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Marketing Campaign

DATALICIOUS PRESENTATION 2023

Rakamin Academy
Data Science Batch 32

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COMPANY BAGROUND

Lottomart is a supermarket retail that sell various type of products such as Fish, Meat, Fruits, Sweet Products, Wines, and Gold Products. For the last 6 months, Marketing Team has conducted a campaign in the form of giving discount vouchers to all customers via Broadcast Messages.

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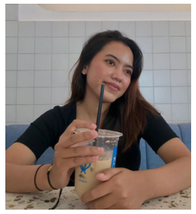
MEET THE TEAM

JOHANES
CRISTIAN

NUR IMAM
MASRI

SITI HAJJAH
MARDIAH

PRASIDYA
BAGASKARA



RISKIYATUL
HASANAH

M. RAYHAN
AZZINDANI

ASTUTI
RAHMAWATI

M. HARWIN
PRAYOGA

CHRISTINE

M.IFZAL
ASRIL

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OUTLINE

Business Understanding

Exploratory Data Analysis

Data Prepocessing

Modelling & Evaluation

Business Recomendation

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Business Understanding

- Problem Statement
- Goals, Objective & Businss Metrics

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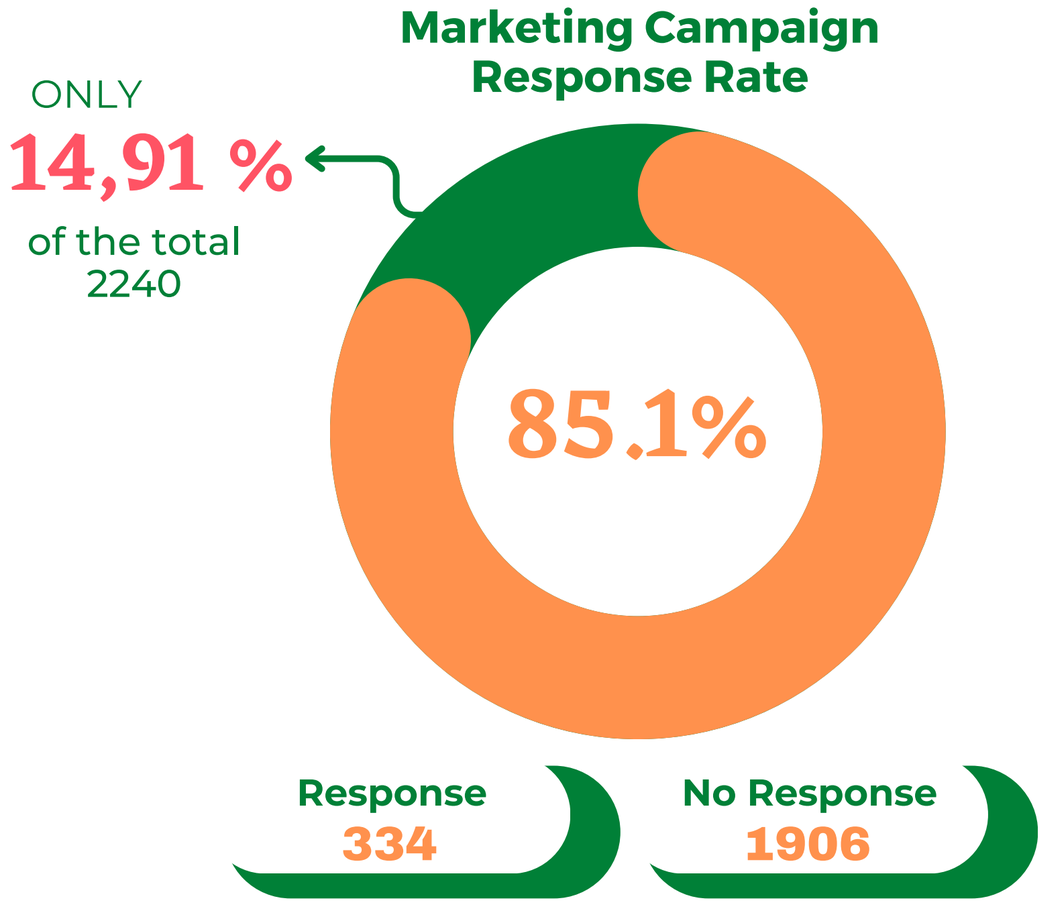
PROBLEM STATEMENT

1. Lower Response Rate



2. Inefficient Cost

3.Profit Isn't Maximum

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GOALS, OBJECTIVE & BUSINESS METRICS

Goals

Increasing response rate and **minimizing marketing cost** for each customers, so it can **boost profit** for the next marketing campaign

Objective

1. Create a **classification model** to **predict which customer groups will respond** for the next marketing campaign
2. Create a **clustering model** to make it easier for companies **to determine the right target of customers**

Business Metrics

1. Response Rate
2. Net Profit Margin
3. Return of Invesment

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Exploratory Data Analysis

- Dataset Information
- Preliminary Insight

DATA UNDERSTANDING

Accepted/Resposes Campaign	Customer Information	Sales Product Type	Number of Purchases per Type
AcceptedCmp1 AcceptedCmp2 AcceptedCmp3 AcceptedCmp4 AcceptedCmp5 Complain Response (target)	ID Year_Birth Education Marital Kidhome Teenhome Income DtCustomer Recency Z_CostContact Z_Revenue	MntFishProducts MntMeatProducts MntFruits MntSweetProduct MntWines MntGoldProds	NumDealsPurchases NumCatalogPurchas NumStorePurchases NumWebPurchases NumWebVisitsMonth

Dataset memiliki 29 kolom dan 2240 baris
Kolom income memiliki 2216 nilai non-null,dan 24 nilai null (1.07% data null)
Tidak terdapat data duplikat

