

ROBOTICS INDUSTRY

Objective

- To get the prediction accuracy of experiments with high robustness by Auto-AI and SXI and compare.
- Precision AI using Target SXI based Random Forest trees. Target increase in High robust experiments is **20%** up from current levels.

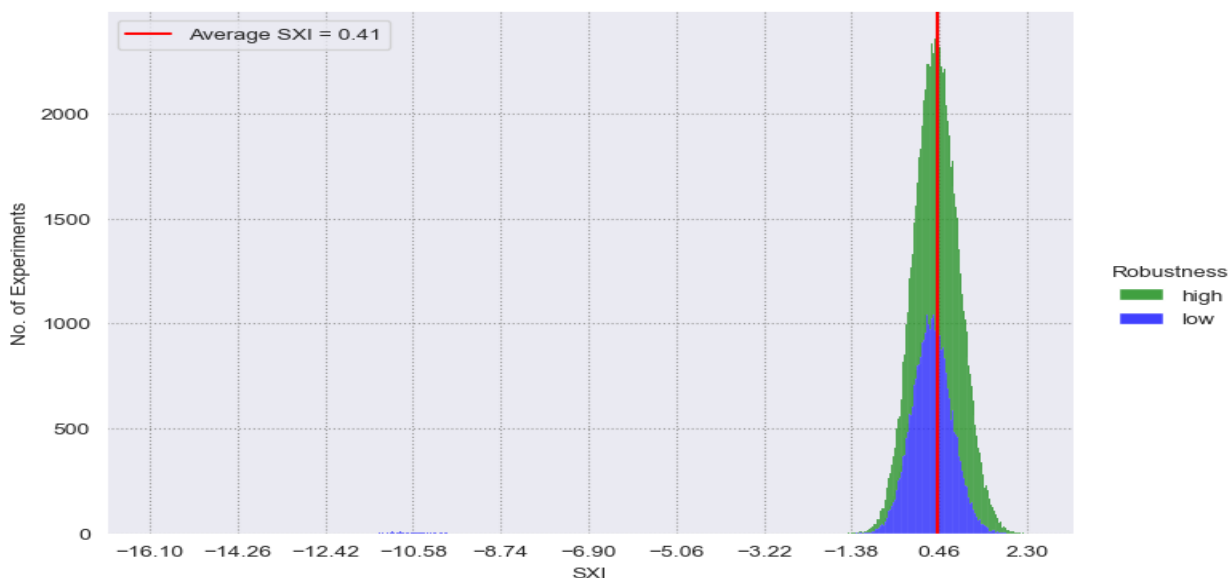
SXI Hypothesis

- SXI is a proxy/surrogate for all features responsible for ensuring high or low robustness rate in the experiments. The higher the SXI, the better is the robustness and hence increasing SXI score should lead to higher robustness.

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

1,00,000 experiments were distributed to 61909 good and 38091 bad. Good are experiments with high robustness and Bad are experiments with low robustness. So, 61.9% is the current high robustness rate and 38.1% is low robustness rate.

2. SXI - Exploratory Data Analysis

Current Average SXI is **0.41**. No. of total experiments above 0.41 is **50914** and of these **34907** are experiments with high robustness and **16007** are experiments with low robustness. So High robust experiments (%) is **68.6%** and low robust experiments is **31.4%**.

Correspondingly No. of total experiments below 0.41 is **49086** and of these **27002** are high and **22084** are low. So, experiments with High robustness (%) is **55%** and low is **45%**.

So SXI is a perfect proxy/surrogate for experiments with High robustness and above average SXI ratio of good outcome is **1.11x** of the overall average and below average SXI ratio of good outcome is **0.88** overall average. So, the increase in SXI leads to an increase in experiments with high robustness.

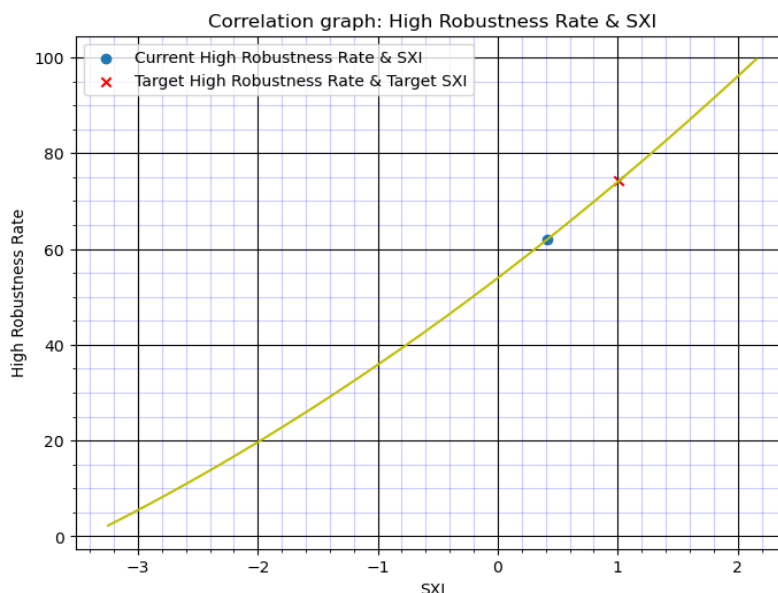
3. Predictive AI

- Auto-AI Prediction accuracy is **88%** and the best performing algorithm is **Random Forest**.
- SXI Prediction accuracy of Subscribers is **99%**.
- Ratio of SXI/Auto-AI prediction accuracy is **1.13**.

