Updated Measurement Framework & Normalized Severity

2023 / 2024

Measurement Framework

2023 / 2024

Why are we making changes?

- **ICBC's Collision Repair Program is continually evolving**, we're always looking to improve the Program for repair facilities and customers

- **Severity** (average repair cost) as a measure **does not account for work-mix**

- Some of you experienced **significant shifts in rank month over month**, this was the result of a few factors:
  - Quality Assurance (QA) carried a 50% overall KPI weighting
  - The average QA Review score is in the high 90% range
  - QAs are relatively low volume, applying to roughly 10% of claims
  - Program Rank was displayed based on measurement period results (May – April), early in the period claim count is limited, leading to outlier QAs having an significant impact on overall index score & rank

- Supply chain conditions have further increased the **importance of repairing / saving parts**

What are the changes?

- ICBC is introducing a new Key Performance Indictor (KPI) **“Normalized Severity”.** This KPI **accounts for each repair facility’s unique work-mix** when assessing average repair cost
- KPI weighting is **shifting from QA towards Normalized Severity**
- **Scorecards will now display** performance *&* rank based on a **12 month rolling average** *(previously year to date)*
- **Repair to Replace ratio** will now be calculated on **part count** *(rather than dollars)*

New & Reweighted KPI's

To better recognize high performing repair facilities consistently and objectively regardless of work-mix

- **Repair to Replace** measure is will now be **based on part count** rather than dollars
  - Parts under $100 are excluded from the calculation
- **Average Severity** will no longer be scored, it has been **replaced by Normalized Severity**
  - Clams under $500 or over $25k are excluded from the calculation, there are too few instances of these for the model to accurately learn / assess
- **Key to Key Cycle time will no longer be scored**, it has been replaced by Avg. Labour Hrs./Day (aka. Touch-Time)
  - Calculation remains the industry standard
    # of Repair & Refinish Hrs. / # of days (Car-in to Car-out)

Revised (*2023/24*)

KPI Measure	KPI Weighting			Repair Process Component
	Revised Quadrant Weight	Revised Sub Weight	Revised Overall Weight	
Estimatics	55% ↑	15% ↓	8.25%	Initial Estimate Efficiency
		15%	8.25%	Alternate Parts
		15%	8.25%	Repair to Replace - **Part Count**
		55% ↑	30.25%	Normalized Severity
Cycle Time	15% ↓	0% ↓	0%	~~Key to Key~~
		100% ↑	15.00%	Avg. Labour Hrs./Day
QA	30% ↓	45% ↓	13.5%	QA Review Score
		55% ↑	16.5%	QA Variance

