Balancing Risk and Profit: Predicting the Performance of Potential New Customers in the Insurance Industry

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ICSO
INTELLIGENT COMPUTING
SYSTEMS OPTIMIZATION

LLEIDA TECH
ARTIFICIAL INTELLIGENCE & OPTIMIZATION CONGRESS

About me

Celia Osorio

2022

UNIVERSITAT POLITÈCNICA DE VALÈNCIA
CAMPUS D'ALCOI

MBA

ICSO
INTELLIGENT COMPUTING
SYSTEMS OPTIMIZATION

2023

Present

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

DOCTORAL SCHOOL

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Contents

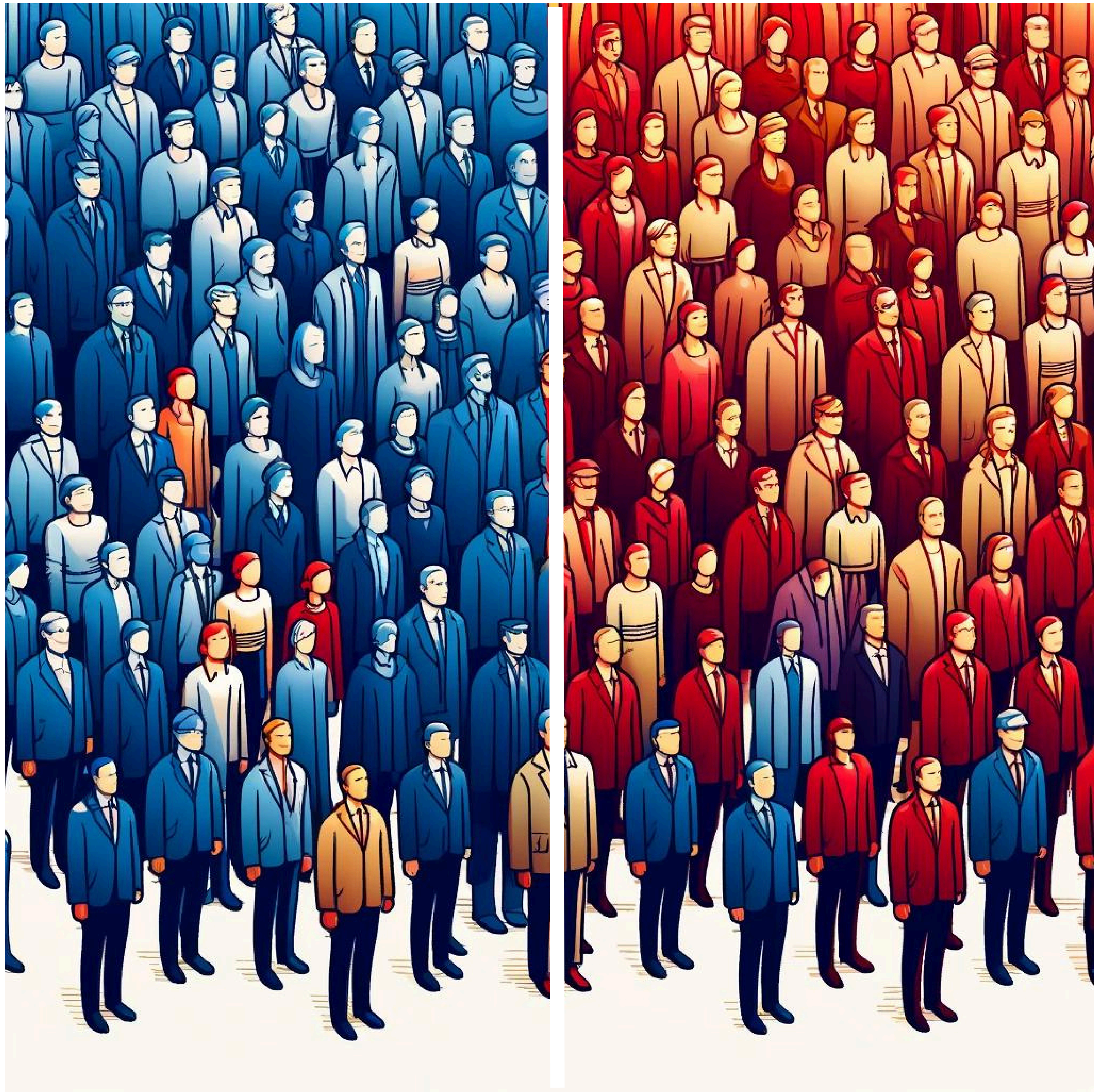
1. The Challenge of Predicting New Customers' Performance

The Challenge of Predicting New Customers’ Performance

With limited data, can we predict with confidence how new clients with perform in the company?

