

STORYTIME

STORYTIME

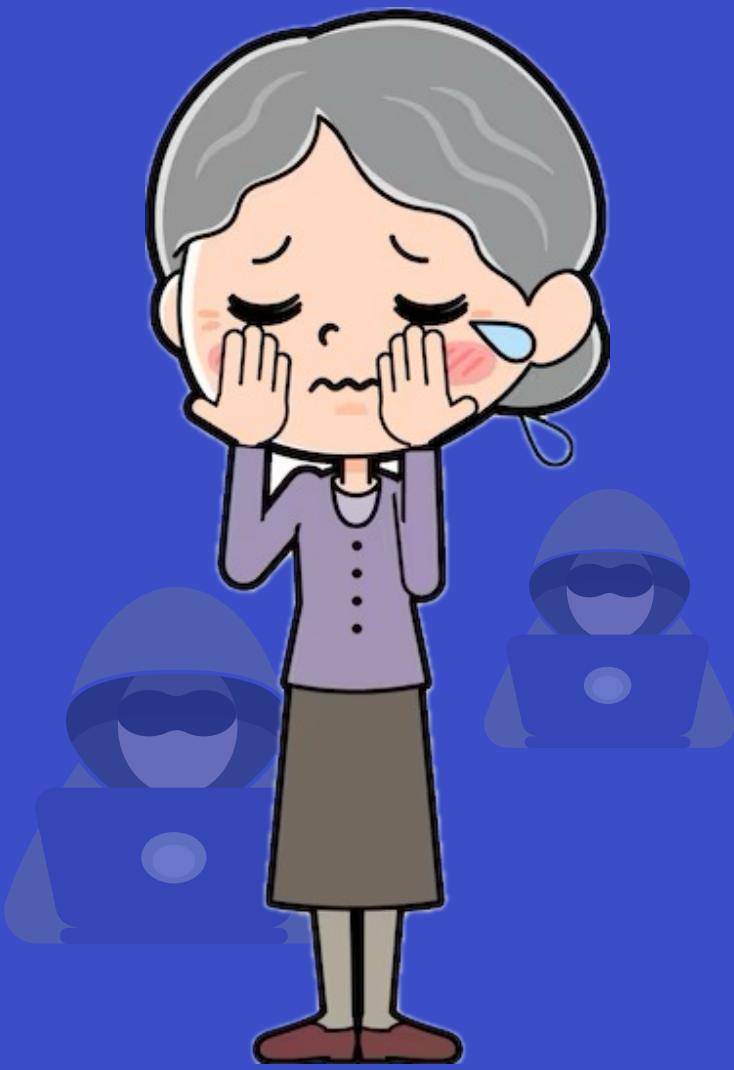


Grandmother Jane

STORYTIME



Grandmother Jane



Sad Grandmother Jane



Detecting Banking Card Fraud

A Data-Driven Approach for Bank of Ireland

Group 4: Josephine Leltz, Krishan Kant, Luis Gonzalez, Ruben Cuesta, Sarah Raubenheimer



Irish Fraud Problem

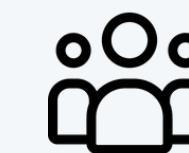
- **324,000 Fraudulent Payment Transactions in Ireland**
- **95% of Fraud Cases comes from Card Fraud**
- **€33.4 Million losses in 2022 (37% YoY) from Card Fraud**

Fraud Gross Losses





Bank of Ireland



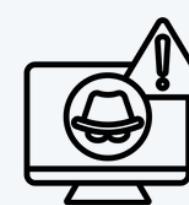
+1.8 Million Customers



€4.2 Billion Revenue



14% YoY Increase on Security Measures



Loss of €117 per Transaction



Business Problem

Problem Statement

Problem

Increasing Number of Card Frauds in Ireland

Strategy

Using Statistical Models to Predict & Prevent Fraud

Goal

Detect and Prevent Future Fraud

Target Audience

Internal stakeholder:

- Bol Executives
- Risk Management

External stakeholder:

- Customers

Competitors:

- AIB, Ulster, etc.

