



Interpreting Reliability Data

A New Approach to Benchmarking

Yamille del Valle, Nigel Hampton, Josh Perkel, Essay Wen Shu

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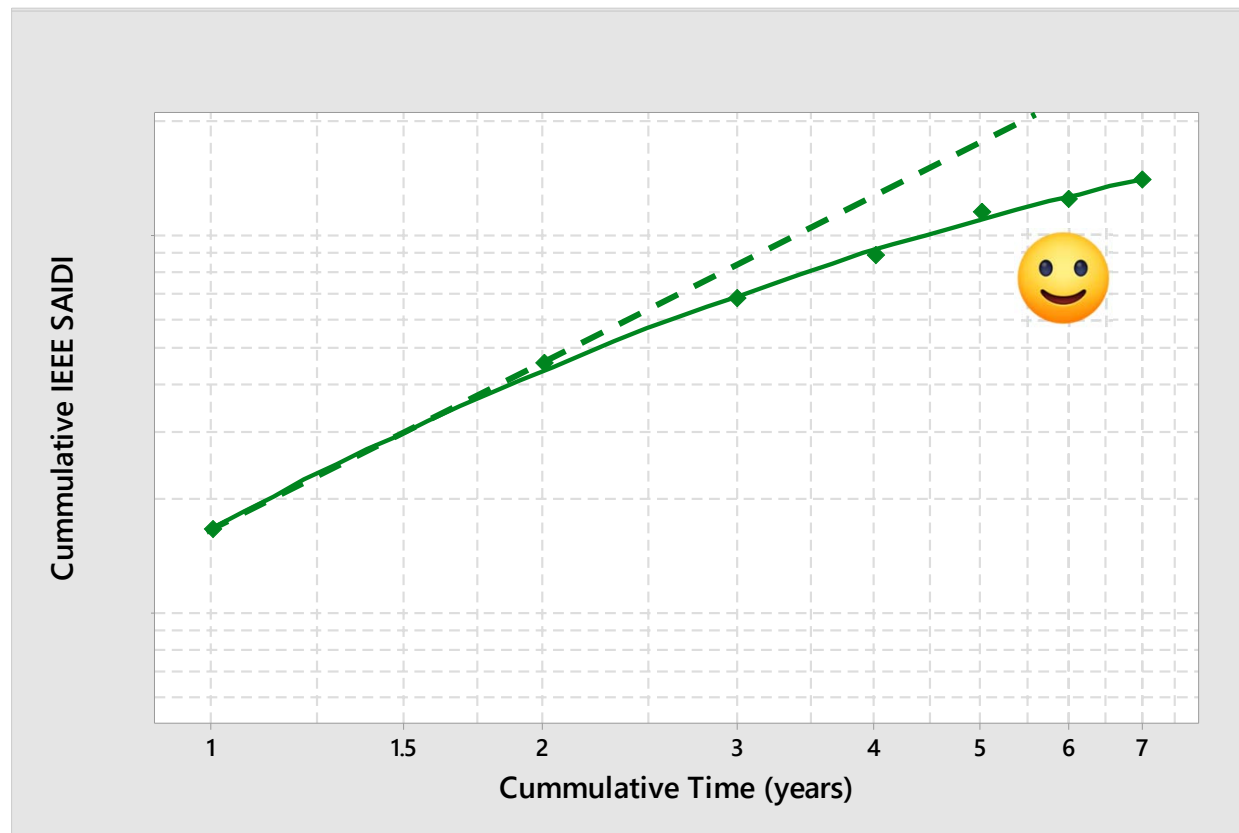
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Purpose of the Study

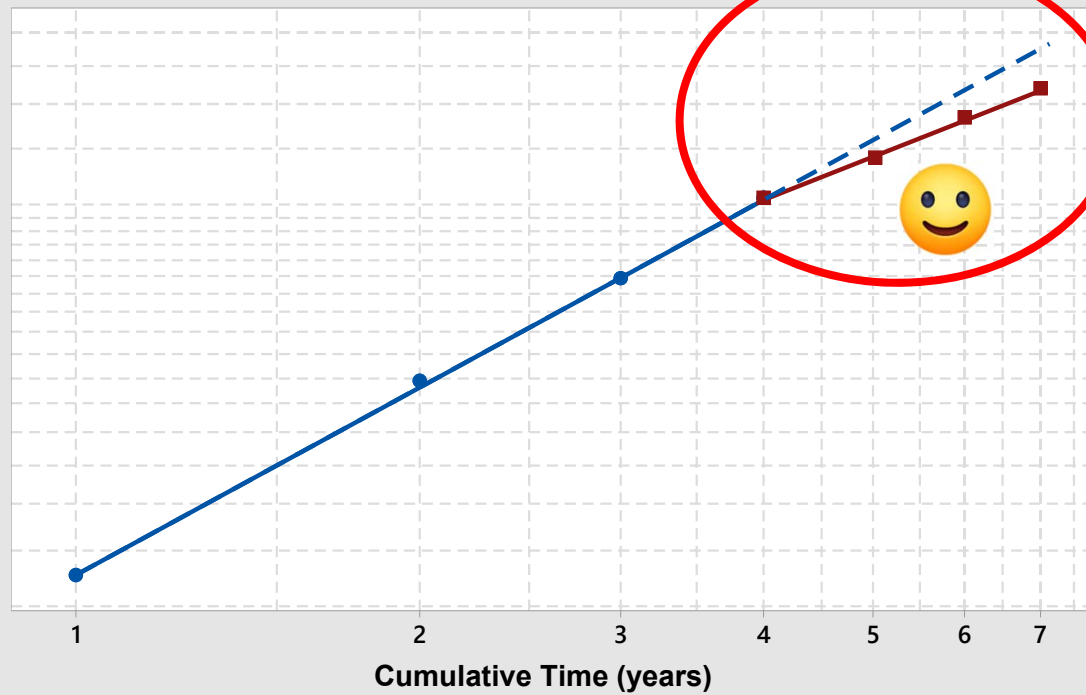
- SAIDI, SAIFI are internationally recognized indices used to describe electric service reliability at distribution level
- Used to:
 - Provide Context
 - Understand correlations
 - Improve performance
 - Estimate future performance / establish resource needs
- Public Data available (IEEE, EIA, Regulators, CEER, Utility websites etc.)

