# Sriya.AI
AI ANYWHERE ANYTIME

## Objective

- To get the prediction accuracy of COVID-19 ***not detected*** by Auto-AI and SXI and compare.
- Precision $AI^2$ using Target SXI based Random Forest trees.
- Target increase in COVID-19 not detection rate is **20%** up from current levels.

## SXI Hypothesis

- SXI is a proxy/surrogate for all features responsible for detecting if patients have COVID-19 detected or not. The higher the SXI, the better is the COVID-19 not detected rate and hence increasing SXI score should lead to increase in No. of Patients with COVID-19 not detected.

## 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
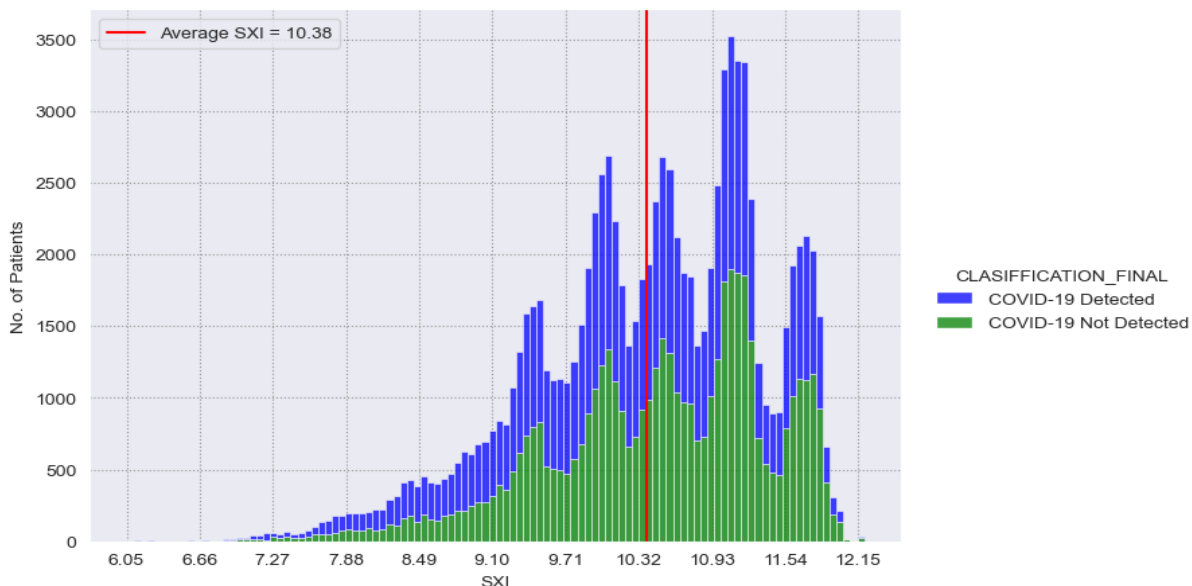


### 1. Exploratory Data Analysis

**100,000** patients are distributed to **50,000** good and **50,000** bad. Good are COVID-19 Not Detected and Bad are COVID-19 Detected. So, **50%** is the current COVID-19 Detected and COVID-19 Not Detected Rate.

## 2. SXI - Exploratory Data Analysis

The current Average SXI is **10.38**. No. of Patients above 10.38 is **54,739** and of these **25,312** are COVID-19 Detected patients and **29,427** are COVID-19 Not Detected patients. So COVID-19 Detected patients (%) are **46.24%** and COVID-19 Not Detected patients are **53.75**%.

Correspondingly, No. of Patients below 10.38 is **45,261** and of these **24,688** are COVID-19 Detected patients and **20,573** are COVID-19 Not Detected patients. So, COVID-19 Detected patients (%) are **54.54**% and COVID-19 Not Detected patients are **45.45**%.

So SXI is a perfect proxy/surrogate for COVID-19 Not Detected patients and above average SXI ratio of good outcome is **1.075x** of the overall average and below average SXI ratio of good outcome is **0.85** of the overall average. So, the increase in SXI leads to an increase in COVID-19 Not Detected patients.