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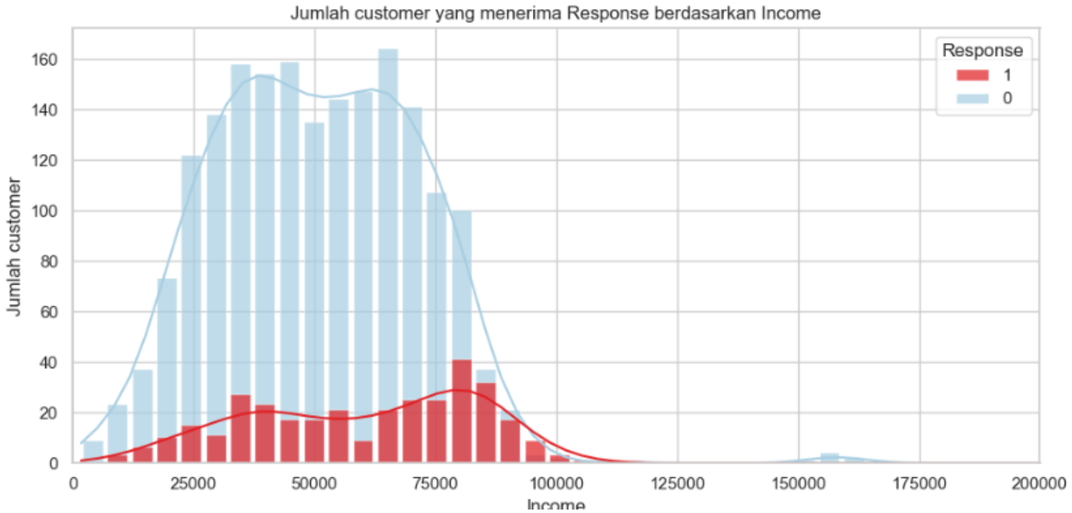
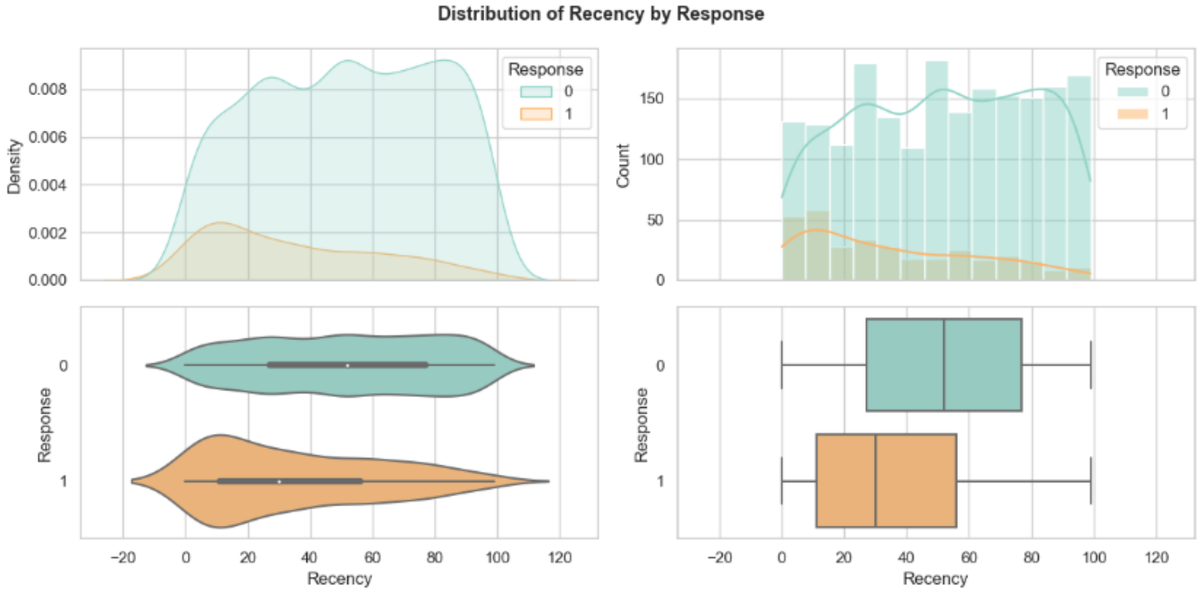
Business Insights

income >= $75K



Dari visualisasi Income, dapat dilihat bahwa customer yang merespon terbanyak berasal dari customer dengan pendapatan > $75000

Recency = 0-20 days



Dari visualisasi Recency, dapat dilihat bahwa customer yang merespon terbanyak berasal dari customer dengan Recency yang rendah