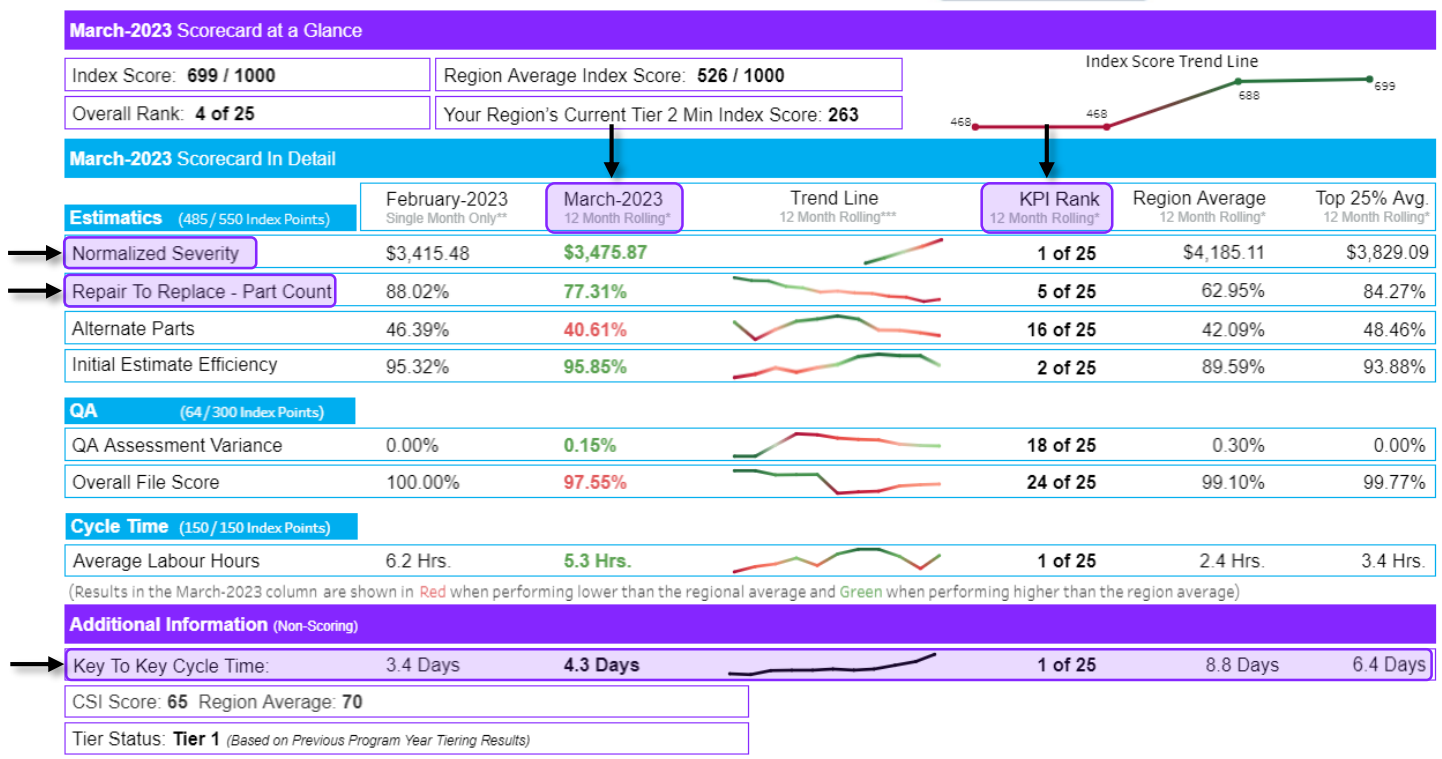
Updated Scorecard

- **Updated Scoring KPI's:**
  - Add: Normalized Severity
  - Add: Repair to Replace – Part Count
  - Remove: Key to Key Cycle-Time

    K2K Cycle-Time will still appear as a monitor only metric under "Additional Information"

- **Program YTD Scores, 12 Month Rolling**

- **KPI Rank, 12 Month Rolling**



March-2023 Scorecard at a Glance

Index Score: **699 / 1000**

Region Average Index Score: **526 / 1000**

Overall Rank: **4 of 25**

Your Region's Current Tier 2 Min Index Score: **263**

Index Score Trend Line: 468, 468, 688, 699

March-2023 Scorecard In Detail

	February-2023 Single Month Only**	March-2023 12 Month Rolling*	Trend Line 12 Month Rolling***	KPI Rank 12 Month Rolling*	Region Average 12 Month Rolling*	Top 25% Avg. 12 Month Rolling*
Estimatics (485 / 550 Index Points)						
Normalized Severity	$3,415.48	$3,475.87		1 of 25	$4,185.11	$3,829.09
Repair To Replace - Part Count	88.02%	77.31%		5 of 25	62.95%	84.27%
Alternate Parts	46.39%	40.61%		16 of 25	42.09%	48.46%
Initial Estimate Efficiency	95.32%	95.85%		2 of 25	89.59%	93.88%
QA (64 / 300 Index Points)						
QA Assessment Variance	0.00%	0.15%		18 of 25	0.30%	0.00%
Overall File Score	100.00%	97.55%		24 of 25	99.10%	99.77%
Cycle Time (150 / 150 Index Points)						
Average Labour Hours	6.2 Hrs.	5.3 Hrs.		1 of 25	2.4 Hrs.	3.4 Hrs.

(Results in the March-2023 column are shown in Red when performing lower than the regional average and Green when performing higher than the region average)

Additional Information (Non-Scoring)

Key To Key Cycle Time:	3.4 Days	**4.3 Days**		**1 of 25**	8.8 Days	6.4 Days

CSI Score: **65** Region Average: **70**

Tier Status: **Tier 1** *(Based on Previous Program Year Tiering Results)*

Normalized Severity

Introduction to Normalized Severity

What is Normalized Severity?

Normalized severity is a model created to measure a repair facility's ability to make cost effective decisions and **considers claim and repair differences outside of a repair facility's control** (work mix variables) when calculating average repair cost.

Average Severity views all repairs as equal

Normalized Severity views all repairs as unique

Parallel

ICBC has 40+ years experience setting insurance rates based on vehicle, driver, usage and location factors.

Normalized Severity uses a similar statistical technique.

Introduction to Normalized Severity

What data and tools were used to create the Normalized Severity Model?

- **12 months of rolling data** – hundreds of thousands of claims analyzed
  - **Why 12 months? Why rolling?**
    - Meaningful, statistically significant period of time required for accurate training of the model
    - The Collision industry is rapidly changing – for example, the increased prevalence of ADAS and 4 stage paint – we want to ensure new variables are taken into account
    - 12 months strikes the ideal balance between sample size and current / relevant data
- Over 200 Variables have been analyzed, roughly **150 of these variables were found to have an impact on repair cost** – these are considered when calculating Normalized Severity.

Introduction to Normalized Severity

What data and tools were used to create the Normalized Severity Model?

- At a high level, the **variables considered** are:
  - **Vehicle:** make, body style, engine type, model year, MSRP, fuel type
  - **Incident**: point of impact, seasonality, incident type, incident location
  - **Operations**: type of parts and repair work required (e.g. body, frame, mech., hood, bumper, etc.)
  - **Drive Status**: Whether the vehicle is drivable or non-drive (i.e., non-drive repairs compared against non-drive repairs)

  Full list of variables will be posted to the MD Partners Page

- There are multiple **machine learning algorithms** available to create forecasting models, several were considered

- **Explainable Boosting Machine,** was determined to be the **optimum Statistical Forecasting Model**, it provides the ideal balance of transparency and accuracy

Normalizing Severity

Training the model – Process

Amounts indicated are for **illustration purposes only**

1. **Establish Provincial Average Severity**

   Total Cost of All Repairs Provincially divided by the **Number of Repairs Provincially**
   e.g. $732,183,540 / 195,771 = **$3,740**

2. **Establish Provincial Average Severity for each Variable**

   Total Cost of All Non-Drive Repairs divided by the **Number of Non-Drive Repairs**
   e.g. $109,827,531 / 20,908 = **$5,253**