4. Precision AI

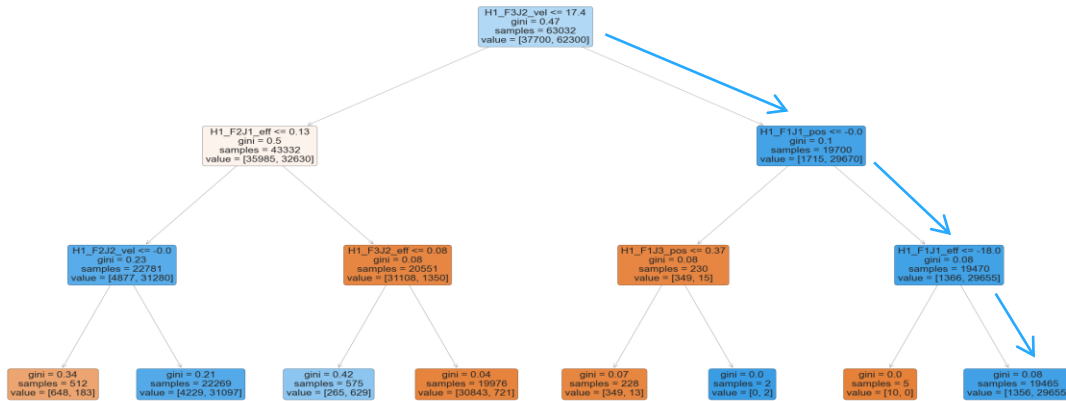
The desired increase in target outcome which is experiments with high robustness rate is 20%. The original high robustness rate is **61.9%** so a **20%** increase should lead to a **74.28%** overall high robustness (**61.9*1.2**). Which means **74280** of the experiments from 1,00,000 would become those with high robust nature rather than current **61900**.

The correlation between SXI and High robustness rate is **0.99**. This implies that SXI and High robustness rate is highly positively correlated to each other. Hence, an increase in SXI will result in increase in High robustness rate.



Current SXI and Target SXI Decision Trees

a. Current SXI Decision Tree



Interpretation

Node 1: Hand with 3 Fingers with 2 joins of the velocity ≥ 17.4 (Total value for the split from parent node: 62300)

- Left split: 32630; gini:0.5, **Right Split: 29670- majority class; gini:0.1**

↓ (Total value for the next split: 29670)

Node 2: Hand with 1 Finger with 1 join of the position ≥ 0

- Left split: 15; gini:0.08, **Right Split: 29655 - majority good class; gini:0.08**

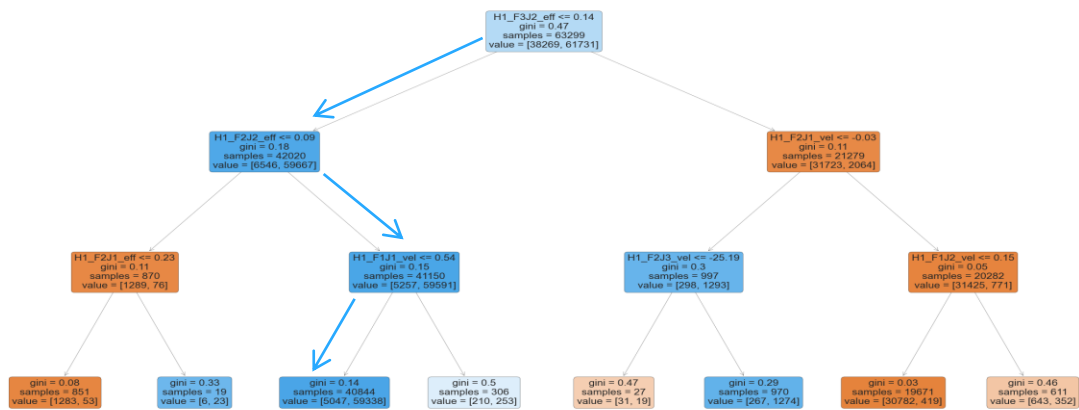
↓ (Total value for the next split: 29655)

Node 3: Hand with 1 Finger with 1 join of the effort ≥ -18

- Left split: 0; gini:0, **Right Split: 29655 – majority good class; gini:0.08** – Final Leaf Node

✓ **29655** experiments with high robustness

b. Target SXI Decision Tree



Target SXI from correlation curve for 20% increase in target outcome of experiments with high robustness is **1.01**.

Interpretation

Node 1: If Hand with 3 Fingers with 2 joins of the effort <= 0.14 (Total value for the split from parent node: 61731)

- **Left split: 59667- majority class; gini:0.09, Right Split: 2064; gini:0.11**
(Total value for the next split: 59667)

Node 2: If Hand with 2 Fingers with 2 joins of the effort >= 0.09

- **Left split: 76; gini:0.11, Right Split: 59591 - majority class; gini:0.15**
(Total value for the next split: 59591)

Node 3: If Hand with one Finger with one join of the velocity <= 0.54

- **Left split: 59338- majority good; gini:0.14, Right Split: 253 class; gini:0.5 – Final Leaf Node**
- ✓ **59,338** experiments with high robustness

Conclusion

1. SXI Prediction accuracy is **1.13** times Auto AI prediction accuracy and hence is **13%** superior.
2. Experiments, whose SXI score is higher than current average SXI score of 0.41 have **11%** higher robustness rates than overall robustness rates average of all experiments.
3. Target **20%** increase in high robust experiments is achievable by increasing target SXI to **1.01** from current **0.41** levels. This would result in **74280** high robust experiments from current **61900** levels.

Initial Increase from
current levels:
20% or 12,380

SXI Impact
Potential

4. Based on the inference from the correlation graph w.r.t SXI there is a **potential 61.5% compounded increase** if all recommendations in target SXI are completely implemented.

Compounding Increase
from current levels:
61.5% or 37979.

SXI Impact
Potential