## 3. Predictive AI

- Auto-AI Prediction accuracy is **63.29%** and the best performing algorithm is **Multi-Layer Perceptron**.
- SXI Prediction accuracy of COVID-19 Not Detected patients is **100%**.
- Ratio of SXI/Auto-AI prediction accuracy is **1.58.**

## 4. Precision AI

The desired increase in target outcome which is COVID-19 not detection rate is 20%. The original is COVID-19 not detection rate is **50%** so a **20%** increase should lead to a **60%** overall COVID-19 not detection rate (**50*1.2**). Which means **60000** of the patients from 100,000 would become COVID-19 not detected patients rather than the current **50,000.**

The correlation between SXI and COVID-19 not detection rate is **0.99**. This implies that SXI and COVID-19 not detection rate is highly positively correlated to each other. Hence, an increase in SXI will result in an increase in COVID-19 not detection rate.



Correlation graph: COVID-19 Not Detected rate(%) & SXI
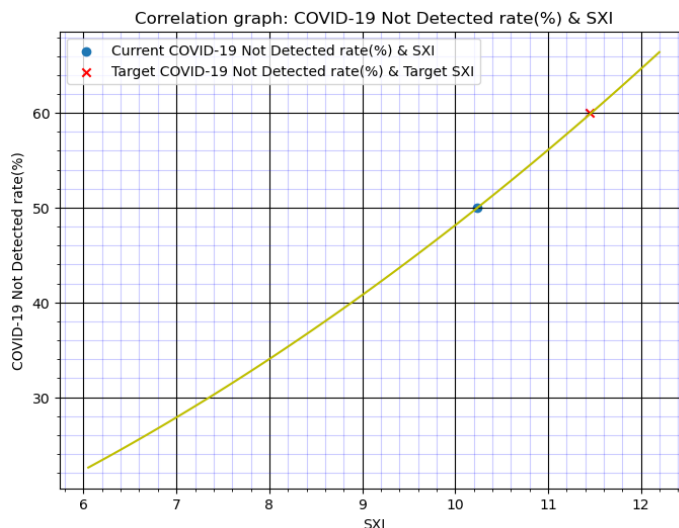
**Current SXI and Target SXI Decision Trees**

   **a.  Current SXI Decision Tree**
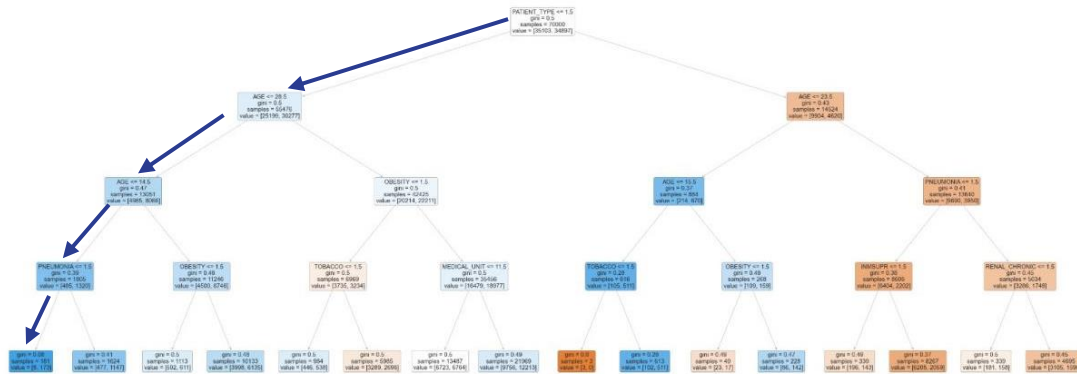


**Interpretation**

**Node 1: PATIENT_TYPE (whether the patient returned home or was hospitalized)** = more likely patient returned home (Number of patients in whom COVID-19 was not detected in the parent node: 34897).