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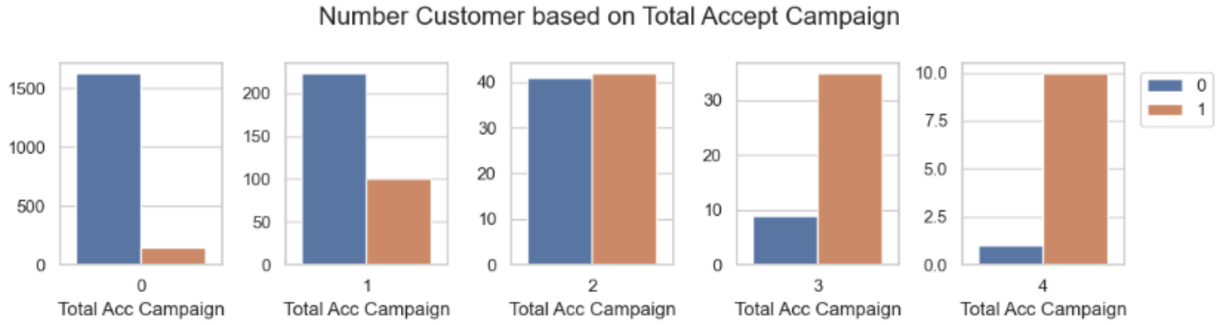
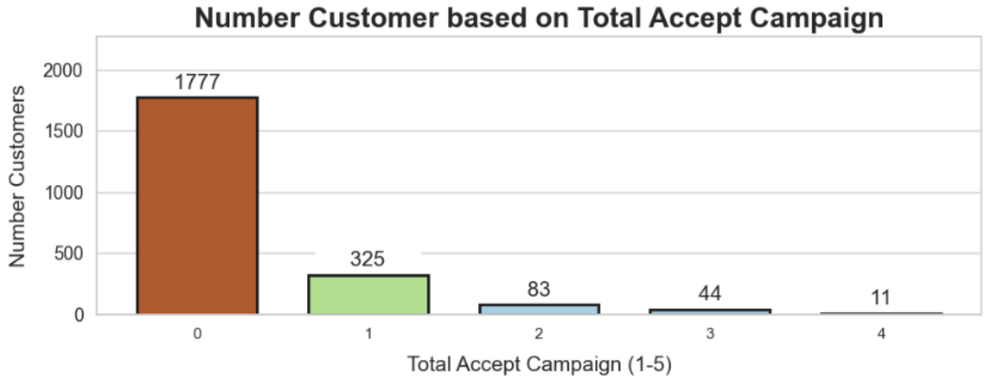
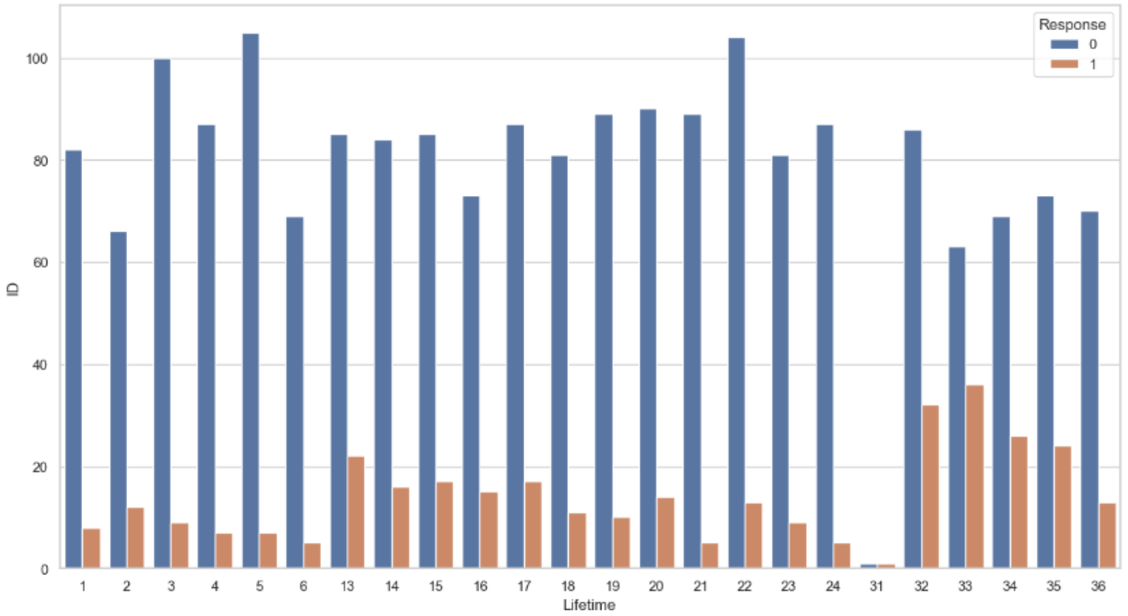
Total Accepted Campaign by Customer >=2 (from 5 campaigns)





Paling banyak pada Lima Campaign kita adalah 0 (tidak pernah merespon), namun ada yang sedikit berpotensi pada, hanya sekali (1) atau dua kali (2) merespon masing-masing 325 dan 83 Customers

Lifetime minimal 32 - 35 months



Customer yang memiliki lifetime yang tinggi cenderung memberi respon

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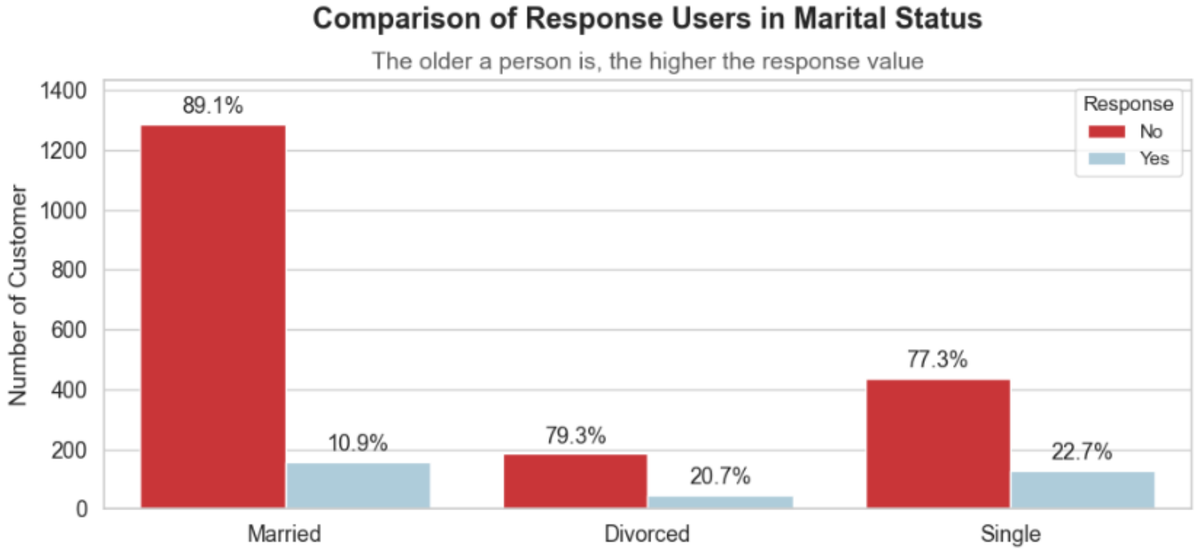
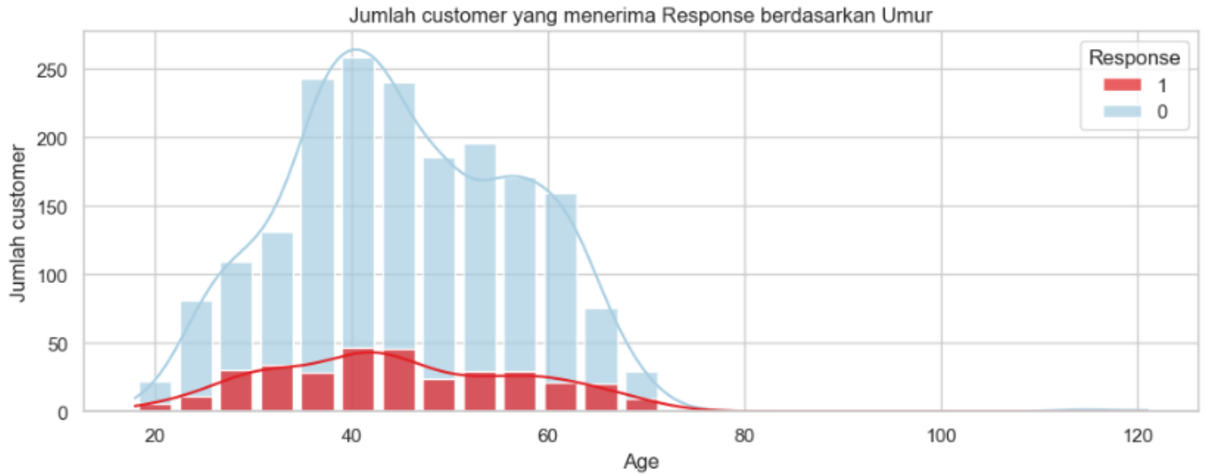
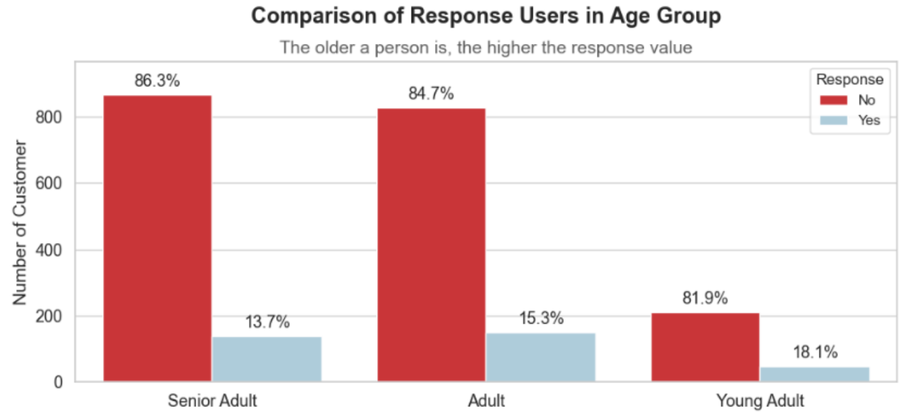
Business Insights

