

### Objective

- To get the prediction accuracy of not readmitted patients by Auto-AI and SXI and compare.
- Precision AI using Target SXI based Random Forest trees. Target increase in Number of not readmittance of patient is 20% up from current levels.

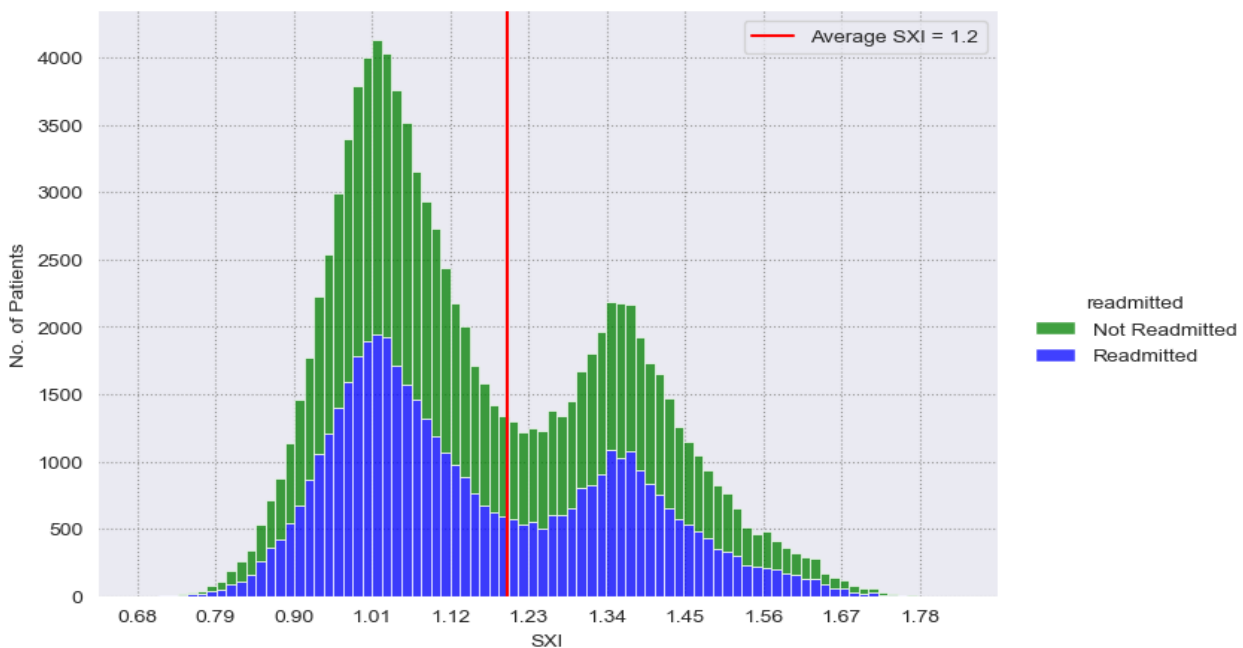
### SXI Hypothesis

- SXI is a proxy/surrogate for all features responsible for ensuring not readmitted or readmitted patients. The higher the SXI, the better is the prediction of not readmitted patients and hence increasing SXI score should lead to increase in the number of not readmitted patients.

### SXI Definition

- **Sriya Expert Index (SXI)**: Dynamic score/index obtained from a proprietary formula consisting of weights from 10 ML algorithms. SXI is a super feature and is a true weighted representative of all important features. Converts a multi-dimensional hard to solve problem into a simpler 2-dimensional solution (problem solved).
- **SCORE + CORRELATE = IMPROVE**

## Discussion & Results



### 1. Exploratory Data Analysis

101,766 patients were distributed to 54864 good and 46902 bad. Good are Not Readmitted patients and Bad are Readmitted patients. So, 53.91% is the current number of Not Readmitted patients and 46.09% is number of Readmitted patients.

## 2. SXI - Exploratory Data Analysis

Current Average SXI is **1.2**. The total number of patients above **1.2** is **42651** and of these **23712** are Not Readmitted patients and **18939** are Readmitted patients. So, the number of Not Readmitted patients (%) is **55.6%** and number of Readmitted patients are **44.4%**.

Correspondingly total numbers of patients below are **1.2** is **59115** and of these **31152** are Not Readmitted patients and **27963** are Readmitted patients. So Not Readmitted patients (%) is **52.7%** and Readmitted patients (%) is **47.3%**.

So SXI is a perfect proxy/surrogate for number of not readmitted patients and above average SXI the ratio of good outcome is **1.03x** overall average and below average SXI this ratio of good outcome is **0.97** overall average. So, increase in SXI leads to increase in number of not readmitted patients.

