

# Interim Progress Report for **verizon**<sup>v</sup>



# Agenda

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## Business Problem & EDA

*Summary of Verizon's primary challenge and brief review of dataset*

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## Methodology and Model Selection

*Overview of the selected model*

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*Demonstration of model performance metrics*

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## Business Value Estimation

*Credible estimate of the model's business value and financial impact*

# Business Problem & EDA

*Summary of Verizon's primary challenge and brief review of dataset*

# Customer Payment Failures Causing Substantial Revenue Loss

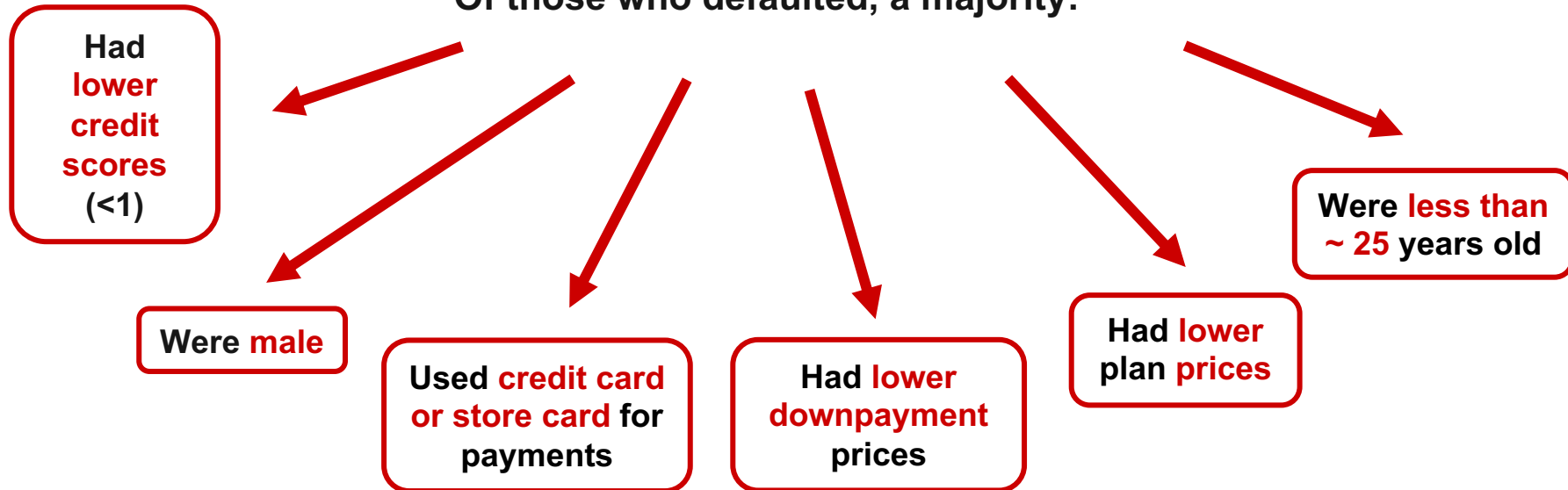


- Our **business model** relies heavily on consumers purchasing cell phones through **contracts**, but this introduces the **risk** of customers **failing** to complete their **payments**.
- As the company grows, it's critical to **identify customers** who are **more likely to default** on their contracts.
- Our **goal** is to **predict** which customers are at **higher risk of defaulting**, enabling proactive actions to **reduce financial risk** and **improve customer retention**.

# Key Characteristics of Defaulting Customers

In our data, **11.5%** of the customers **defaulted**.

Of those who defaulted, a majority:



# Methodology and Model Selection

*Overview of the selected model*

# XGBoost Model For Real-Time Prediction of Potential Customer Default

XGBoost is an advanced tool for making precise predictions by learning from previous patterns and adjusting based on past errors.

Think of it as a team working together, with each member improving on the last, to reach the most accurate result.