Reliability Growth Model

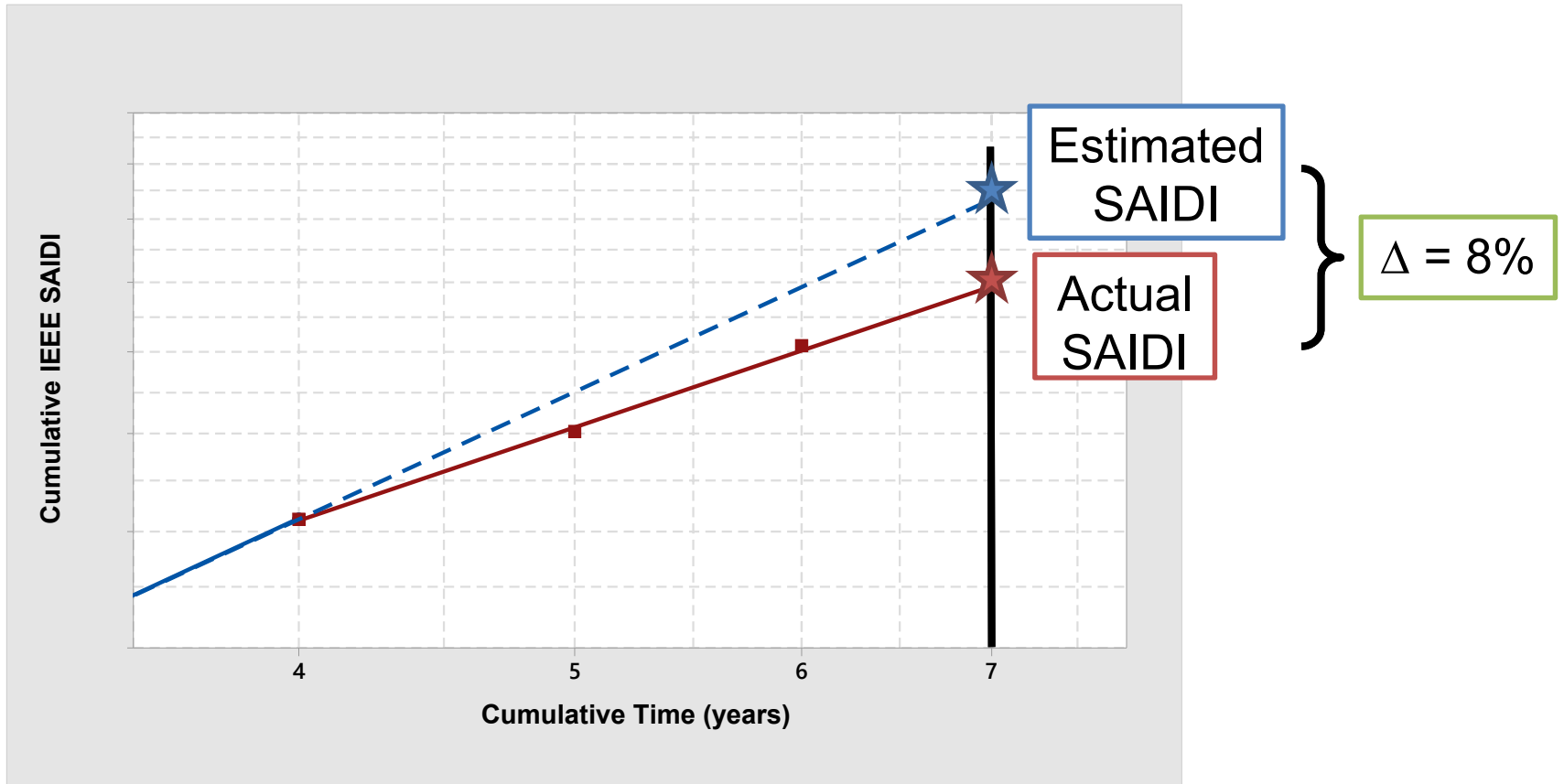


Performance Evaluation

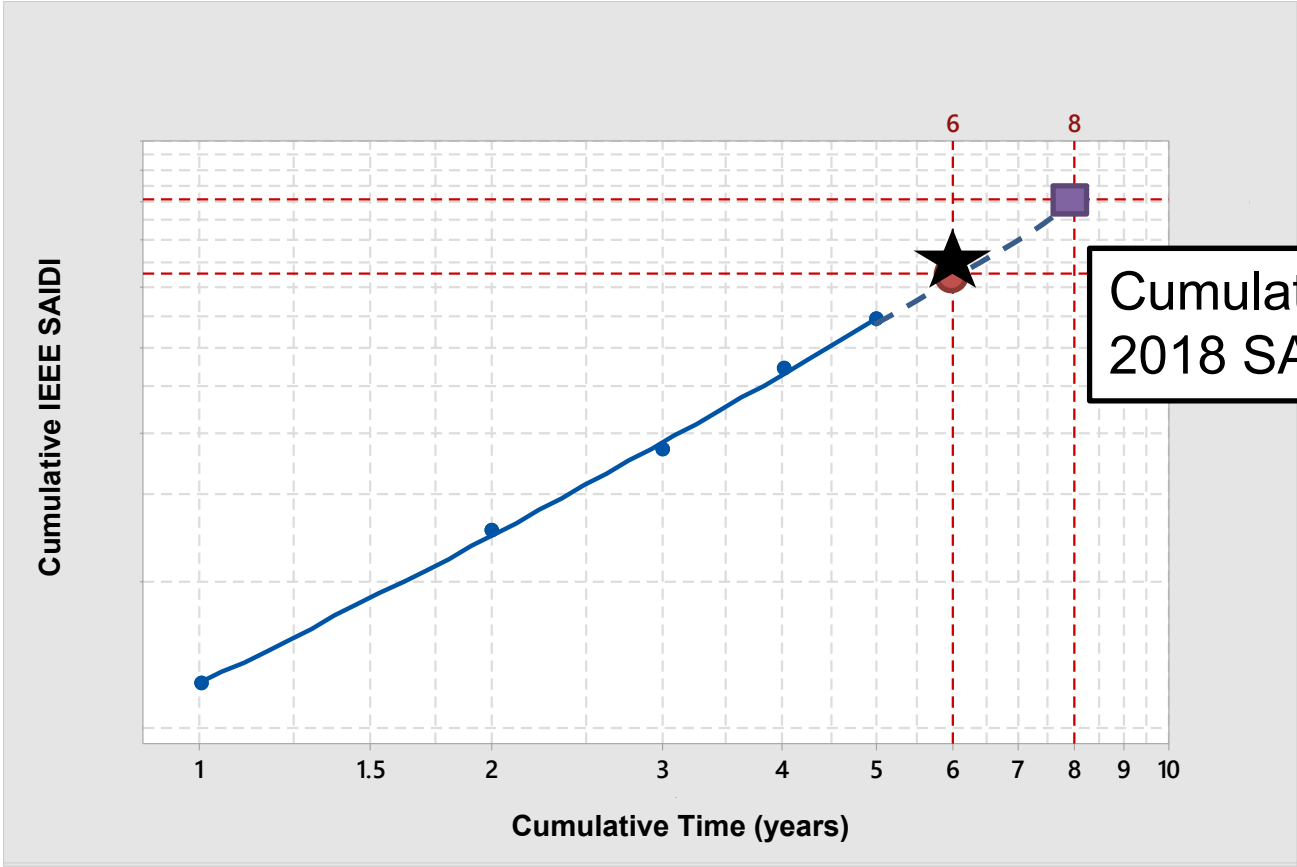
Cumulative IEEE SAIDI