Marrital Status =
Married > Single > Divorced



Age &
Age Group (dominated by Senior Adult group)





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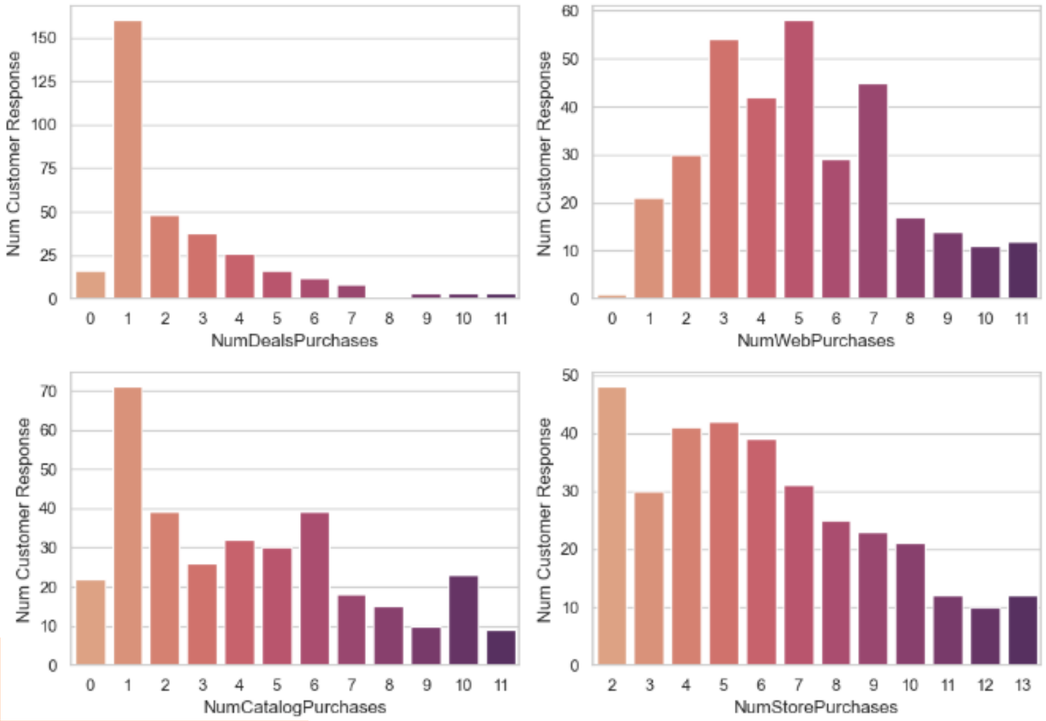
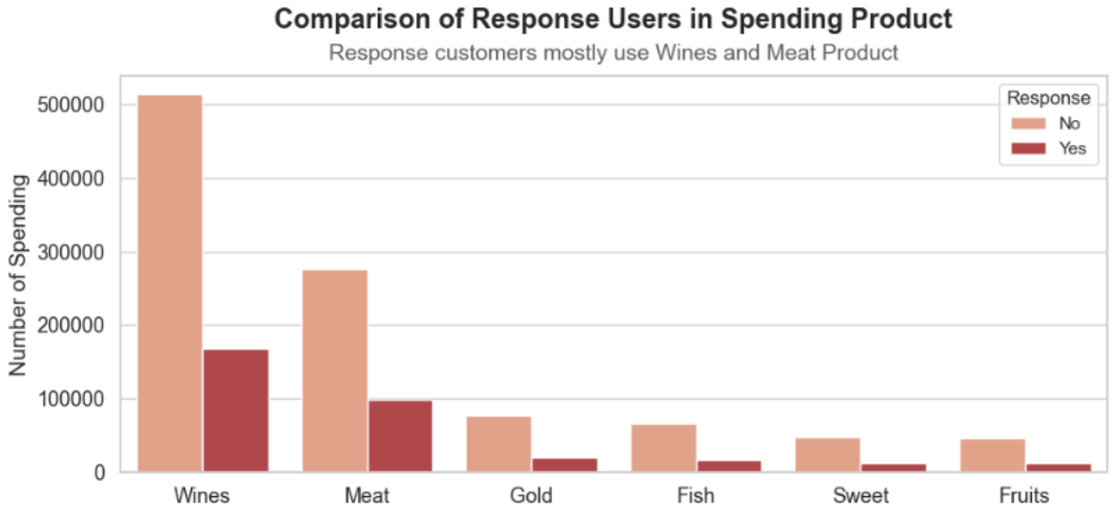
Business Insights