3. **Establish Provincial Average Impact of each Variable**

   Avg. Non-Drive Severity less **Avg. Severity**
   e.g. $5,253 - $3,740 = **$1,513**

Steps 2 & 3 are repeated for each work mix variable

Result

Avg. Severity: **$3,740**

Avg. Non-Drive Severity: **$5,253**

Impact of Non-Drive Severity: **+$1,513**

Normalizing Severity

Training the model – Output

Amounts indicated are for **illustration purposes only**

Top Variables	Increases Repair Cost		Decreases Repair Cost	
Drive/Non-drive	Non-drivable	+$1,513	Drivable	-$112
Primary Point of Impact	All over Front center Front corner Roll over Right side Left side	+$1,131 +$531 +$522 +$275 +$111 +$3	Non collision Front side Unknown Rear center Rear corner Rear side Undercarriage	-$115 -$123 -$138 -$183 -$521 -$601 -$616
Loss cause	Single vehicle collision Multi vehicle collision Fire or weather	+$383 +$194 +$43	Hit and run Other Theft or vandalism	-$223 -$875 -$1,200
Model year	2016 – 2019 Greater than 2020	+$188 +$340	Before 1988 1988-1992 1993-2005 2006-2015	-$67 -$588 -$750 -$330
MSRP *(at time of purchase)*	40K - 55K 55K - 70K 70K - 90K 90K - 130K More than 130K	+$175 +$370 +$630 +$1,000 +$1,324	25K – 40K 15K – 25K Less than 15K	-$100 -$412 -$613
Seasonality	May – September October	+$400 +$165	April November – March	-$17 -$200

Comments

- Increase / Decrease is **relative to Provincial Average Severity**
- For simplicity we are focusing on a handful of top variables (rather than all 150+)
- A **complete list** will be available on the **MD Partners Page**
- **Impacts of each variable will be continually updated** as the model is re-trained monthly

Calculating Normalized Severity

Calculating Normalized Severity at the claim level

Amounts indicated are for **illustration purposes only**

City: Dawson Creek, 2018 Toyota Camry, Drivable, Impact Front Centre, Single Vehicle, Aug 1st

Provincial Average Severity	**$3,740**
Region (Northeast)	+$221
Drivable	-$112
Primary POI (Front Center)	+$531
Loss Cause (Single Vehicle)	+$383
Model Year (2016 - 2019)	+$188
MSRP ($25k - 40K)	-$100
Season (August)	+$400
Modeled Repair Cost	**$5,251**

Actual Repair Cost (Severity)	**$4,983**
÷	
Modeled Repair Cost	**$5,251**
=	
Performance Ratio	**0.95**
×	
Provincial Average Severity	**$3,740**
=	
Normalized Severity	**$3,553**