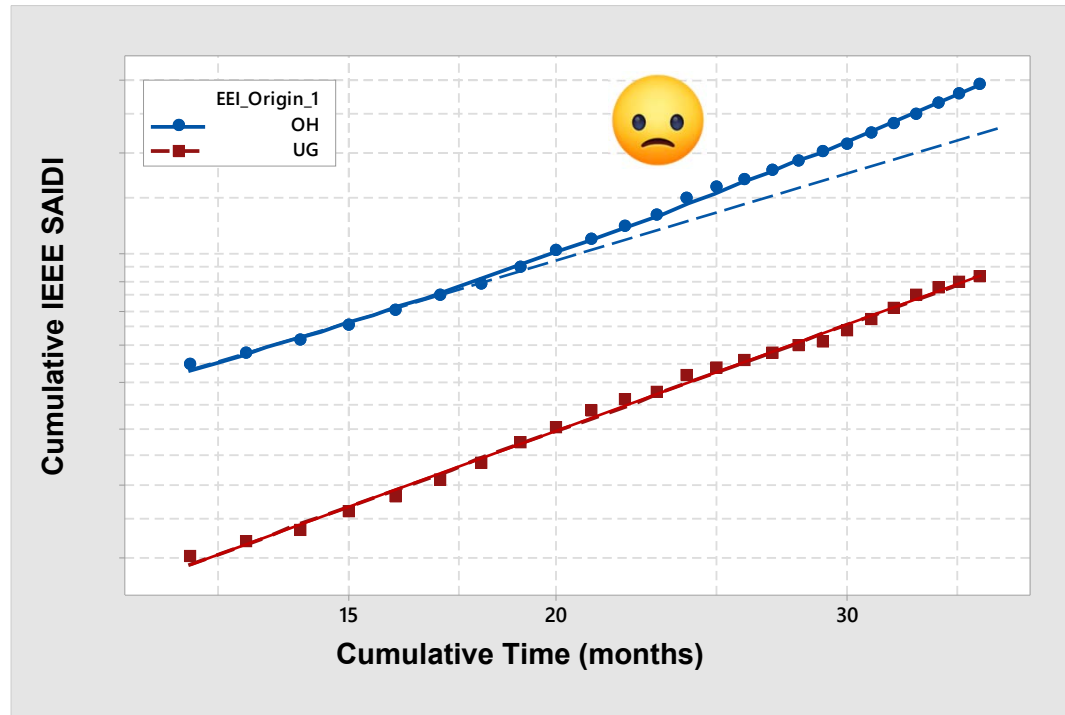
Performance Quantification



Trending / Prognosis

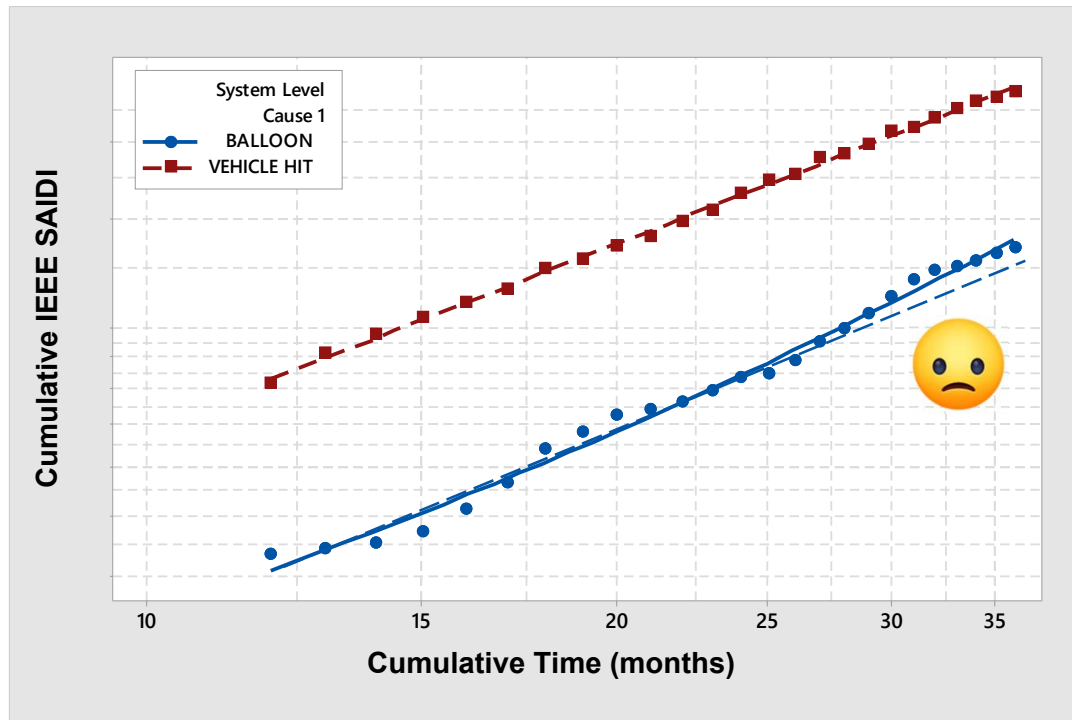


Performance by System



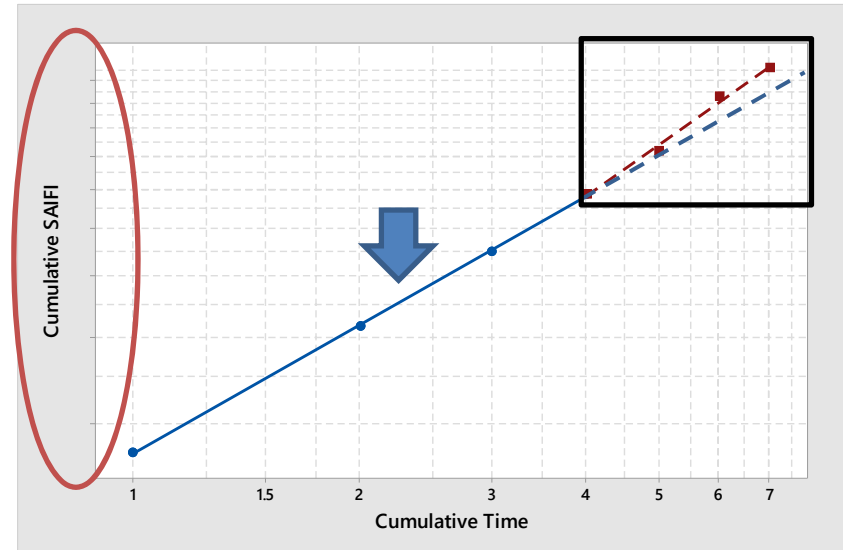