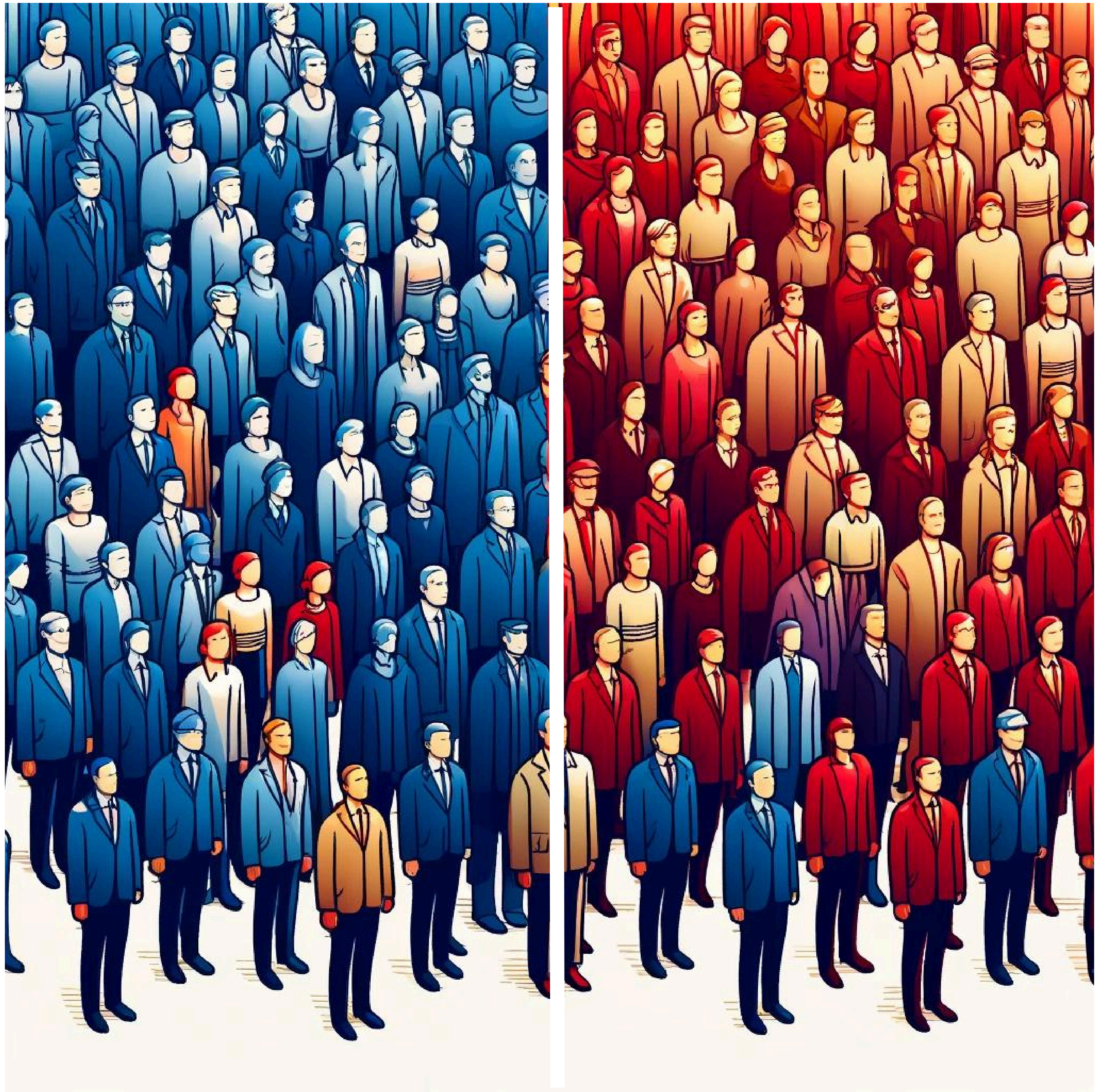
2. Objective of the Study

TARGET: Average Annual Profit (AAP)