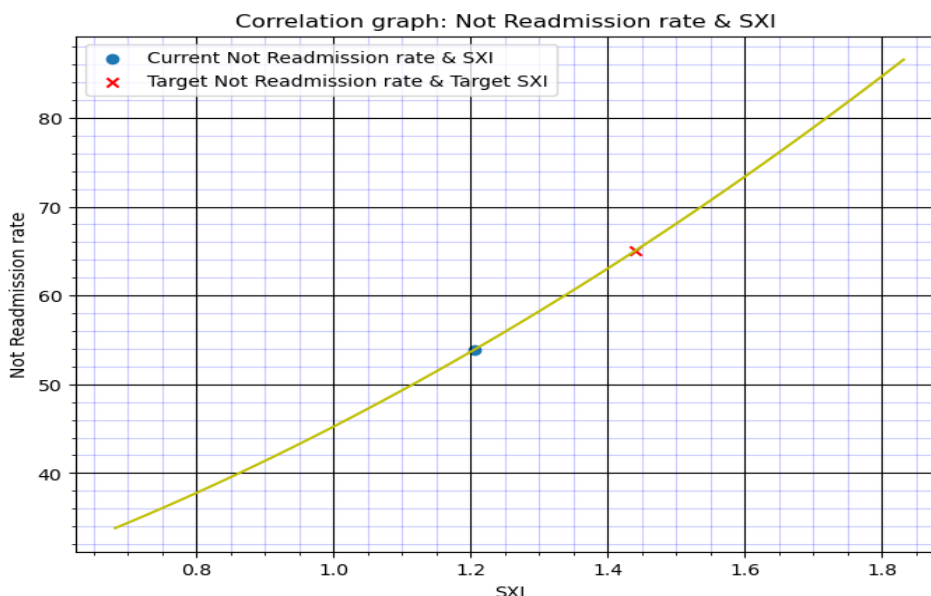
## 3. Predictive AI

- Auto-AI Prediction accuracy is **89%** and the best performing algorithm is **Multi-Layer Perceptron**.
- SXI Prediction accuracy of number of not readmitted patients is **98.8%**.
- Ratio of SXI/Auto-AI prediction accuracy is **1.11**.

## 4. Precision AI

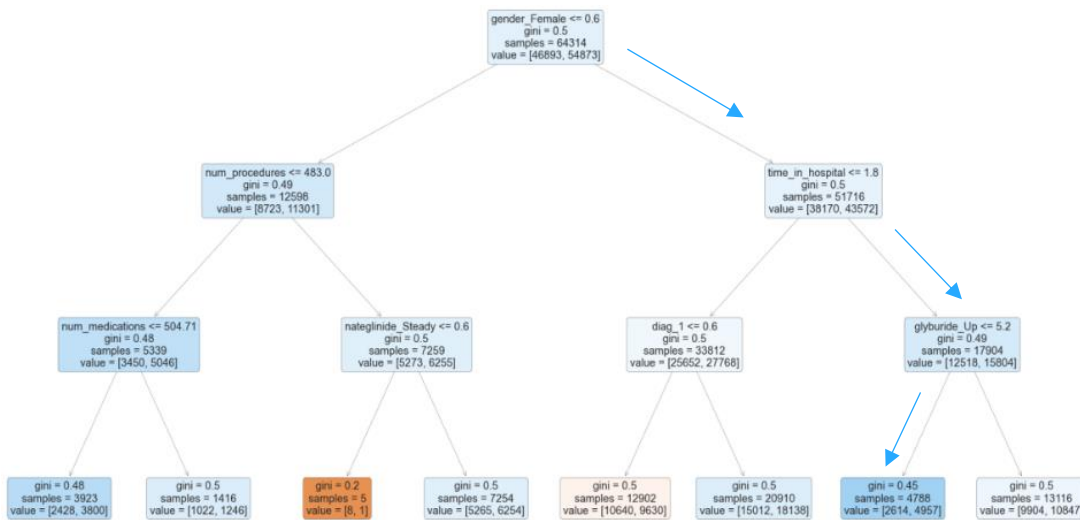
The desired increase in target outcome which is number of Not Readmission rate is **20%**. The original number of Not Readmitted patients is **53.91%** so a **20%** increase should lead to a **64.69%** overall number of Not Readmitted patients (**53.91\*1.2**). Which means **65837** of the patients from **101,766** would become number of not Readmitted patients rather than current **54864**.

The correlation between SXI and Not Readmitted patients is **0.99**. This implies that SXI and the number of Not Readmitted patients are highly positively correlated to each other. Hence, an increase in SXI will result in an increase in number of Not Readmitted patients.