Responded Customer Purchase Types (the fewer purchases, the more likely it is)



Types of Purchased Products (customers tend to buy Wines and Meat)



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Data Preprocessing

- Handling Missing, Invalid
- Feature Transform & Engineering
- Feature Selection
- Handling Imbalance Data

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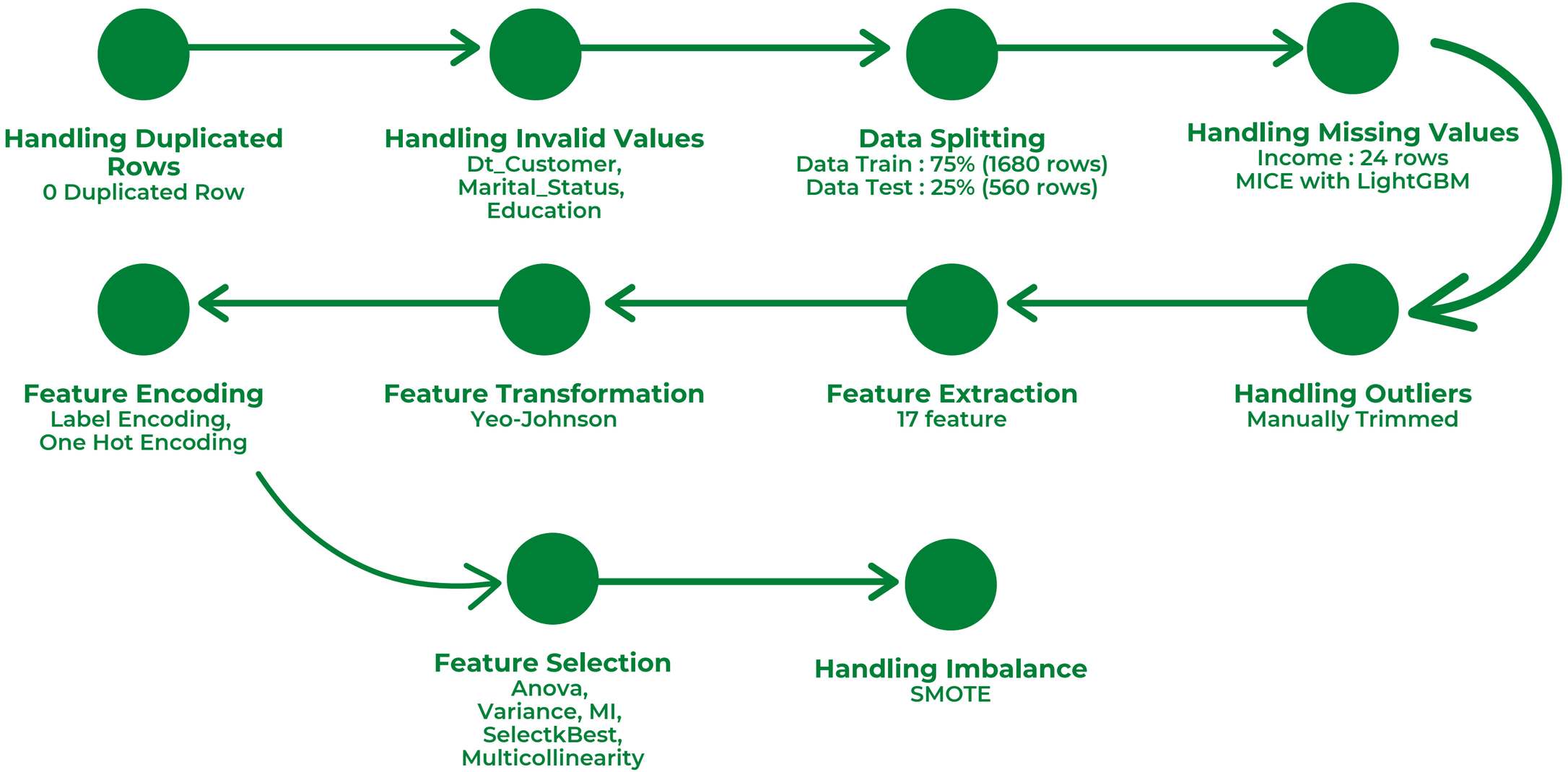
DATA PRE-PROCESSING
CLASSIFICATION



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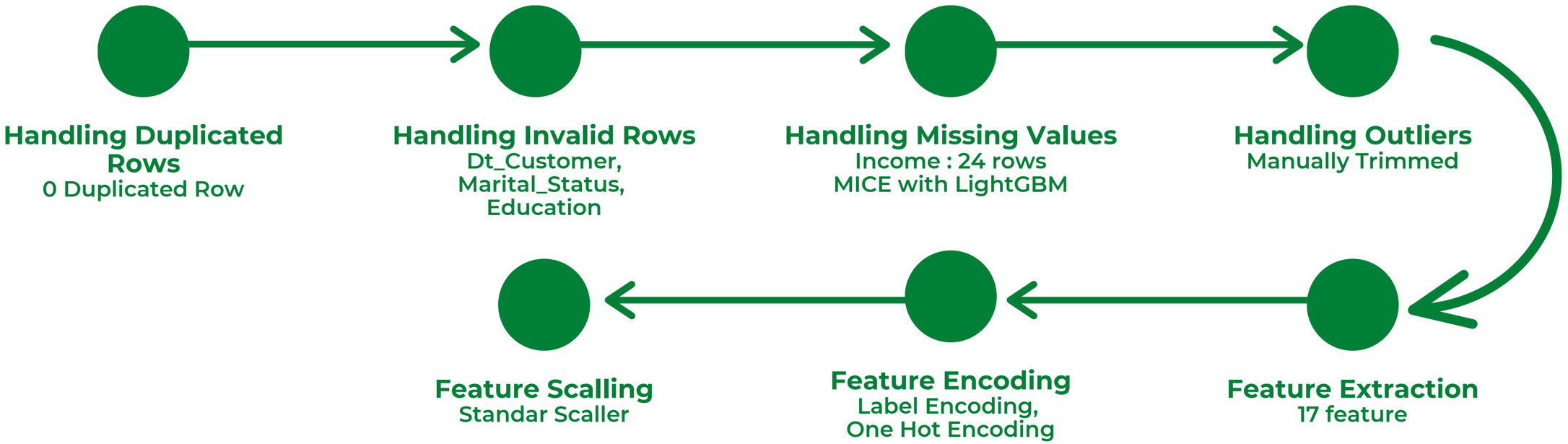
DATA PRE-PROCESSING
CLUSTERING