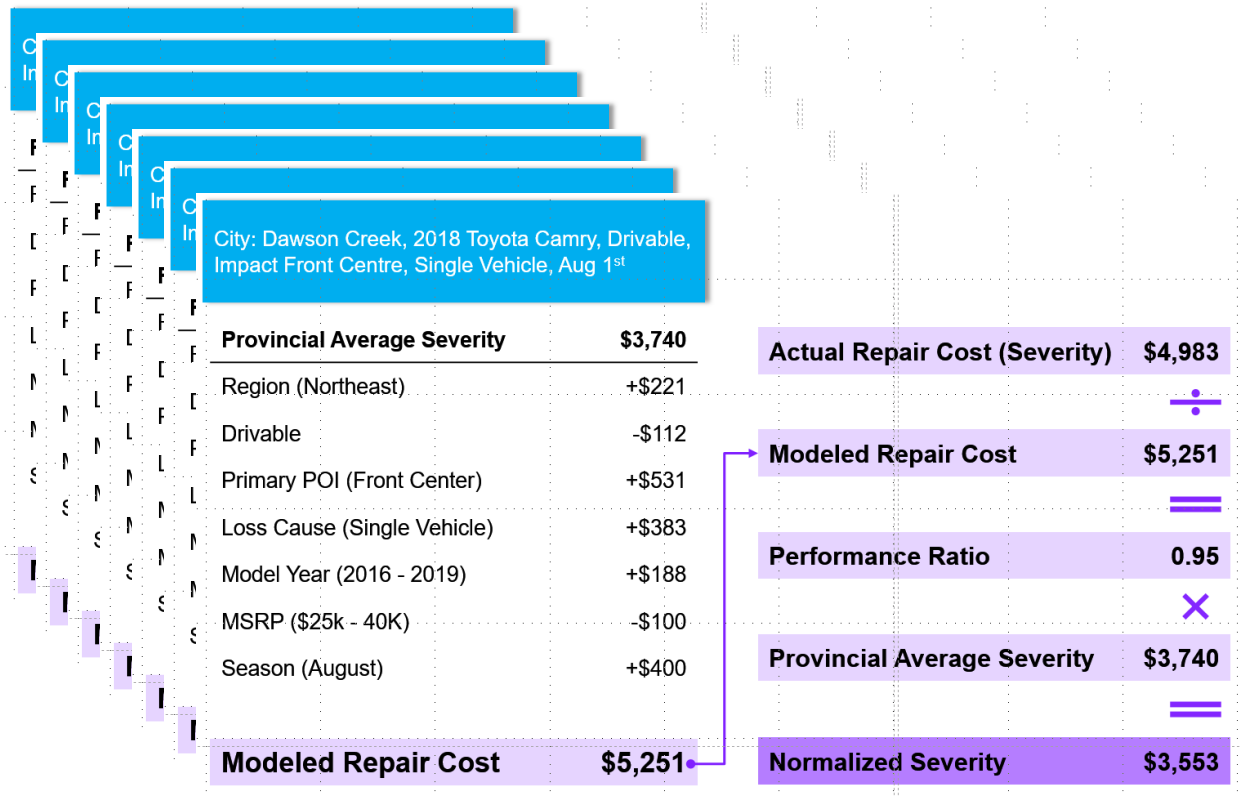
Considerations

- For this example we are considering 7 variables
- **In practice more than 150 variables are considered on each claim**
- There are millions of possible outcomes
- **Each repair is unique**

Calculating Normalized Severity

Calculating Normalized Severity at the shop level

Amounts indicated are for **illustration purposes only**



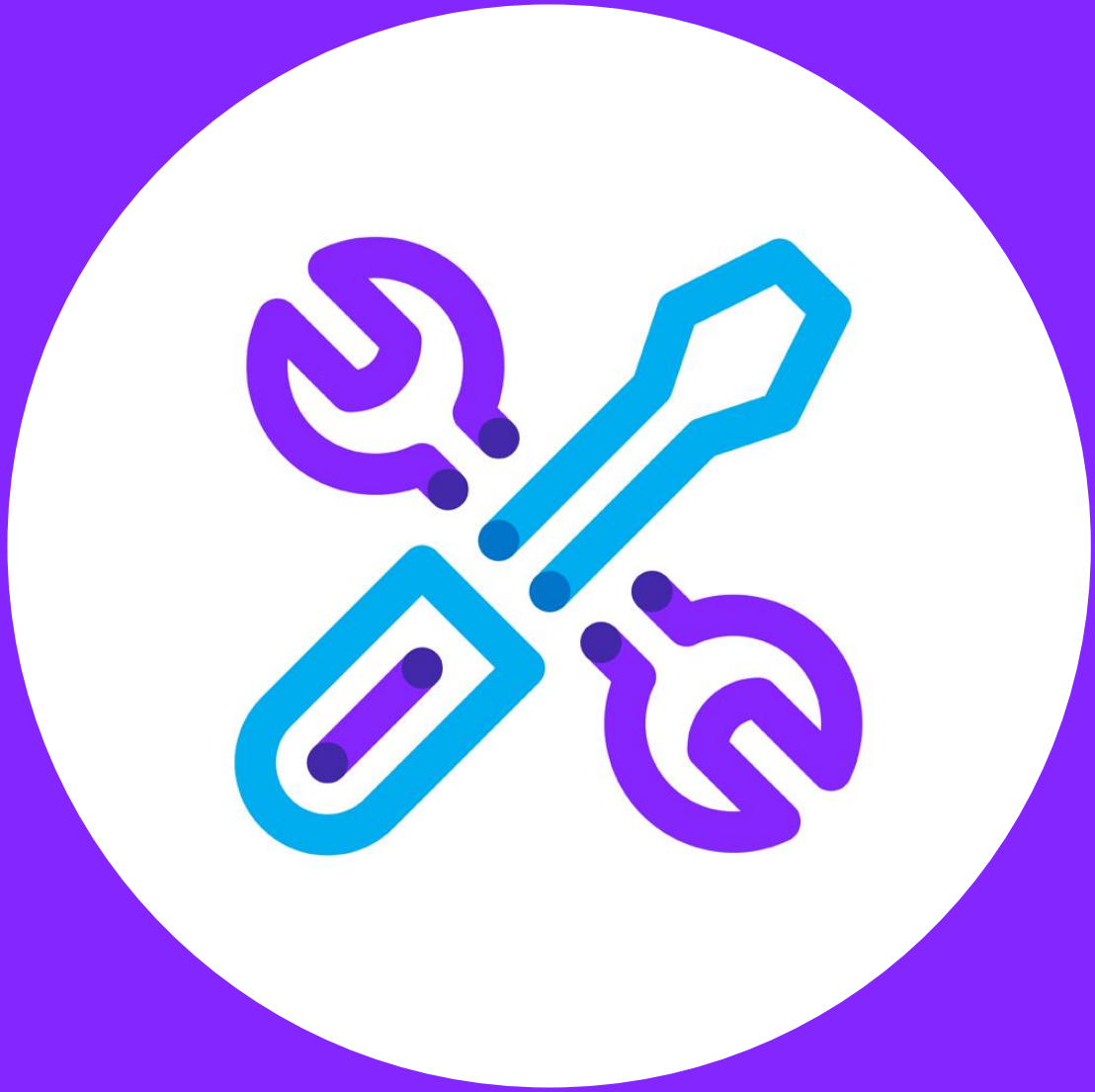
The **claim level calculation is applied to each repair** within the measurement period

The average of all claims completed by your repair facility **appears on your scorecard**