## Current SXI and Target SXI Decision Trees

### a. Current SXI Decision Tree



#### Interpretation: -

**Node 1:** Gender female > 60% more likely (No. of Not Readmission in parent node: 54873) (Right split so it is False symbol changes from < to >)

**Left split:** 11301; gini:0.49, **Right Split:** 43572- majority positive class; gini:0.5  
(Total value for the next split: 43572)

**Node 2:** Time in hospital > 1.8 days (Right split so it is False symbol changes from < to >)

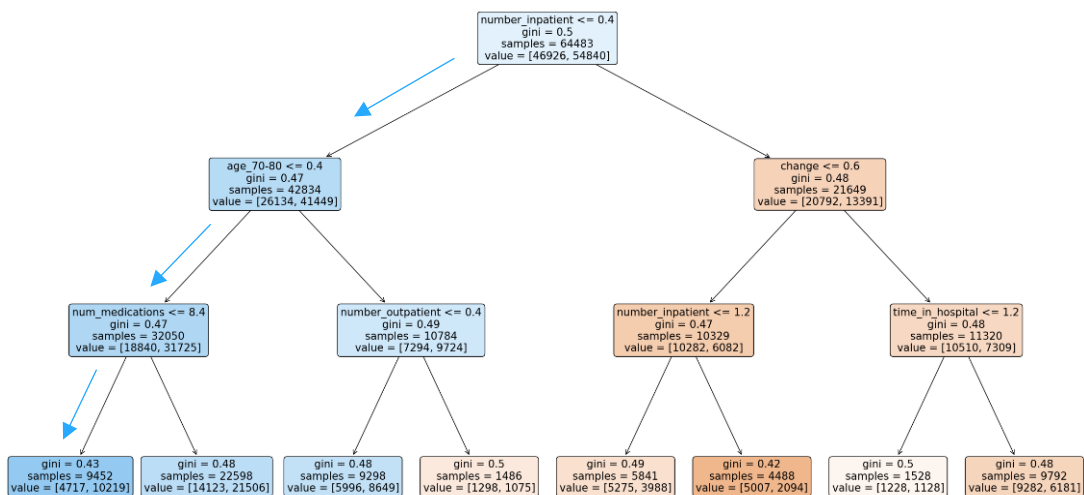
**Left split:** 27768; gini:0.5, **Right Split:** 15804- majority positive class; gini:0.49  
(Total value for the next split: 15804)

**Node 3:** Glyburide up <= 5.2

**Left split:** 4957- majority positive class; gini:0.45, **Right Split:** 10847; gini:0.50 – Final Leaf Node.

- ✓ 4957 are Not Readmitted Patients
- ✓ Success Ratio is: **11.37%**  $(4957/43572) * 100$  – (Total value of the positive class in the final leaf node/Total value of the positive class after first split) \*100
- ✓ Not Readmitted/readmitted Ratio: **1.9**

**b. Target SXI Decision Tree**



Target SXI from correlation curve for 20% increase in target outcome of Not Readmission rate is **1.44**.

**Interpretation: -**

**Node 1:** No. of Inpatients < 1 (No. of Not Readmission in parent node: 54840)

**Left split:** 41449- majority positive class; gini:0.40, **Right Split:** 13391; gini:0.6  
(Total value for the next split: 41449)

**Node 2:** Age of 70-80 <= 40% probability

**Left split:** 31725- majority positive class; gini:0.47, **Right Split:** 9724; gini:0.49  
(Total value for the next split: 31725)

**Node 3:** Number of Medications < 9

**Left split:** 10219- majority positive class; gini:0.43, **Right Split:** 21506; gini:0.48 – Final Leaf Node.

- ✓ **10219** are Not Readmitted Patients
- ✓ Success Ratio is: **24.65%** (10219/41449) \*100 – (Total value of the positive class in the final leaf node/Total value of the positive class after first split) \*100
- ✓ Not Readmitted/readmitted Ratio: **2.2**

## Conclusion

- SXI Prediction accuracy is **1.11x** Auto AI prediction accuracy and hence is **11%** superior.
- Patients whose SXI score is higher than current average SXI score of 1.2 have **3%** higher Not readmitted rates than overall readmission rates average of all patients.
- Target **20%** increase in number of not readmitted patients is achievable by raising target SXI to **1.44** from current **1.2** levels. This would result in **65837** were become number of not Readmitted patients from current **54864** levels.

Initial Increase from  
current levels:  
**20% or 10,973**

**SXI Impact**  
*Potential*

- Based on the inference from the correlation graph w.r.t SXI there is a **potential 54.89% compounded increase** if all recommendations in target SXI are completely implemented.

Compounding Increase  
from current levels:  
**54.89% or 30,115**

**SXI Impact**  
*Potential*