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Modeling and Evaluation

- Parameter Evaluasi Model
- Machine Learning Techniques
- Model Comparison
- Feature Importance

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Modeling and Evaluation

Parameter Evaluasi Model

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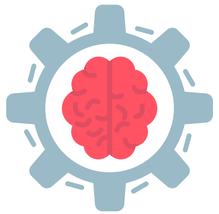
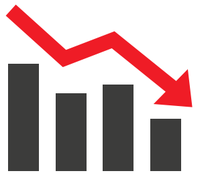
Positive = Response Campaign
Negative = Tidak Response Campaign

	 Model Prediction	 Actual / Reality	 Impact
False Positive Main target to be reduced	Response ✓	No Response ✕	Response Rate & Cost Marketing ↑
False Negative Second target to be reduced	No Response ✕	Response ✓	↑ Loss Potential Revenue
	FALSE	TRUE	To Be Solved

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Modeling and Evaluation

Parameter Evaluasi Model

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1

Precision

Primary Metrics Evaluation

Mereduksi False Positif

Customer Diprediksi merespon ✓, namun kenyataannya tidak ✗

- **Meningkatkan Response Rate**

- **Meminimalisasi Cost Marketing**

2

Recall

Secondary Metrics Evaluation

Mereduksi False Negative

Customer Diprediksi tidak merespon✗, namun tertarik merespon / ikut campaign ✓

Mengoptimalkan Revenue Rate

3

F1 Score

Combined Metrics Evaluation

Sama pentingnya untuk masalah kita, kita membutuhkan **trade-off** antara **Precision dan Recall.** F1 Score didefinisikan sebagai **rata-rata harmonik** dari Precision dan Recall.

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Modeling and Evaluation

Machine Learning Techniques

1. Decision Tree
2. **Random Forest** ✨
3. Logistic Regression
4. Gaussian Naive Bayes
5. K-Nearest Neighbor
6. MLP Classifier (Neural Network)
7. Adaboost Classifier
8. XGBoost Classifier
9. Gradient Boosting Classifier
10. Support Vector Machine

Random Forest
Best Fit Models

Modeling and Evaluation

Model Comparison

Model (Test)	Accuracy	Precision	Recall	F1 Score	Cross Val F1 (k=5)	ROC AUC	Cross Val ROC AUC (k=5)
Random Forest	0.909	0.786	0.530	0.633	0.519	0.905	0.896
XGBoost Classifier	0.889	0.652	0.542	0.592	0.525	0.895	0.887
Logistic Regression	0.861	0.523	0.675	0.589	0.510	0.900	0.885
Support Vector Machine	0.859	0.520	0.614	0.564	0.448	0.895	0.884
K-Nearest Neighbors	0.845	0.482	0.639	0.549	0.400	0.842	0.810
Adaboost Classifier	0.855	0.511	0.578	0.542	0.539	0.892	0.885
MLP Classifier	0.846	0.483	0.518	0.500	0.558	0.830	0.887
Gradient Boosting Classifier	0.846	0.482	0.494	0.488	0.487	0.725	0.752
Naive Bayes	0.830	0.441	0.542	0.486	0.451	0.838	0.824
Decision Tree	0.838	0.456	0.494	0.474	0.488	0.699	0.718

Nilai **Precision, Recall dan F1 Score** pada hasil evaluasi yang paling baik dihasilkan oleh

Random Forest, XGBoost Classifier, dan Logistic Regression

Modeling and Evaluation

Model Comparison

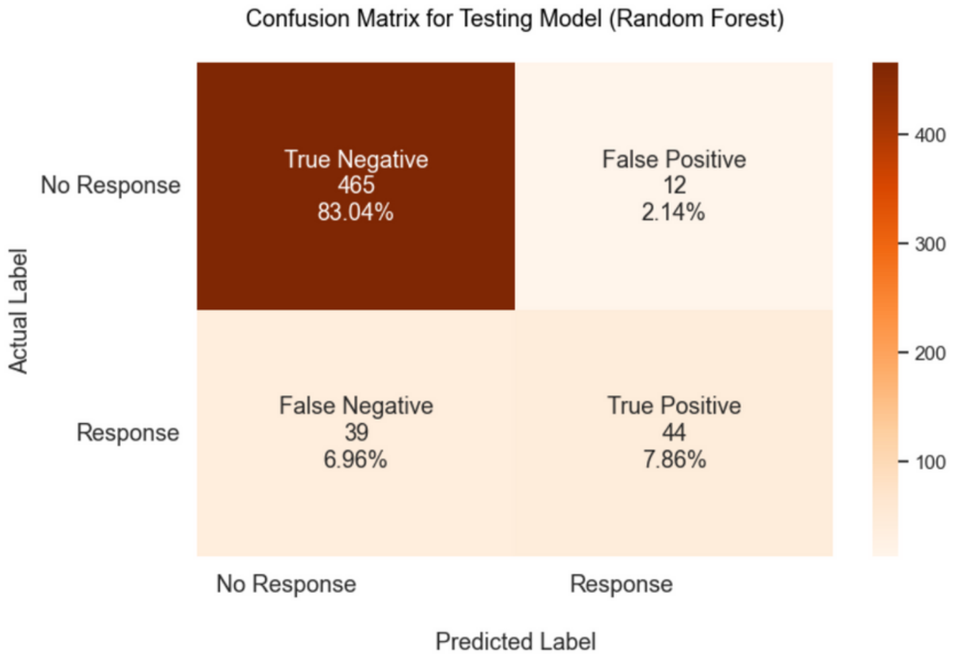
Models	Precision (Train)	Precision (Test)	Recall (Train)	Recall (Test)	F1 Score (Train)	F1 Score (Test)	Total Diff
Logistic Regression (HT)	0.755	0.528	0.660	0.675	0.704	0.593	0.323
Random Forest (HT3)	0.867	0.702	0.584	0.482	0.698	0.571	0.394
Decision Tree (HT2)	0.719	0.441	0.574	0.542	0.639	0.486	0.463
XGBoost Classifier (HT2)	0.826	0.595	0.699	0.566	0.757	0.580	0.541
K-Nearest Neighbors (HT)	0.763	0.465	0.871	0.639	0.814	0.538	0.806
XGBoost Classifier (HT)	0.976	0.710	0.920	0.530	0.947	0.607	0.996
Random Forest (HT2)	0.972	0.724	0.912	0.506	0.941	0.596	0.999
Random Forest (HT1)	0.997	0.772	0.993	0.530	0.995	0.629	1.054
Decision Tree (HT)	1.000	0.484	0.990	0.554	0.995	0.517	1.430