Opport. & Challenges

Opportunities

- Improve Security Measures
- Enhance Customer Loyalty
- Reduce Fraud Losses

Challenges

- High costs
- False Positive vs Negative



Data Mining Goal

Data Mining Goal

Predicting whether a Transaction is Fraudulent or Not

Methods

Classification:

- Logistic Regression
- Decision Tree
- Random Forest

Benchmark:

- Naïve Rule

Outcome Variable

Binary for Fraud = 1

Cut-off Value = 0.25

Higher Costs for False Negatives



Dataset Selection

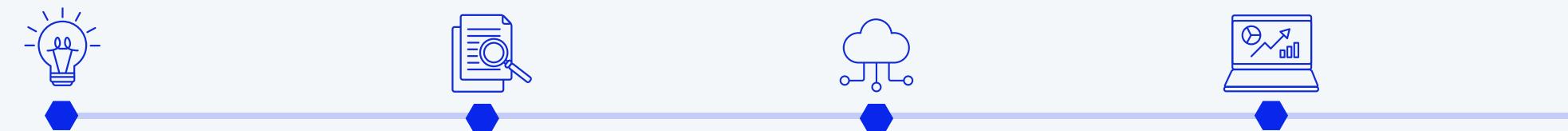
Snapshot of 1st row:

Distance from Home	Distance from Last Transaction	Ratio to Median Purchase Price	Repeat Retailer	Used Chip	Used Pin Number	Online Order	Fraud
57.8778566	0.31114001	1.94593998	1	1	0	0	0