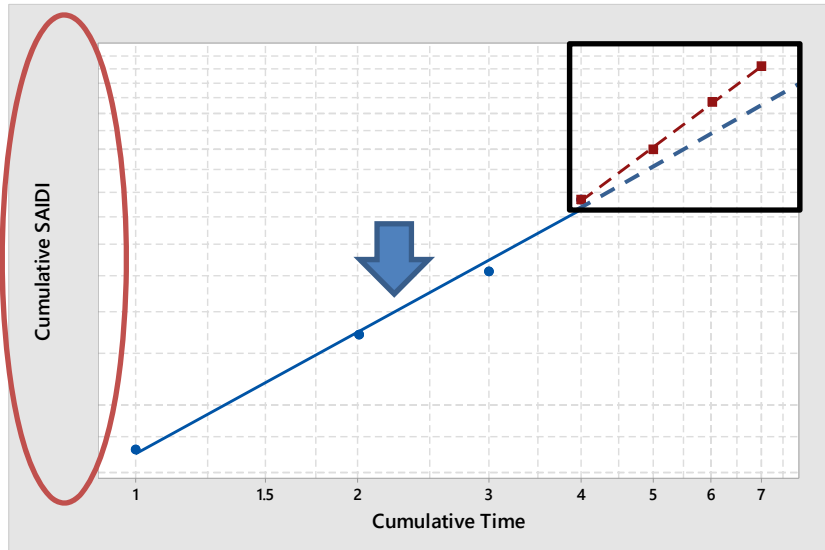
OH contribution to total SAIDI is higher than the contribution of UG
However both systems are comparable in size