Setelah dilakukan Hyperparameter Tuning

Nilai Total Diff (Gap) pada dataset train dan test yang paling stabil dengan metrics yang lumayan tinggi adalah pada Random Forest

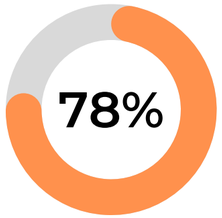
Modeling and Evaluation

Model Selection

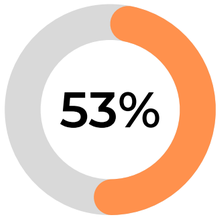


True Positif	Diprediksi merespon ✓	benar, merespon ✓
True Negative	Diprediksi tidak merespon ✗	benar, tidak merespon ✗
False Positif	Diprediksi merespon ✓	salah, tidak merespon ✗
False Negative	Diprediksi tidak merespon ✗	salah, merespon ✓

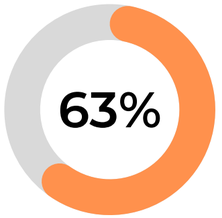
Precision



Recall



F1 Score



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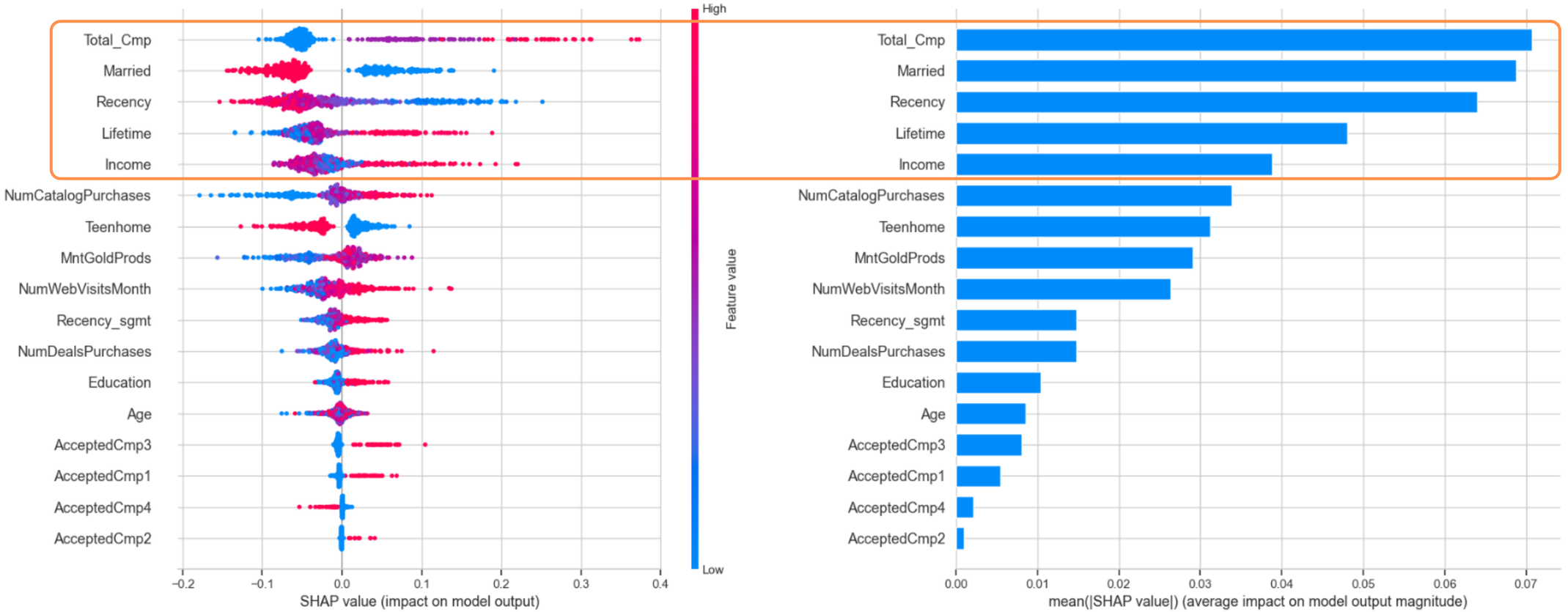
Modeling and Evaluation

Feature Importance



Positive = Response Campaign

Negative = Tidak Response Campaign

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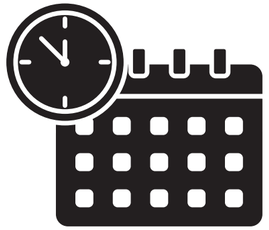
Modeling and Evaluation