# Why XGBoost: A Superior Choice for Predictive Modeling

- ✓ **Handles Class Imbalance**

*Manages the default rate by emphasizing high-risk customers, reducing losses from missed defaulters.*

- ✓ **Efficient with Large Data**

*Optimized for Verizon's extensive dataset (demographics, payment history, usage patterns), enabling rapid and cost-effective model execution.*

- ✓ **Feature Importance**

*Identifies key factors like payment type, credit score, and age, offering actionable insights for targeted retention and risk management.*

- ✓ **Captures Complex Patterns**

*Models nonlinear interactions in customer data, essential for precise predictions where default drivers are multi-faceted.*

- ✓ **Business-Driven Tuning**

*Loss function adjusted to prioritize false-negative minimization, aligning with Verizon's financial risk mitigation strategy.*



# Model Performance and Evaluation

*Demonstration of model  
performance metrics*

# The XGBoost Model has 90% Accuracy for Predicting Customer Default

During testing our model achieved a high overall **accuracy** of **90%** and maintains strong **recall** for both non-default (91%) and **default (81%)** predictions.

Further, the feature SHAP importance<sup>^</sup> shows the most influential factors in predicting default risk

	Precision	Recall	F1 Score
Non-Default	97%	91%	94%
Default	52%	<b>81%</b>	<b>63%</b>
Model Accuracy	<b>90%</b>		

Top Features	Feature Importance <sup>^</sup>
Credit Score	21%
Payment Type – Credit	16%
Downpayment	14%
Monthly Payment	11%
Payment Left	9%
Payment Type – Gift Card	9%
Months Due	5%
Age	5%
Price	3%
Gender	2%

\*Detailed model performance slide in Appendix.

<sup>^</sup>Feature importance based on Shapley (SHAP) values

# XGBoost Maximizes Revenue Through By Minimizing False Predictions

When our model is used to predict defaults in our database, it achieves a **low rate of false predictions**, with a 7% false positive rate and less than 1% false negative rate. This performance enables us to maximize revenue by optimizing the value equation.

We ensured the right balance for best revenue by applying appropriate higher penalty\* for false negatives in the XGBoost loss function.

True label	Non-Default	Default
	Predicted label	Predicted label
Non-Default	20,209 81%	1,767 7%
Default	181 <1%	2,676 11%

\* Penalty for FN vs FT is 4:1 based on revenue loss values

# Business Value Estimation

*Credible estimate of the model's  
business value and financial  
impact*

# Value Estimation Based on Profits and Loss From Model Predictions

- ✓ **Minimizing Future Loss by Catching Potential Defaulters**: If the model accurately identifies a potential defaulter
- ✓ **Profit from Reliable Customers**: When the model accurately predicts that a customer will pay
- ✓ **Missed Revenue from Overly Conservative Predictions**: If the model incorrectly flags a paying customer as a potential defaulter
- ✓ **Loss from Overlooked Defaulters**: If the model fails to identify an actual defaulter

**Net Value = Savings from  
Catching Defaulters + Profit from  
Reliable Customers - Missed  
Revenue - Loss from Overlooked  
Defaulters**

Assumptions made:

Direct average revenue loss of roughly \$1000 per default

Direct average profits of roughly \$250 spread out over a 36-month contract

# XGBoost Model Provides A Net Value Increase of \$200 million

	Model Prediction - percentage of total applicants	Impact per applicant	Financial impact projection	
			24,833 Applicants	1 Million Applicants
Reducing loss from catching potential defaulters	11%	\$1000	\$2,731,630	\$107,759,836
Profit from reliable customers	81.3%	\$250	\$5,028,683	\$203,449,040
Missed revenue from overly conservative predictions	7%	-\$250	-\$434,578	-\$17,788,829
Loss from overlooked defaulters	0.7%	-\$1000	-\$248,330	-\$7,288,688
Net Value			<b>\$7,077,405</b>	<b>\$286,131,357</b>

**Current System has net value at around \$85 million\***

\*Current system value breakdown in Appendix

# Turning Insights into Action: Next Steps and Key Recommendations

- ✓ **Deploy and Monitor XGBoost Model:** validate live prediction and track model performance
- ✓ **Introduce Survival Analysis:** recommended for predicting contract duration and default timing, enable targeted interventions and optimized retention efforts
- ✓ **Customer Segmentation:** utilize risk scores (probability of default) to adapt contract terms for high-risk customers while incentivizing loyalty for low-risk customers
- ✓ **Continuous Improvement:** retain the model periodically and evaluate risk tolerance regularly
- ✓ **Customer Experience Focus:** ensure transparency in approval/rejection processes