Card Transaction Data

1 000 000 Transactions

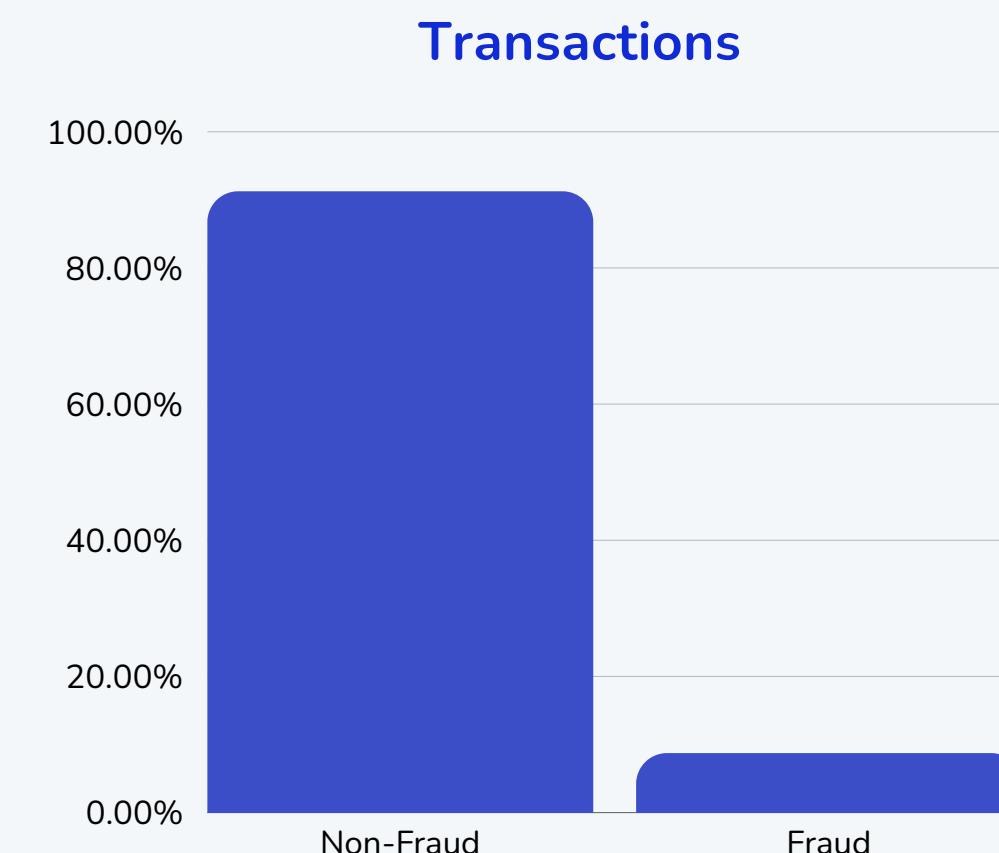
8 Variables



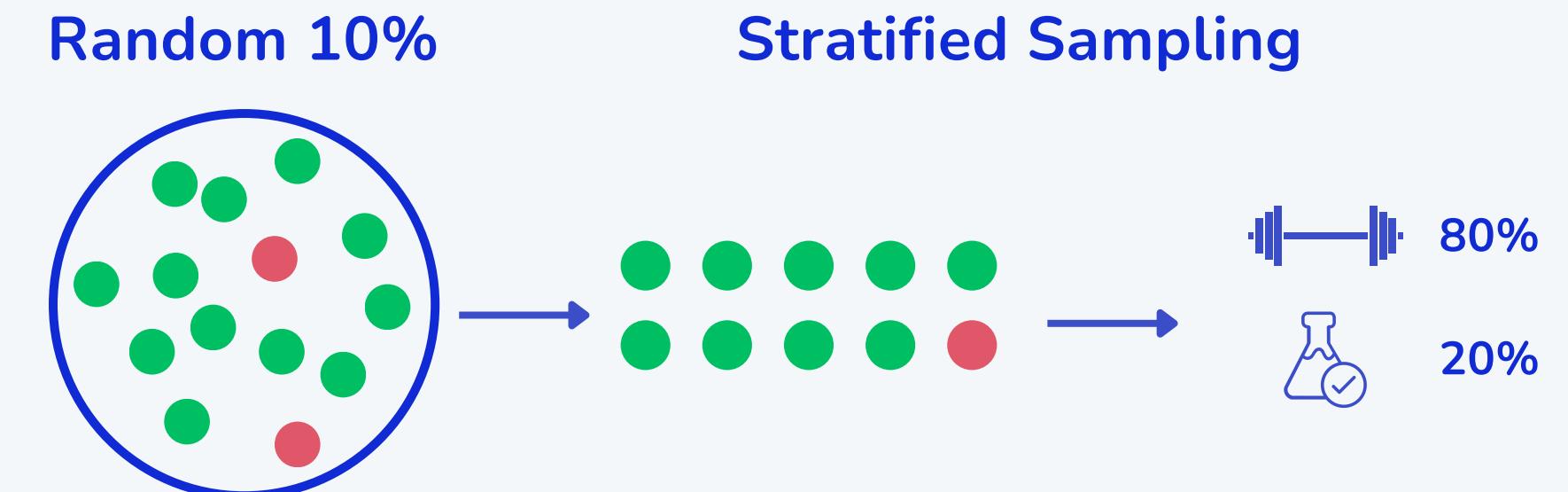


Data Exploration & Processing

Data Exploration



Data Processing





Models & Findings

Model	Balanced Accuracy	Insights
Naïve Rule	91.3%	Benchmark Accuracy
Logistic Regression	90.29%	Significant Variables (p-values)
Decision Tree	99.17%	Interpretable Fraud Detection
Random Forest	99.9%	Higher Accuracy; Computational Complexity