Under the hood

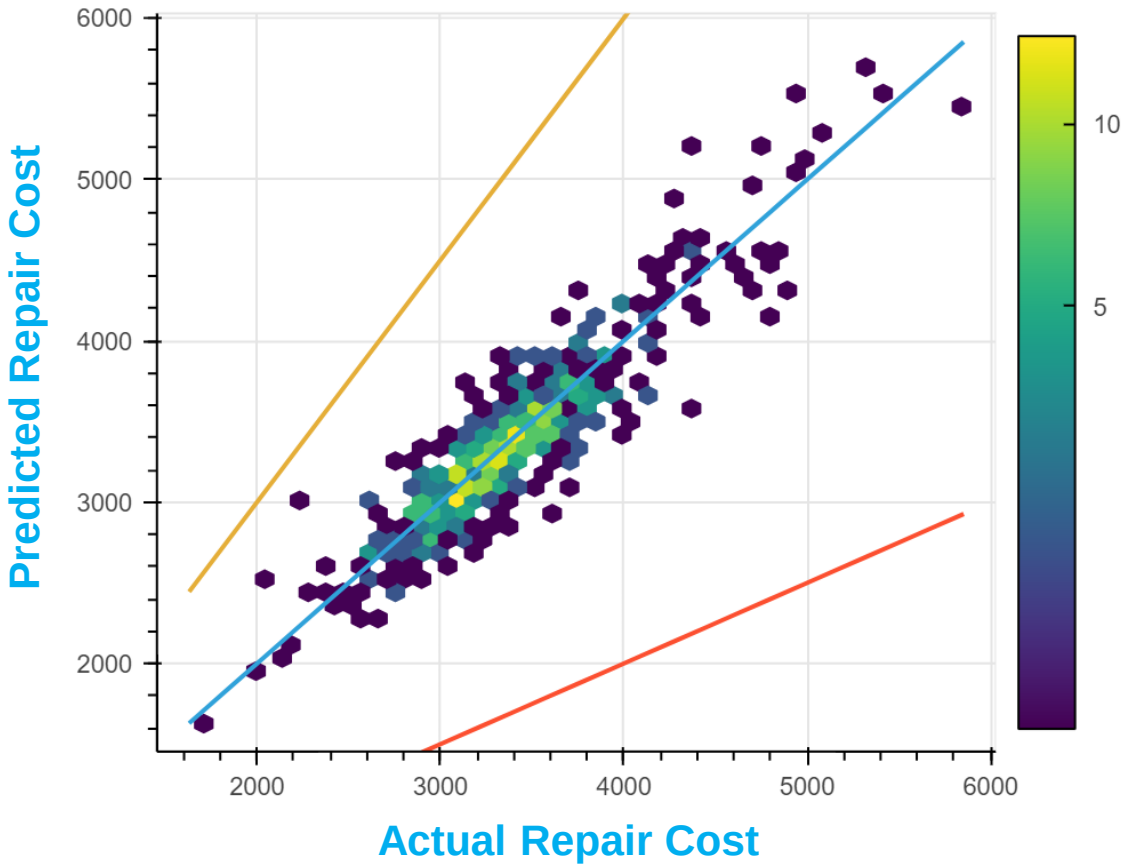
Model accuracy

Explainable Boost Machine

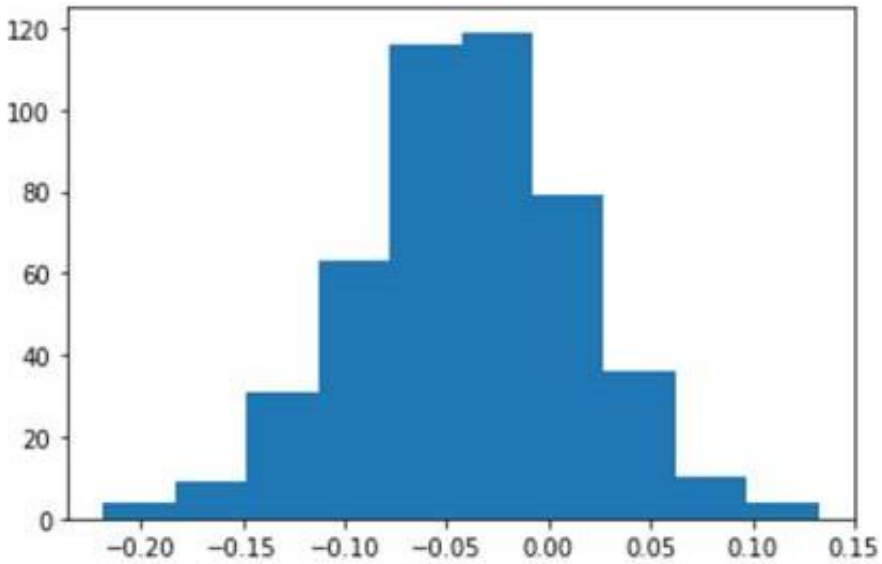


How do we know the model works?

Undertanding model accuracy



In 95% of test cases the Modeled vs. Actual Severity varies by an average of just 4%



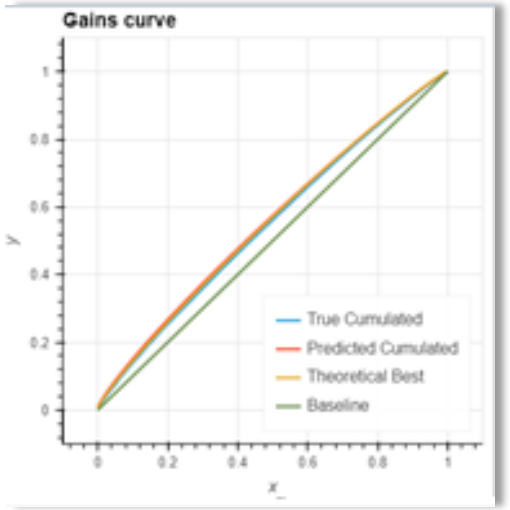
How do we know the model works?