# Key Takeaway:

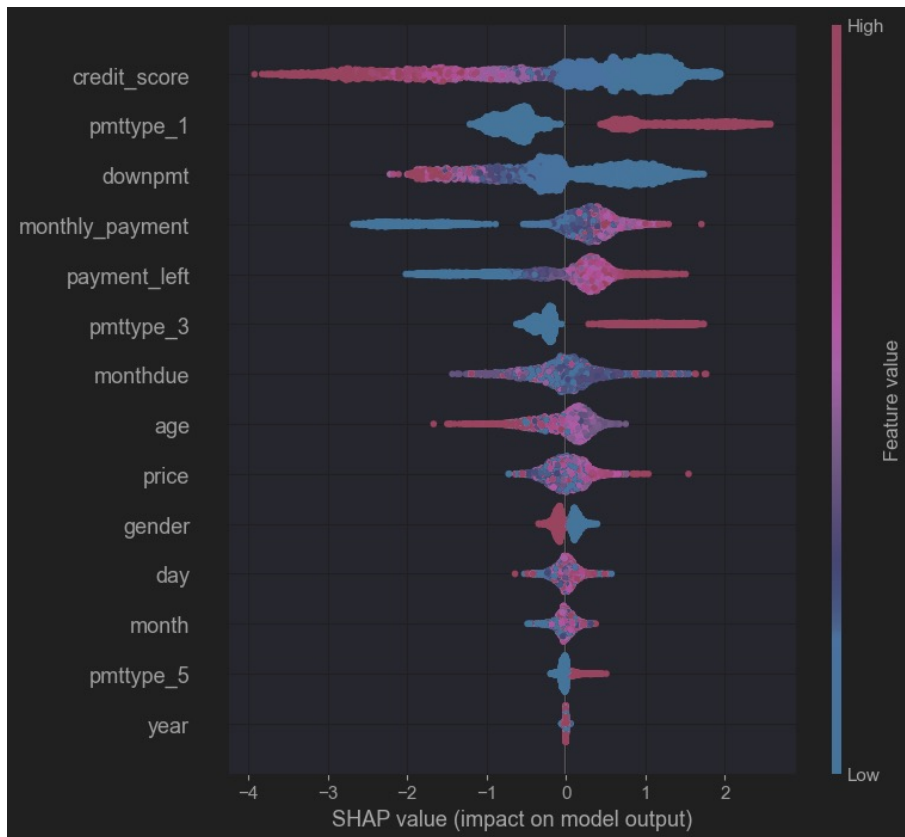


**Our XGBoost Model provides a net value increase of \$200 million for Verizon.**



# Appendix

# Detailed Model Performance Results



Feature	SHAP Importance	Direction
Credit Score	21%	-1
Payment Type – Credit	16%	1
Downpayment	14%	-1
Monthly Payment	11%	1
Payment Left	9%	1
Payment Type – Gift Card	9%	1
Months Due	5%	-1
Age	5%	-1
Price	3%	1
Gender	2%	-1
Day	2%	-1
Month	1%	-1
Payment Type – Cash	1%	1
Year	0%	-1

# Methodology of Estimation of Value

## *Detailed Formula*

$$\begin{aligned} & (\text{Number of Non-Defaulting Customers (TP)} \times \text{Loss per Default}) + \\ & (\text{Number of Defaulting Customers (TN)} \times \text{Profit per Paying Customer}) - \\ & (\text{Number of Rejecting Reliable Customers (FP)} \times \text{Profit per Paying} \\ & \text{Customer}) - (\text{Number of Accepting Unreliable Customers (FN)} \times \text{Loss} \\ & \text{per Default}) \end{aligned}$$

# Comparison of Business Value: Current vs Proposed System

Metric	Current System		Proposed System (XGBoost System)	
	Business Assumption	Value	Business Estimate	Estimate Value
<b>Total Applicants</b>	-	1,000,000	-	1,000,000
<b>Applicants Approved</b>	80%	800000	81.3%	813,796
<b>Default</b>	11.5%	92,000	7%	7,289
<b>Losses from Defaulters</b>	Default x \$1,000	\$92,000,000	-	-\$7,288,688
<b>Paying Customers</b>	Applicants approved - Default	708,000	81.3%	813,796
<b>Profit from Paying Customers</b>	Paying Customer x \$250	\$177,000,000	-	\$203,449,040
<b>Savings from Defaulters Identified</b>	-	-	11%	\$107,759,836
<b>Lost Profit from Overly Conservative Rejections</b>	-	-	0.7%	-\$7,288,688
<b>Total Net Value</b>	-	<b>\$85,000,000</b>	-	<b>\$286,131,357</b>

# End of Deck