost)</th>
<th>Balanced accuracy</th>
<th>F1 score</th>
<th>AUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male - SH</td>
<td>85.9</td>
<td>84.0</td>
<td>88.3</td>
</tr>
<tr>
<td>Female - SH</td>
<td>79.6</td>
<td>84.9</td>
<td>82.0</td>
</tr>
<tr>
<td>DKA</td>
<td>83.1</td>
<td>78.6</td>
<td>85.3</td>
</tr>
</tbody>
</table>

**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.