Metrics logged & monitoerd to ensure model performance

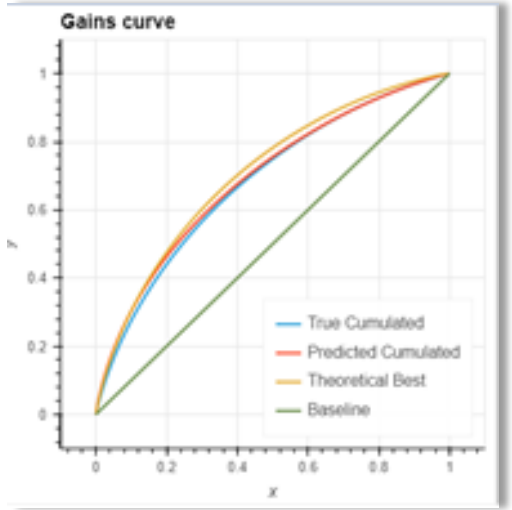
Gains Curves & Gini coefficients

Gini coefficient is derived by comparing cumulative gains curve to the straight diagonal line (which represents having no predictive information).

Shop level



Claim level



R^2 & RMSE:

Performance metrics to ensure models are robust and consistent.

Results Level	Model Gini	Perfect Gini	r^2	RMSE
Claim	0.37	0.42	0.70	1974
Shop	0.09	0.10	0.68	462

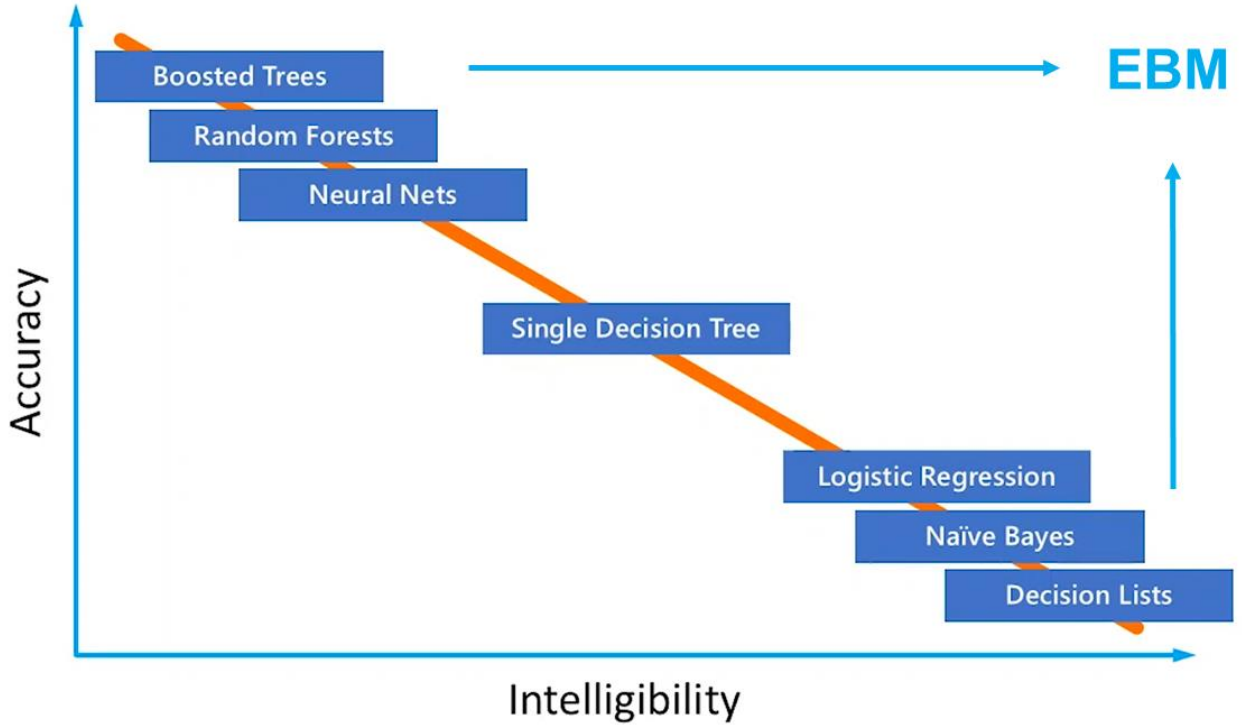
Creating Normalized Severity

Explainable Boosting Machine (EBM) – Additive boosting model

[1] – Microsoft

Benefits:

- High Accuracy, Intelligibility, and Editability
- Glass Box model
- Negates the need for conventional, Black Box models



[1] See the reference paper for full details.

Questions

Tom.Maple@ICBC.com

Or your MD Account Rep

Auto Body & Collision Apprentice Cohort

Apprentice Incentive Background

- ICBC introduced a pilot program to support collision industry sustainment with the goal of increasing apprentice retention rates
- This is a proof of concept, specific dates that will be measured to determine success
- **Auto Body & Collision Technician** and **Automotive Refinishing Technician** apprentices & certifications has not kept up with demand and volume
- Approximately 52 Auto Body & Collision Technician and 34 Automotive Refinish Technicians achieve certification annually
- ICBC is looking to find ways to support industry in attracting and retaining interest in technical roles in the collision industry
- Pilot closes September, 2028

Commenced Oct 1, 2022

What is changing?