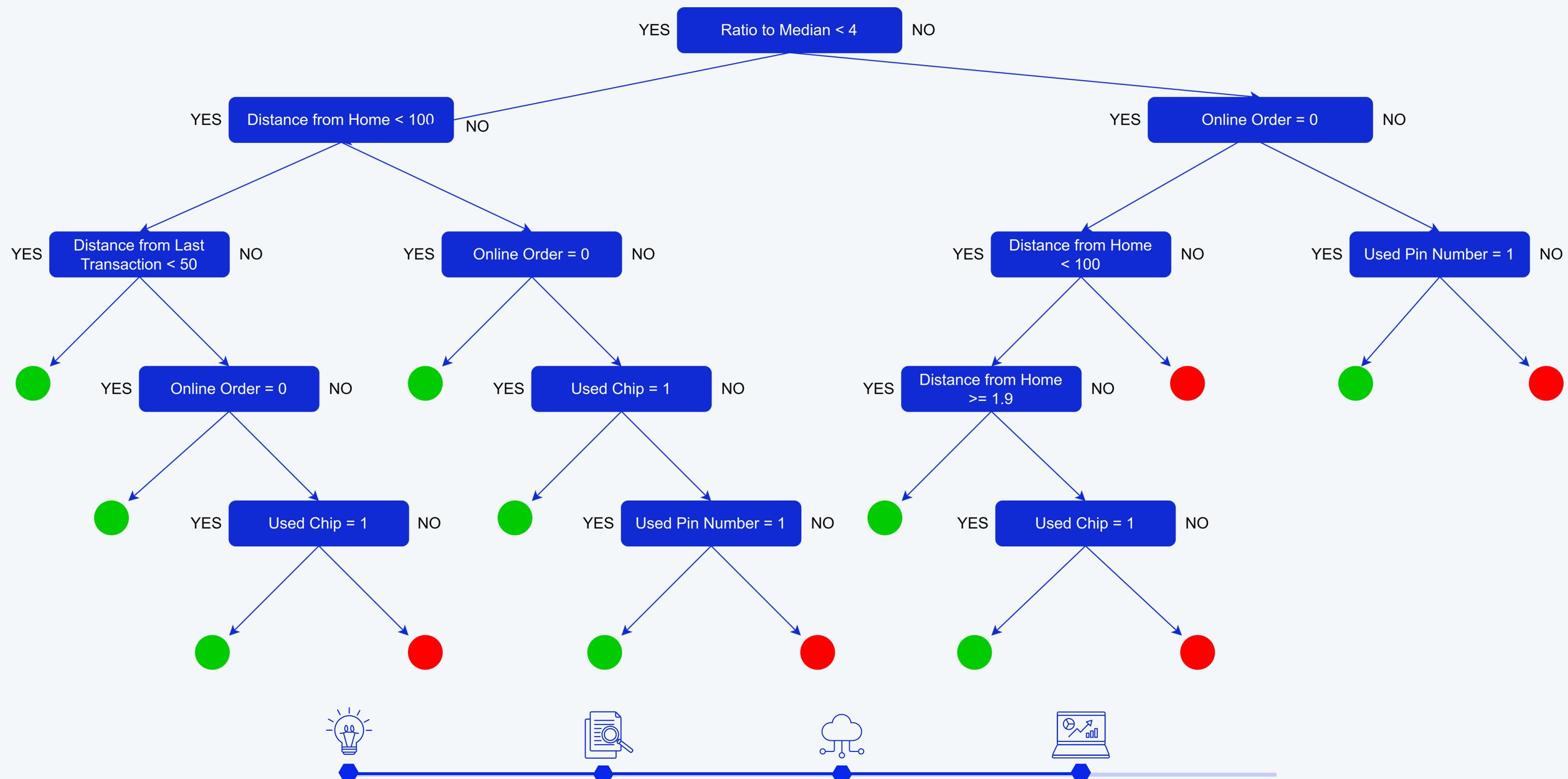
Models & Findings

Model	Balanced Accuracy	Insights
Naïve Rule	91.3%	Benchmark Accuracy
Logistic Regression	90.29%	Significant Variables (p-values)
Decision Tree	99.17%	Interpretable Fraud Detection
Random Forest	99.9%	Higher Accuracy; Computational Complexity