Performance by Cause




Vehicle hits have higher contribution to the SAIDI however balloon caused outages are increasing

Reliability Index

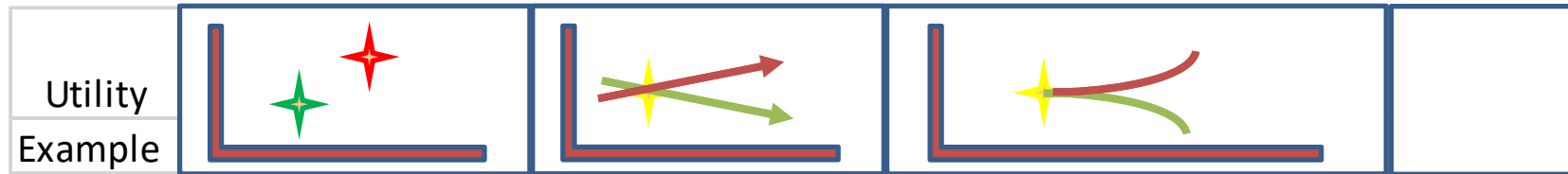


 Compute average yearly SAIDI and SAIFI

 Determine second order performance change (tip-up or tip-down)

 Assess SAIDI and SAIFI evolution over time

Project Status - Benchmarking



Green values are good, Amber needs to be monitored, Red is concern

Multivariate Machine Learning Algorithm based on utility data, self adjust with the “information content” of the data

Overall score combines all features

Outlier rejection included

Model builds with experience

Influence of individual good / bad years is minimized

Average SAIFI	Average SAIDI	SAIFI Trend	SAIDI Trend	SAIFI Tip-up/down	SAIDI Tip-up/down	Score
Amber	Amber	Green	Green	Amber	Amber	Green
Amber	Amber	Red	Amber	Amber	Green	Green
Amber	Amber	Red	Amber	Amber	Amber	Amber
Green	Green	Green	Green	Amber	Red	Amber
Green	Amber	Green	Green	Amber	Green	Green
Amber	Amber	Green	Green	Amber	Amber	Amber
Amber	Amber	Red	Amber	Amber	Green	Amber
Amber	Amber	Green	Green	Amber	Red	Amber
Amber	Amber	Green	Green	Amber	Green	Green
Amber	Amber	Green	Green	Amber	Amber	Amber
Amber	Amber	Red	Amber	Amber	Green	Amber
Amber	Amber	Green	Green	Amber	Amber	Amber
Amber	Amber	Red	Amber	Amber	Green	Amber
Amber	Amber	Green	Green	Amber	Green	Green
Amber	Amber	Green	Green	Amber	Amber	Amber

