Billed It or Missed It?

Sophia Brady
MBAN Capstone Partner

Godwin Zonou
MBAN Capstone Partner

Faculty Advisor: Dr. Ilya Jackson
Company Advisors: Peter Greskoff, Grace An

Detecting Missed Billing at Scale

Project Overview

Problem Statement

- Lineage operates across over 400 warehouses and bills 200+ accessorial charges manually – a process prone to missed billings.
- Lineage wants to recoup this leaked revenue by systematically identifying operational events that should have been billed but were not.
- The project targets approximately $50 million in recoverable revenue.

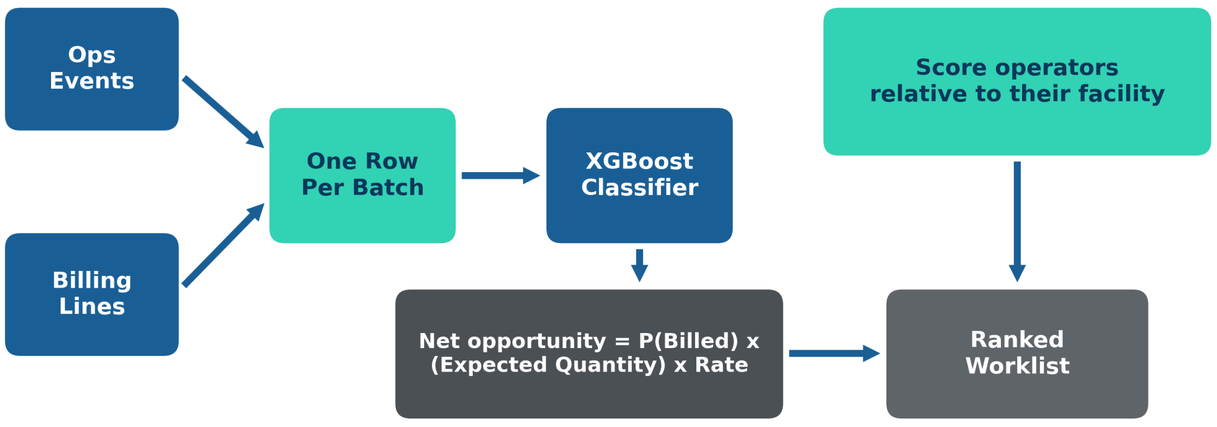
Data

- Operational data: pallet-level inbound and outbound events.
- Billing data: order-level billing history for both inbound and outbound orders.
- Rate data: miscellaneous charge table with billing rates.
- Operator data: employee data at the batch level.

Approach & Framework

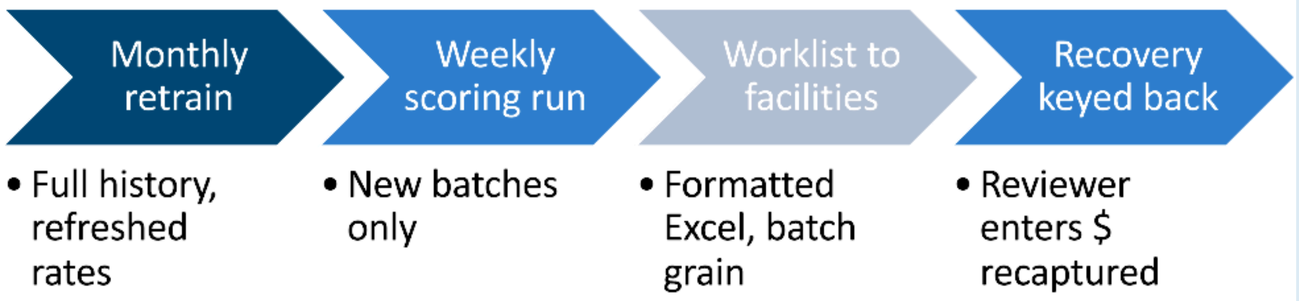
Approach

- We built one generalized anomaly detection system for every billing category.
- Our model predicts whether a batch should have been billed or not and flags batches with a high probability.
- We compute the expected recoverable revenue and send for review.
- Operator scores help reviewers prioritize anomalies from operators who consistently miss billings.



Framework

- Retrain the model on historical data every new month.
- Run the pipeline every week and send scored anomalies for review.
- Enter recovered revenue after review.



Results

Category	Test AUC	Expected Recovery / Yr
Blast Freezing	0.930	$840k
Pallet Sales	0.976	$270k
5 More Categories	~0.97	$782k

$$\text{Expected Recovery} = \underbrace{\frac{\sum_{i,j \in W} p_{ij}\, q_{ij}\, r_{ij}}{B_W}}_{\text{leakage rate } \ell = 3.95\%} \times B_{\text{yr}} \times \alpha$$

- **W = 4-week out-of-sample scoring window (batches i, categories j)**
- **p = calibrated probability the charge was missed**
- **q = recoverable quantity**
- **r = contracted customer rate**
- **B_W: billed accessorial revenue in W**
- **B_Y: billed accessorial revenue in 12mo**
- **α : rebill rate (50-85%)**

Business Impact

Deployable Anomaly Detection Framework

~$1.7M/yr
(44 facilities)