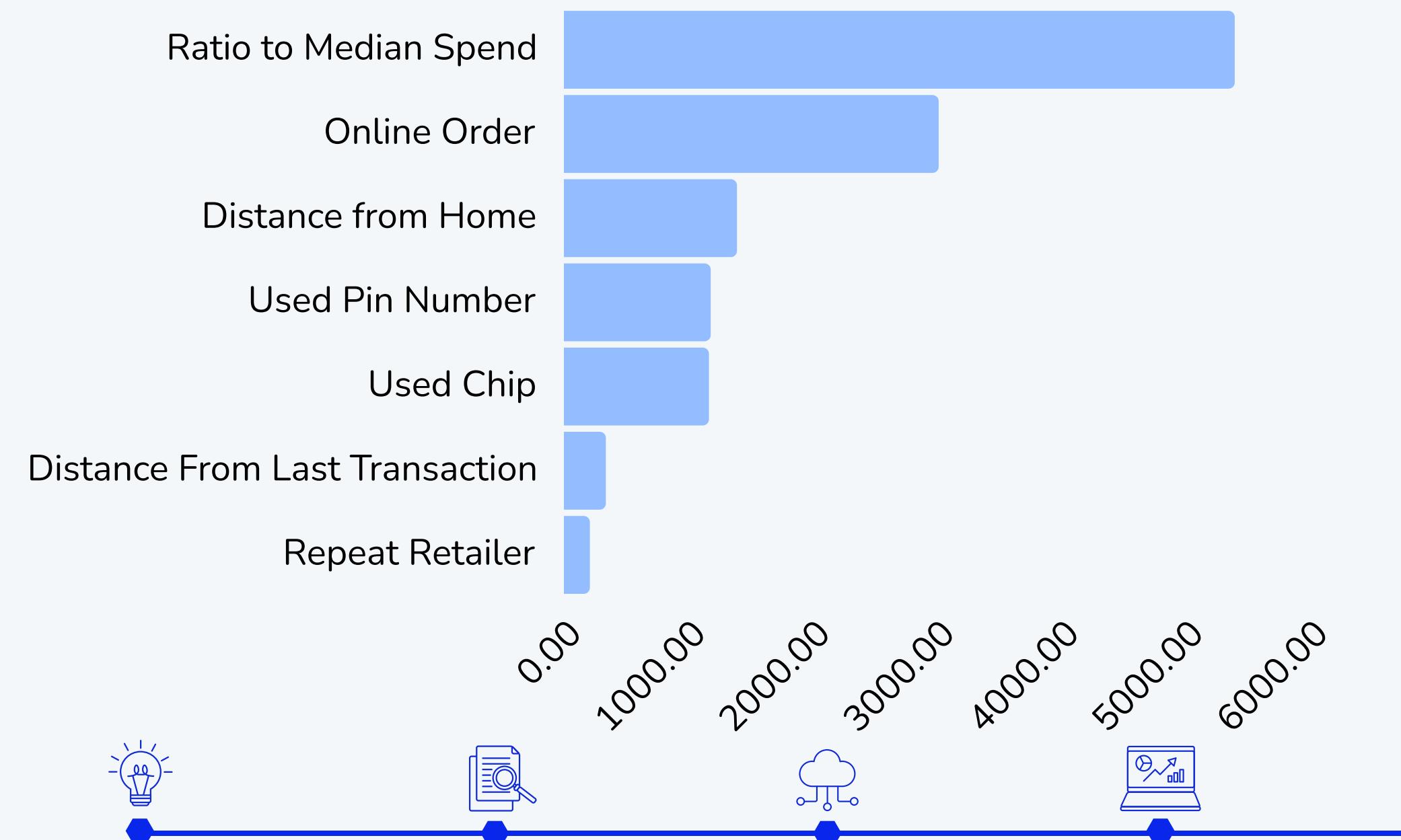
Decision Tree





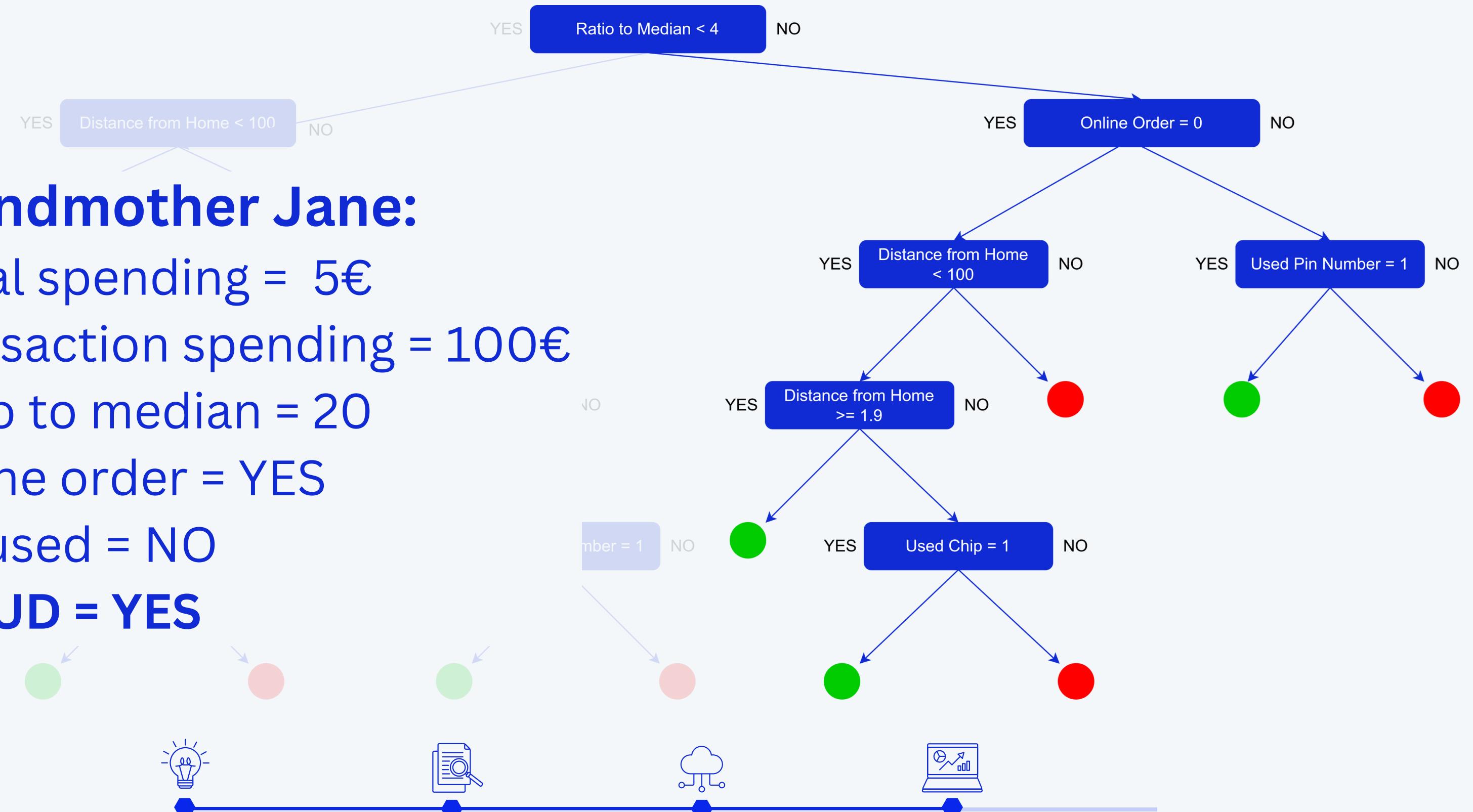
Feature Importance

Variable Importance



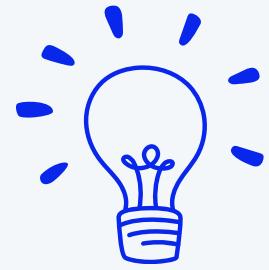


Decision Tree



USE DECISION TREE

Balanced Accuracy of 99.17%
Less Computing Power
Fit Model on Internal Data



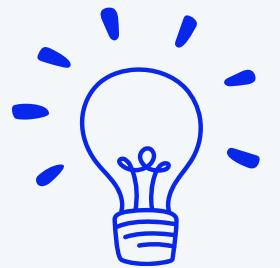
Actionable
Recommendations

USE DECISION TREE

Balanced Accuracy of 99.17%
Less Computing Power
Fit Model on Internal Data

FRAUD INDICATORS

Ratio to Median Spend > 4
Distance from Home > 100 kms
Online Transactions



Actionable Recommendations

USE DECISION TREE

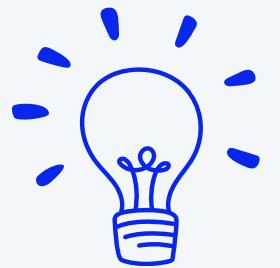
Balanced Accuracy of 99.17%
Less Computing Power
Fit Model on Internal Data

VALUE PROPOSITION

Reduction of Fraud Loss
Improved Reputation
Customer Retention & Attraction

FRAUD INDICATORS

Ratio to Median Spend > 4
Distance from Home > 100 kms
Online Transactions



Actionable Recommendations

USE DECISION TREE