AAP > 0

TARGET: Average Annual Profit (AAP)



High-performance Customer

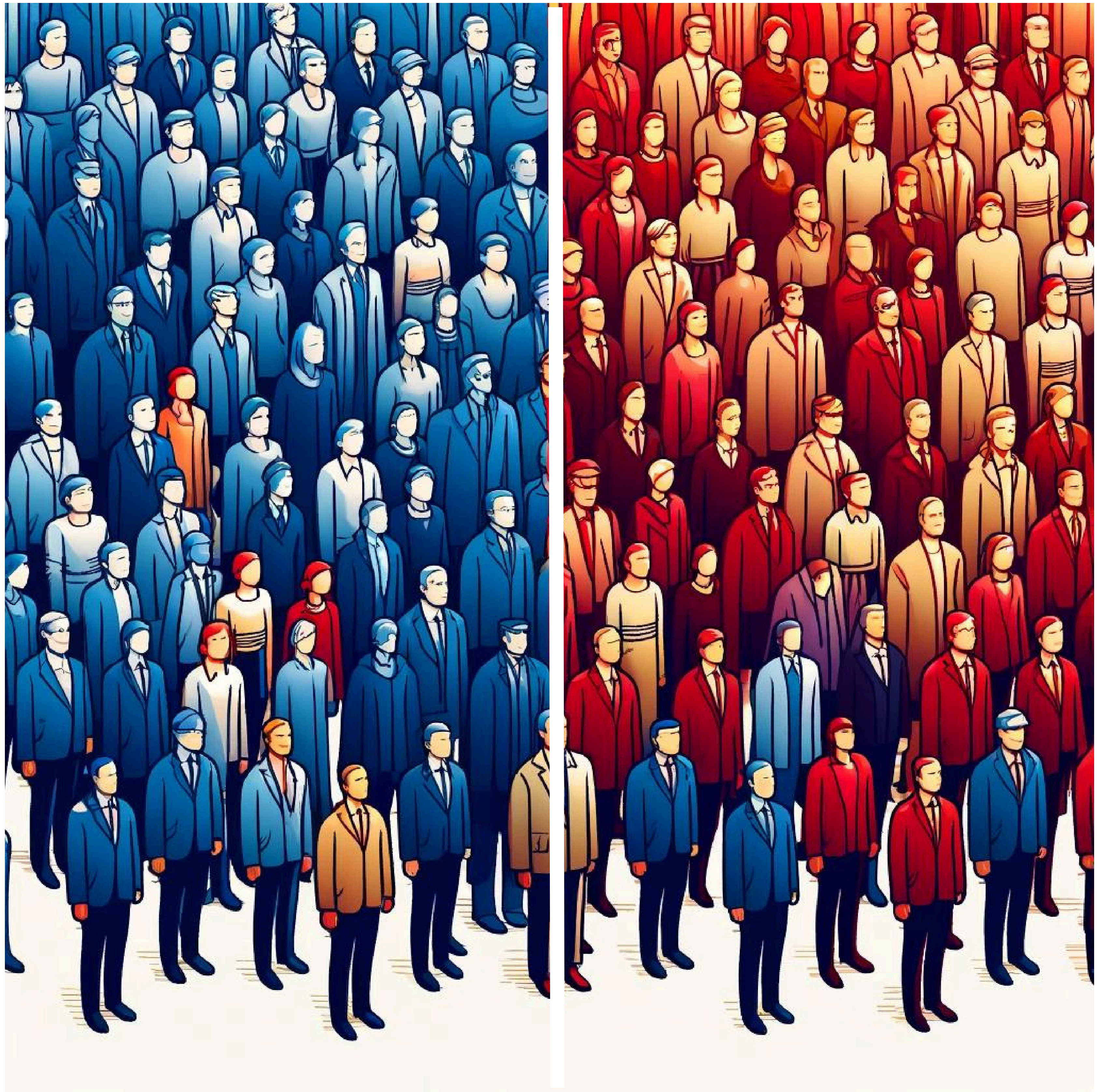
Group 0

Customer to be ***accepted***

AAP > 0

TARGET: Average Annual Profit (AAP)