- Announced on February 23, 2023 eligibility of the program will be extended to September 30, 2023
- The program was expanded to include Automotive Refinishing Technicians
- All registered apprentices and facilities are eligible for level increases where applicable
- Incentive payments will continue to be paid up to September 30, 2028

Extended to Sept 30, 2023

Available Apprentices Incentives

- Cohort - Eligibility to new or existing apprentices employed at a Collision Repair Program facility between Oct 1, 2022 to Sep 31, 2023
- Auto Body & Collision and Automotive Refinisher Apprentices that successfully complete level 1 receive $1,500 tool grant
- Collision Repair Program participants awarded $1,000 per apprentice for each successful completion of level
- **Goal** – Apprentices progressively moved towards certification increasing retention

Oct 1, 2022 to Sept 30, 2023

Apprentice Cohort Examples

- Apprentice registered January 15, 2023 (New apprentice eligible in the cohort dates)
- Apprentice completes **level 1** January 15, 2024
  - ICBC issues $1,500 tool grant to apprentice and $1,000 to collision repair facility
- Apprentice completes **level 2** January 15, 2025
  - ICBC issues $1,000 to collision repair facility
- Apprentice completes **level 3** January 15, 2026
  - ICBC issues $1,000 to collision repair facility
- Apprentice completes **level 4** January 15, 2027
  - ICBC issues $1,000 to collision repair facility

- Total paid over four years
  - $1,500 to apprentice
  - $4,000 to Collision Repair Program facility

Scenario 1

Apprentice Cohort Examples

- Apprentice already registered, currently successfully completed **level 2**

- Apprentice completes **level 3** September 1, 2023
  - ICBC issues $1,000 to collision repair facility
- Apprentice completes **level 4** September 1, 2024
  - ICBC issues $1,000 to collision repair facility
- Apprentice receives certification

- Total paid over four years
  - $0 to apprentice
  - $2,000 to Collision Repair Program facility

Scenario 2

How do I register?

- ICBC will review Entegral to identify existing apprentices employed at your facility
- Apprentices must be registered with the Industry Training Authority (ITA)

  Important – Ensure your facility information is accurate

- ICBC will verify with your facility the apprentice information and current status, e.g. Level 2
- New apprentices – inform ICBC at supplierprograms@icbc.com **prior to 30 September, 2023**

How do I receive compensation?

- **Let us know** when your apprentice completes a level of apprenticeship
- ICBC will verify the level of completion with the ITA, documentation may be required to support level completion
- Once the level of completion ICBC will issue applicable payments to the Collision Repair Program facility and apprentice, if applicable
- Many payments have already been issued!

Note: Pilot expires September 30, 2028, no cheques will be issued after

Questions, comments and feedback

Please contact **MD Account Services** regarding any questions

md-account-services.pdf (icbc.com)