Balanced Accuracy of 99.17%
Less Computing Power
Fit Model on Internal Data

VALUE PROPOSITION

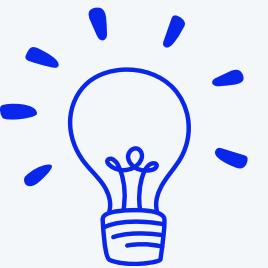
Reduction of Fraud Loss
Improved Reputation
Customer Retention & Attraction

FRAUD INDICATORS

Ratio to Median Spend > 4
Distance from Home > 100 kms
Online Transactions

LONG-TERM INVESTMENTS

Reinvest Into New Technologies
Blockchain, 2FA, Behavioural Biometrics
Continuous Learning & Adaptation



Actionable Recommendations



Let's Make Grandmother Jane Happy Again

Group 4: Josephine Leltz, Krishan Kant, Luis Gonzalez, Ruben Cuesta, Sarah Raubenheimer



References

- Banking & Payment Federation Ireland (2022) Fr F payment fraud report a RA H2 2022 - bpfi.ie. Available at: <https://bpfi.ie/wp-content/uploads/2023/07/BPFI-Fraud-Report-H2-2022.pdf>
- Bank of Ireland Group plc Annual Report. (2022). Available at: <https://investorrelations.bankofireland.com/app/uploads/BOI-Annual-Report-2020.pdf>.
- Guo, Y. and Liang, C. (2016). Blockchain application and outlook in the banking industry. *Financial Innovation*, 2(1). doi:<https://doi.org/10.1186/s40854-016-0034-9>.
- LexisNexis Risk Solutions. What is Behavioral Biometrics. [online] Available at: <https://risk.lexisnexis.com/global/en/insights-resources/article/what-is-behavioral-biometrics>.
- Mtaho, A. (2015). Improving Mobile Money Security with Two-Factor Authentication. *International Journal of Computer Applications*, [online] 109(7), pp.975–8887. Available at: <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=20dad0a832622211f1f1a8969a063c0439ff0ba9>.
- www.kaggle.com. Credit Card Fraud. [online] Available at: <https://www.kaggle.com/dhanushnarayananr/credit-card-fraud>.



[GitHub Link](#)



Appendix: Balanced Accuracy

Model	Accuracy	Balanced accuracy	Sensitivity	Specificity
Naïve Rule	91.3%	N/A	N/A	N/A
Logistic Regression	96.28%	90.21%	82.84%	97.58
Decision Tree	99.76%	99.17%	99.88%	98.45
Random Forest	99.98%	99.99%	99.97%	100%