AAP <= 0



High-performance Customer

Group 0

*Customer to be **accepted***

Low-performance Customer

Group 1

*Customer to be **reviewed***

3. Methodology

Methodology

Classification Model

XGBoost

Model Features

Gradient Boosting	Reduces bias and improves model accuracy
L1 (Lasso) and L2 (Ridge) Regularization Optimization	Controls complexity and improves the model's robustness against noise
Efficient Handling of Missing Data	Simplifies data processing when handling incomplete datasets
Feature Selection	Helps reduce overfitting
Handling Class Imbalance	Ensures accurate classification of minority classes

Methodology

Regularization Technique

Early Stopping

The model's training is monitored on a validation set, and stops once improvements stop, preventing overfitting

Advantages of Early Stopping

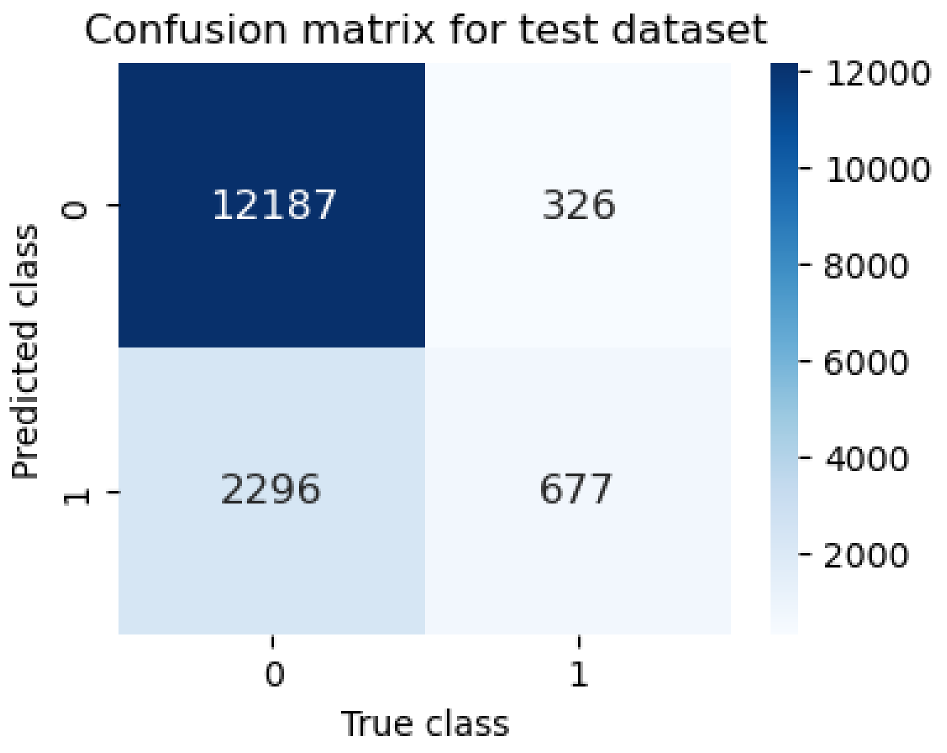
- Prevents Overfitting
- Reduces Training Time
- Improves Model Performance
- Optimizes Computational Resources
- Facilitates Model Interpretation and Fine-Tuning