USA Visualization – IEEE Method

Algorithm
(outlier rejection,
level, trend) can
also be used for
visualization

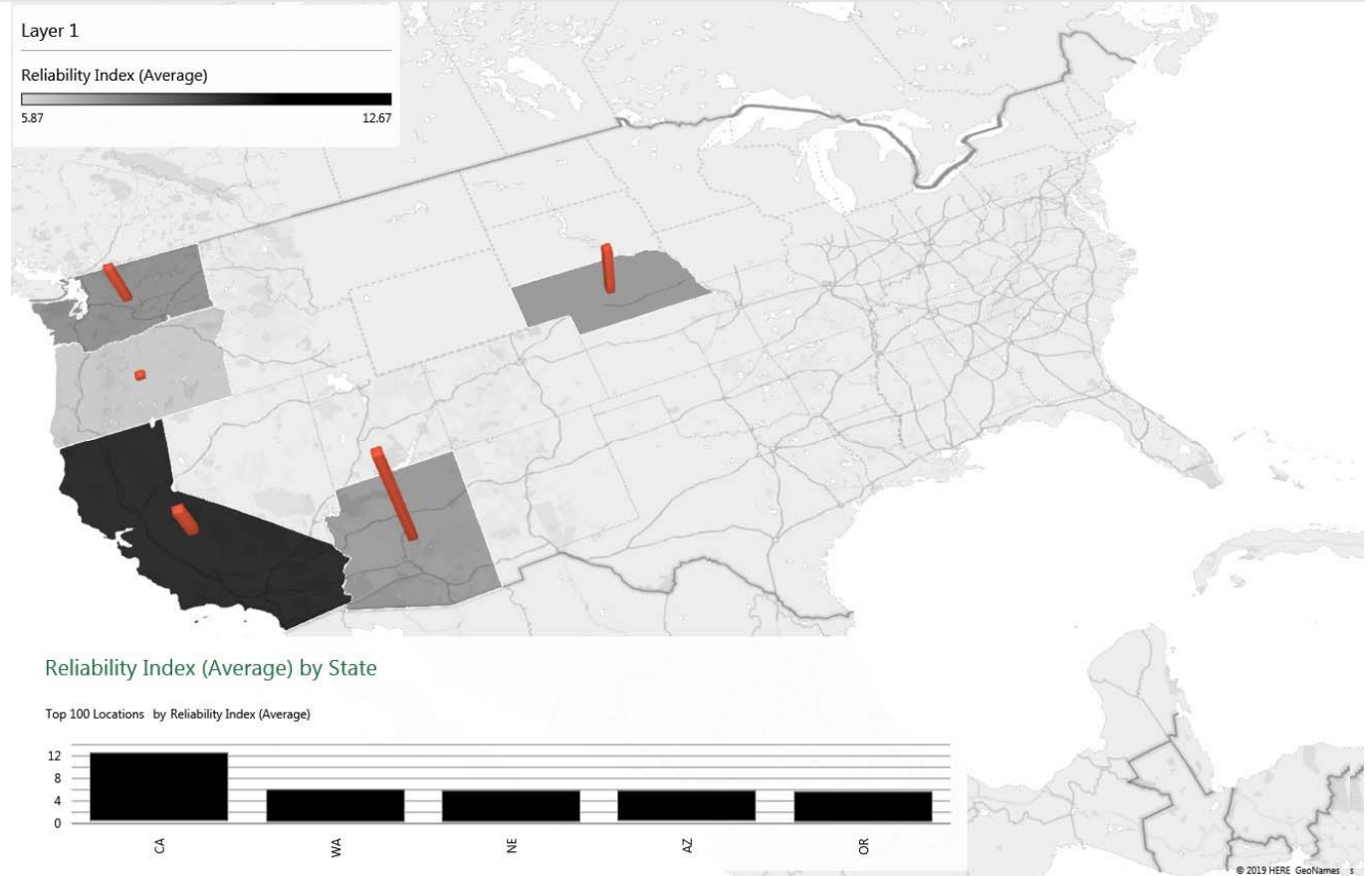
25 PUDs

220+ Munis

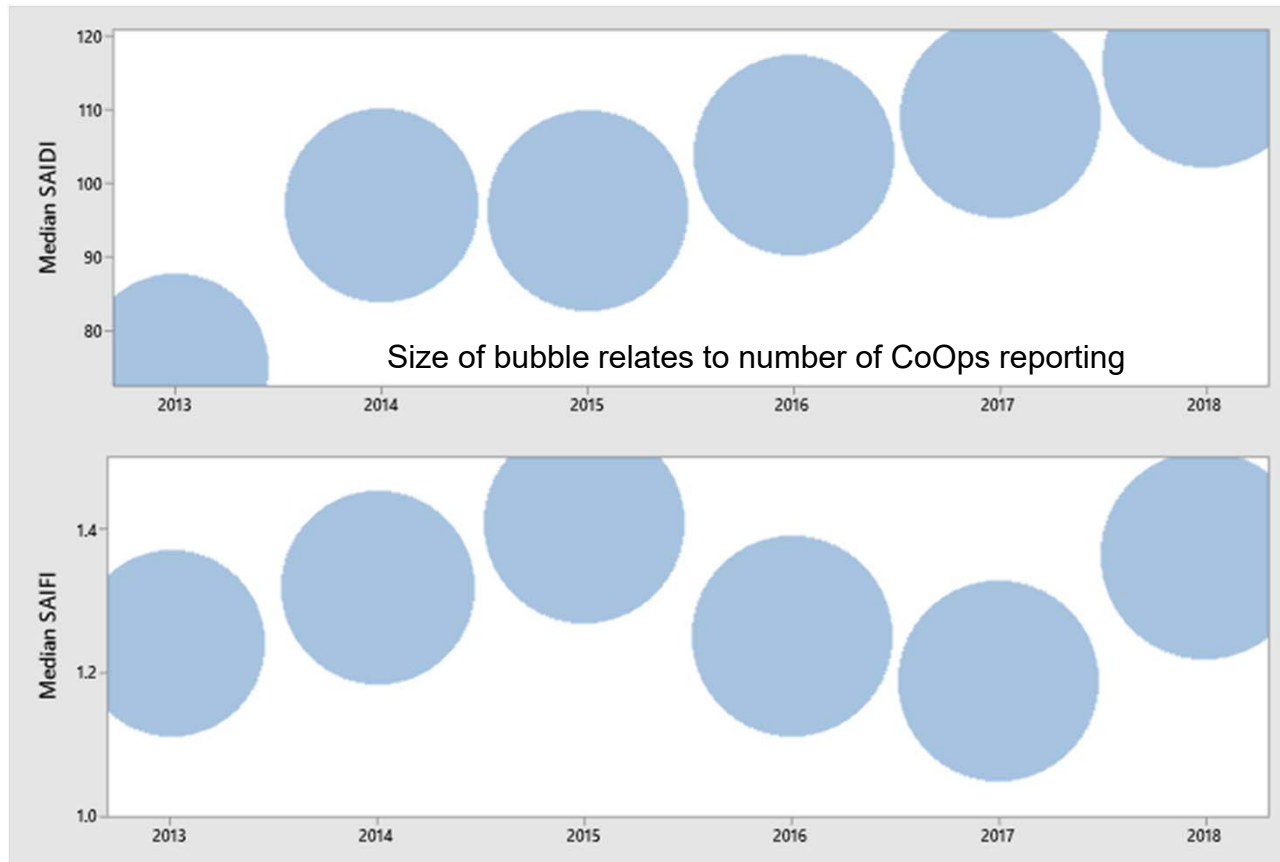
400+ Coops

150+ IOUs

800+ Utilities

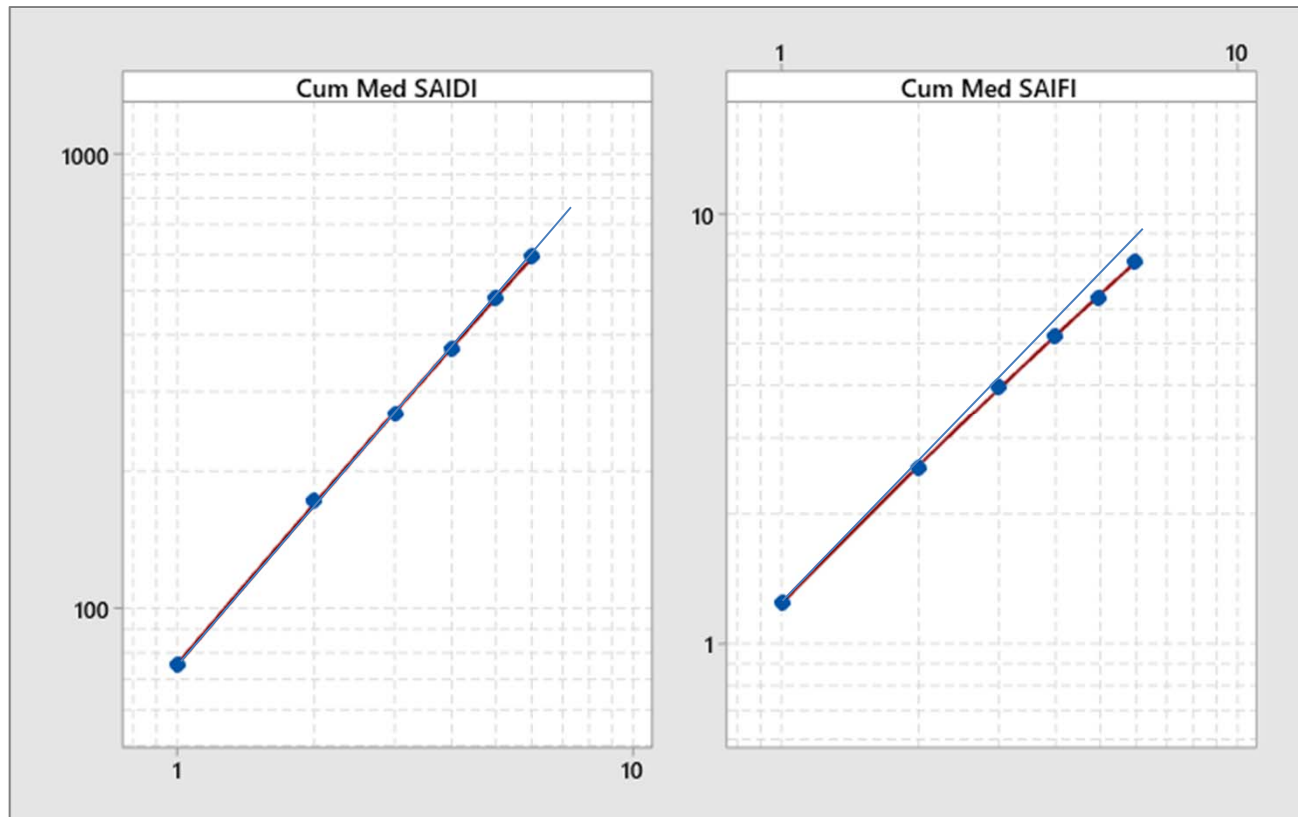


State Cooperatives Example - Median Data



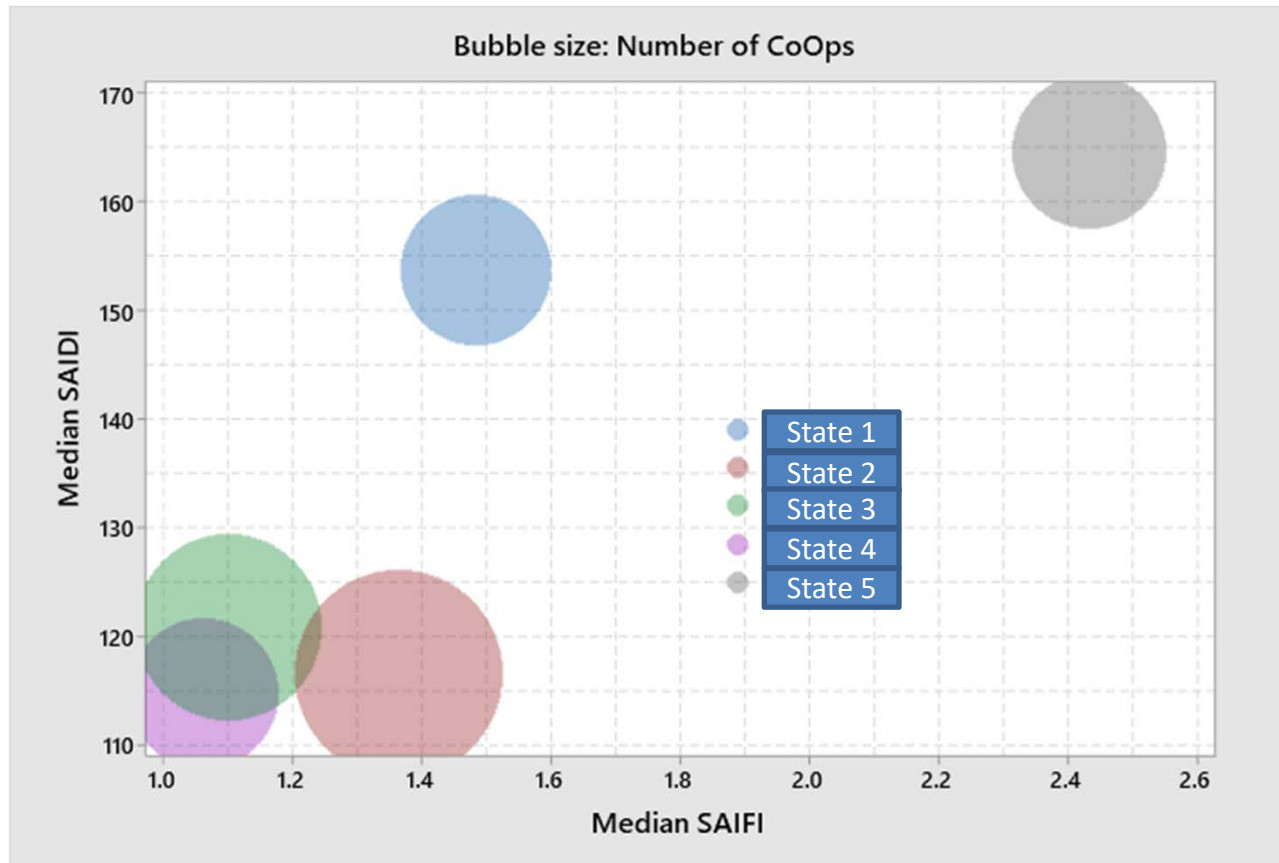
Data
Scrubbed
Outliers Rejected