Thank you

Appendix

Complete list of variables

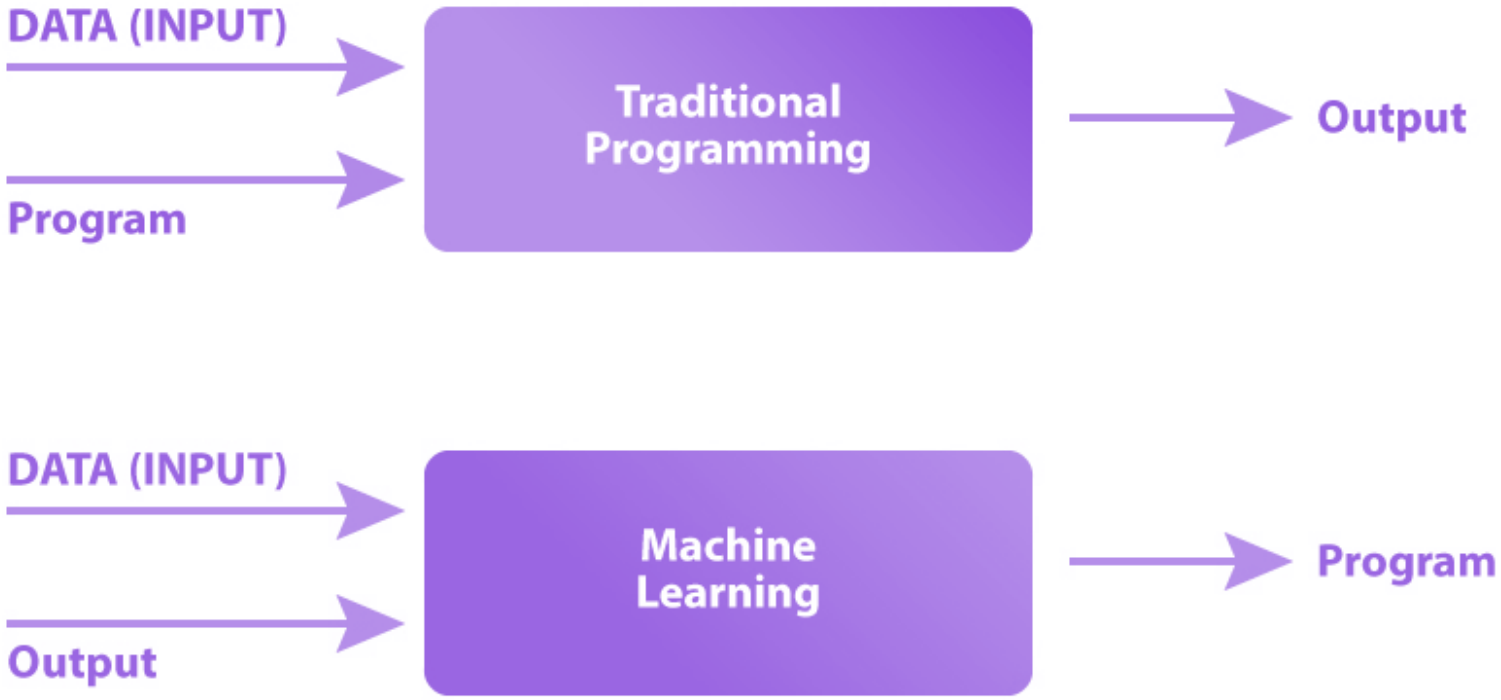
A	**A/c/heater, a/c/heater/ventilation, abs/brakes, additional costs & materials, additional operations, air bag system, air cleaner, air conditioning,**	**N**	
B	Body, back door, back panel, back window, body assy, body components, bumper/grille,	O	
C	Cab, cab assy, cab sheet metal, center console, center seat, coach, convertible top, cooling, cowl & dash, cruise control system,	P	Prime point of impact, panoramic roof, pickup bed, pickup bed side panel,
D	Drivable/non drivable flag,	Q	Quarter glass, quarter moulding, quarter panel,
E	Endorsement, electrical, electronic suspension components, emission system, engine, engine/body under covers, engine/trans, engine/trans mounts, engine lid, engine mounts, engine oil cooler, engine under cover, exhaust,	R	Region of Repair, Refinish, rear axle, rear body, rear bumper, rear console, rear door, rear drive axle, rear fender, rear floor, rear gate, rear lamps, rear seat, rear steering linkage/gear, rear suspension, rocker/pillars, rocker/pillars/floor, rocker panel, roll bar, roof,
F	Frame, fasteners, floor, frame, frame/floor, front body, front bumper, front bumper/grille, front door, front drive axle, front fender, front floor, front inner structure, front lamps, front panels, front seat, front sheet metal, front steering linkage/gear, front suspension, fuel tank,	S	Seasonality (i.e., month of collision), seat, seat belts, side body, side door, special/manual entry, steering column, steering gear, steering linkage, steering pump, steering wheel/column, stripe tape, sunroof, supercharger, supercharger/intercooler,
G	Glass, grille, grille/front panel, ground effects,	T	T-bar roof, tailgate, top assy, trans oil cooler, turbocharger, turbocharger/intercooler,
H	Hardtop, hood,	U	Uniside assembly,
I	Incident type (e.g. collision vs vandalism), Incident scenario (e.g. parking lot vs intersection), information labels, instrument panel, intercooler,	V	Vehicle make, Vehicle type, Vehicle engine configuration, Vehicle engine fuel, Vehicle model year, Vehicle MSRP, van side panel,
J		W	Wheel, windshield
K		X	
L	Labor operations, liftgate, luggage lid,	Y	
M	Mechanical, manual entries,	Z	

Comments

These are the variables currently used – as more data is gathered, variables may be updated (annually).

What is Machine Learning

And how can it help us understand Collision repair costs?



Grant Learning
https://www.mygreatlearning.com/blog/what-is-machine-learning/

How does EBM work

Algorithm 1 Gradient Boosting for Regression

1: $f_j \leftarrow 0$
2: **for** $m = 1$ to M **do**
3: **for** $j = 1$ to n **do**
4: $\mathcal{R} \leftarrow \{x_{ij}, y_i - \sum_k f_k\}_1^N$
5: Learn shaping function $S : x_j \rightarrow y$ using $\mathcal{R}$ as training dataset
6: $f_j \leftarrow f_j + S$

Where:

- N: dataset size
- n: number of features
- M: number of iterations
- R: residuals

generalized additive model

$$g(E[y]) = \beta_0 + \sum f_i(x_i) + \sum f_{i,j}(x_i, x_j)$$

interactions between variables

[1] See the reference paper for full details.

What is Normalized Severity?

- When your **Actual Repair Cost** is **less** than the **Predicted Repair Cost** – you are making good repair decisions and effectively managing your costs – this will give you a strong **Performance Ratio.**

Each month, your **Performance Ratios** will be assessed against the **Provincial Average Severity** – if you are **below** the **Provincial Average Severity**, you are making the most cost effective decisions and will receive a strong **Normalized Severity Rating** **– you will be ranked more highly than peers who are not as cost effective** 👍

- When your **Actual Repair Cost** is **more** than the **Predicted Repair Cost** – then you have the opportunity to improve: your cost management decision making process; your **Performance Ratio** *and* your **Normalized Severity** rating. 👍

Note

The **Predicted Repair Cost** is calculated using **12 months of rolling data** – all data variables will be continuously gathered and analysed to ensure that the Predicted Repair Cost remains fair and accurately reflects the current environment and market conditions.