**Left split:** 30277 – majority positive class; gini: 0.5, **Right split:** 4620; gini: 0.43.

                      (Total value for the next split: 30277)

**Node 2: AGE (Age of patient)** <= 28.5 years

**Left split:** 8066 – majority positive class; gini: 0.39, **Right split:** 22211; gini: 0.48.

                      (Total value for the next split: 8066)

**Node 3: AGE (Age of patient)** <= 14.5 years.

**Left split:** 1320 – majority positive class; gini: 0.47, **Right split:**6746; gini: 0.5.

                      (Total value for the next split: 1320)

**Node 4: PNEUMONIA (whether the patient already have air sacs inflammation or not)** = more likely patient with no air sac inflammation.

**Left split**: 172 - majority positive class; gini:0.08, **Right Split**: 1147; gini:0.41 – Final Leaf Node

    ✓    In **172** patients COVID-19 was not detected.

    ✓    COVID-19 not detected / COVID-19 detected ratio is **172**.

### b. Target SXI Decision Tree
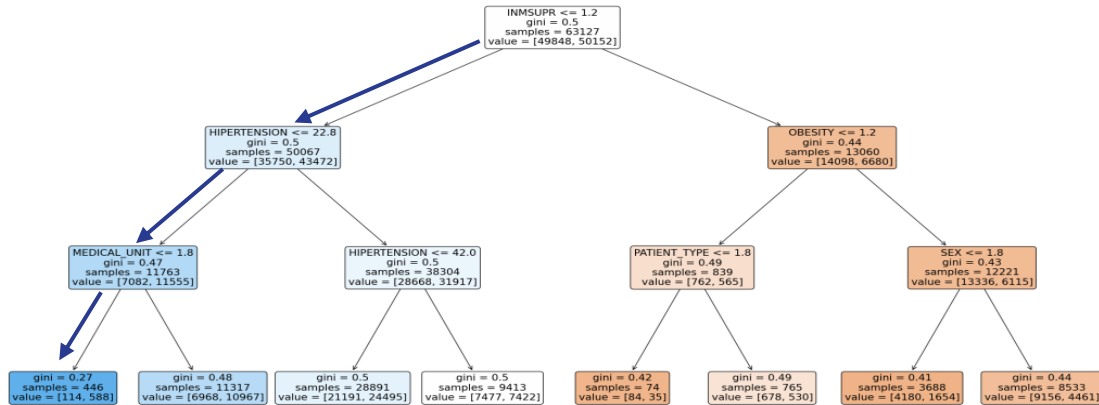


Target SXI from correlation curve for 20% increase in target outcome of COVID-19 Not Detected rate is **11.45**.

### Interpretation

**Node 1: If patient not immunosuppressed** = more likely patient not immunosuppressed (Number of patients in whom COVID-19 was not detected in the parent node: 50152).

Left split: 43472 – majority positive class; gini: 0.5, **Right split:** 6680; gini:0.44.

(Total value for the next split: 43472)

**Node 2: If Hypertension in a patient** <= 22.8%

Left split: 11555 – majority positive class; gini: 0.47, **Right split:** 31917; gini:0.5.

(Total value for the next split: 11555)

**Node 3: If MEDICAL_UNIT =** more likely Type 1

Left split: 588 - majority positive class; gini:0.27, **Right Split**: 10967; gini:0.48 – Final Leaf Node

- ✓ In **588** patients COVID-19 was not detected.

- ✓ COVID-19 not detected/ COVID-19 detected ratio is **5.15**.

# Conclusion

1.  SXI Prediction accuracy is **1.58** times Auto AI prediction accuracy and hence is **58%** superior.

2.  Patients, whose SXI score is higher than current average SXI score of **10.38** have **7%** higher COVID-19 Not Detected rate than overall COVID-19 Not Detected rate average of all patients.

3.  Target **20**% increase in COVID-19 not detection rate is achievable by increasing target SXI to **11.45** from current **10.38** levels. This would result in **60,000** COVID-19 not detection up from current 50,000 levels.

> Initial Increase from current levels:
> **20% or 10,000.**
>
> SXI Impact
> *Potential*

4.  Based on the inference from the correlation graph w.r.t SXI there is a **potential 34% compounded increase** if all recommendations in target SXI are completely implemented.

> Compounding Increase from current levels:
> **34% or 17,000.**
>
> SXI Impact
> *Potential*