2103 to 2018

State Cooperatives Example - Trending

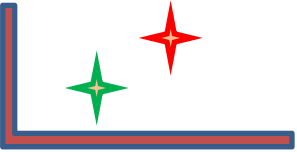
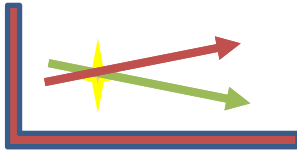
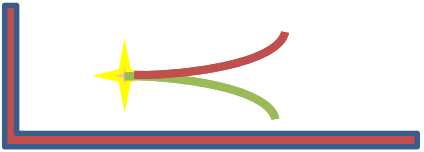


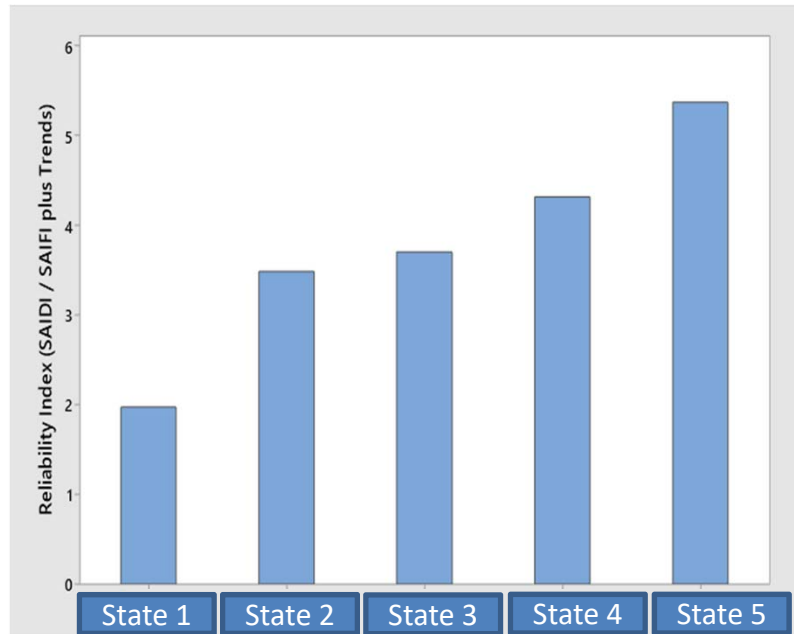
Data
Scrubbed
Outliers Rejected
2103 to 2018

State Cooperatives Example - Local Context



State Cooperatives Example - Benchmarking

Utility				Reliability Index
Example				



- Multivariate Machine Learning algorithm creates a single reliability index for benchmarking purposes
- Index can be used to compare with other state cooperatives
- Can be used with peers selected by other criteria (not geographical proximity)
- Can be used with any level of granularity



Thank you for your attention!

For more information please contact:
yamille.delvalle@neetrac.gatech.edu
nigel.hampton@neetrac.gatech.edu