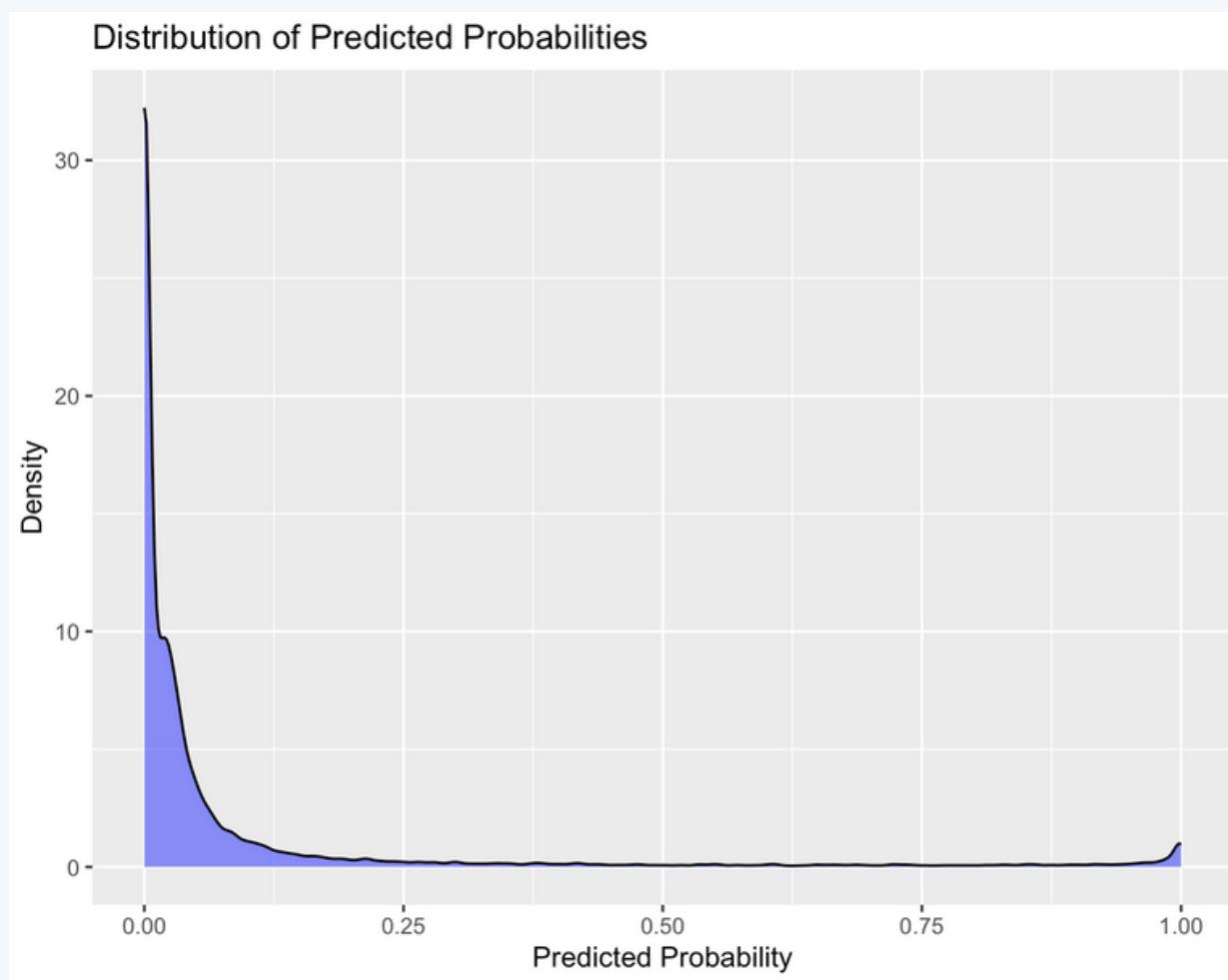
Appendix: Balanced Accuracy 3 Samples

Model	Random- Stratified Sample	Smote - Stratified Sample	Random 50-50 Undersample
Logistic Regression	90.21%	89.98%	94.16%
Decision Tree	99.17%	94.70%	98.96%
Random Forest	99.99%	99.98 %	100%



Appendix: Cutoff Value

Logistic regression



Random forest