4. Results

Model Results

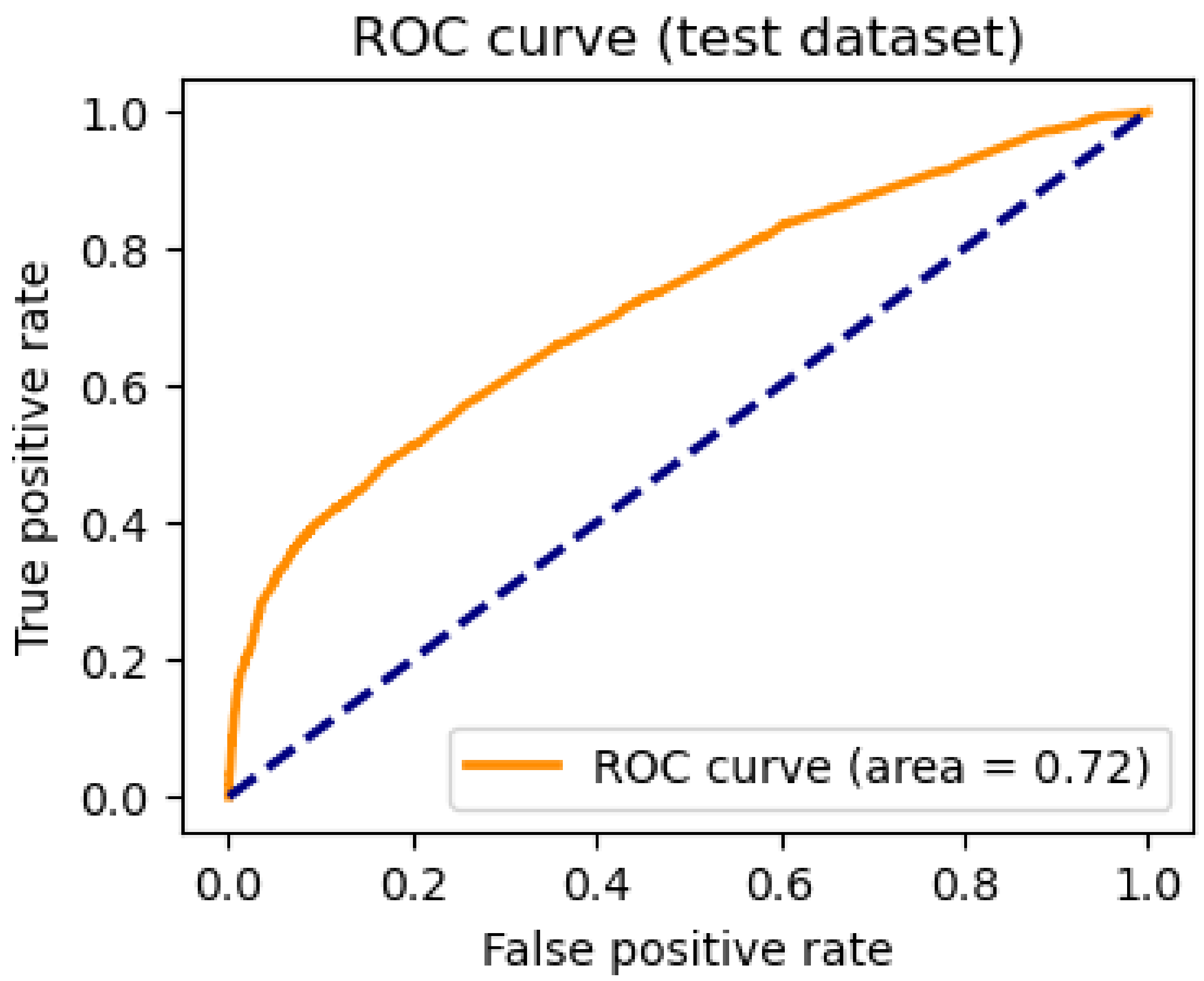
Total customers in test: **15,486**

Confusion Matrix Classification Report



	precision	recall	f1-score	support
0	0.84	0.97	0.90	12513
1	0.67	0.23	0.34	2973
accuracy			0.83	15486
macro avg	0.76	0.60	0.62	15486
weighted avg	0.81	0.83	0.79	15486

Area Under the Curve Score



Model Results

Total customers in test: **15,486**

Accuracy of the model is **0.83**

ROC AUC score is **0.72**

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94% of customers classified as "High-performance"

6% of customers classified as "Low-performance"

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ROC AUC score is **0.72**

94% of customers classified as “High-performance”

6% of customers classified as “Low-performance”

Before

Profit:
406,006 euros

After

Profit:
1,232,66 euros

5. Conclusions and Future Work

Conclusions

- The model accurately predicts and classifies new customers into high and low-performance groups.
- Supports decision-making by enabling customized policies and reducing financial risks.
- Tripled company benefits.
- True value in identifying low-performance customers, preventing financial losses and higher operational costs.

Conclusions

- The model accurately predicts and classifies new customers into high and low-performance groups.
- Supports decision-making by enabling customized policies and reducing financial risks.
- Tripled company benefits.
- True value in identifying low-performance customers, preventing financial losses and higher operational costs.

Future Work:

- *Extend model to other types of insurance policies beyond car insurance.*
- *Identify new variables to include in the model, aligning with the regulatory framework.*

Thank you for your attention!

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