- Clustering with RFM Analysis
- Clustering Results

Modeling and Evaluation

Clustering with RFM Analysis



Recency

The freshness of customer activity

Resources : the number of days since the last purchase

Frequency

The frequency of the customer transactions

Resources : the number of transactions made from various types of purchases

Monetary

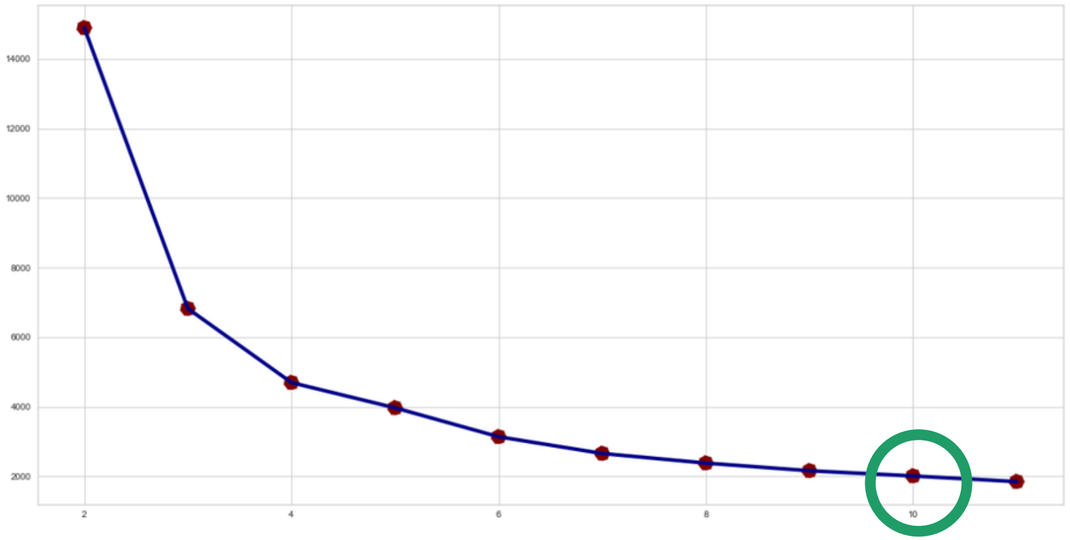
The intention of customer to spend

Resources : the amount spent on various products

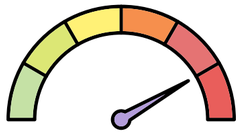
Modeling and Evaluation

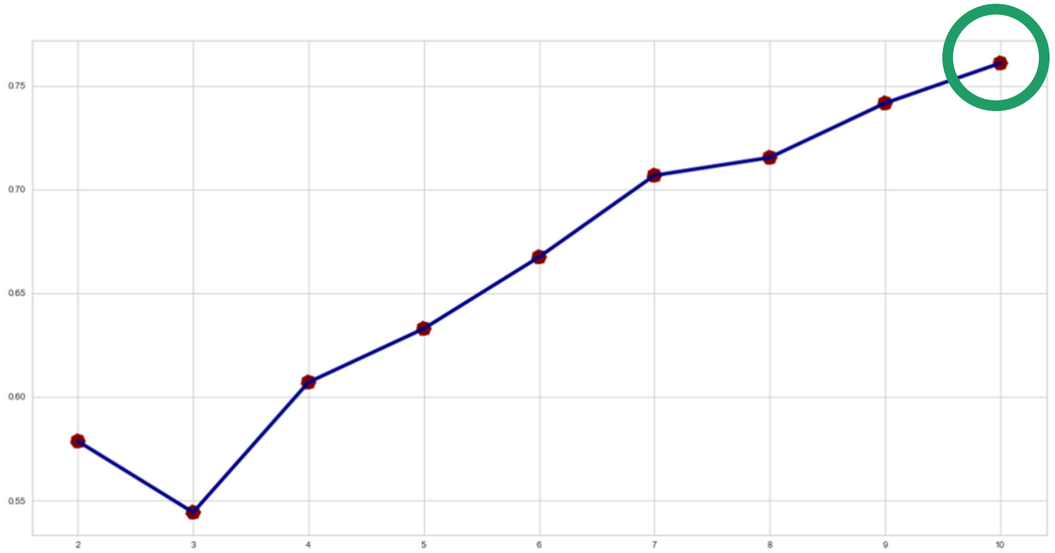
Clustering with RFM Analysis

Elbow Method



Silhouette Score



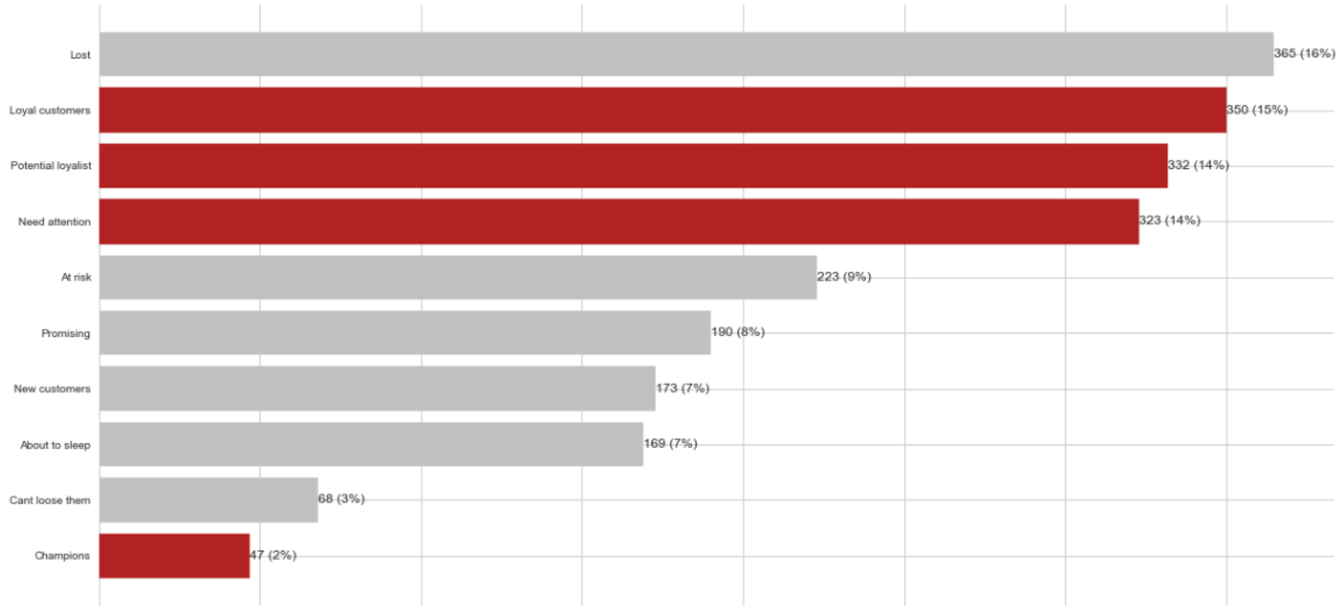


Customers will be divided into 10 clusters with the average silhouette score is 0.76

Modeling and Evaluation

Clustering Results

Cluster Distribution



Cluster Type

Segment	Recency	Frequency	Monetary
About to sleep	medium	low	low
At risk	high	medium	high
Cant loose them	high	high	high
Champions	low	high	medium
Lost	high	medium	medium
Loyal customers	medium	high	high
Need attention	medium	medium	medium
New customers	low	low	low
Potential loyalist	low	medium	medium
Promising	medium	low	low

In supporting goals to get business recommendations, we focus on 4 customer segments with a total of 1052 customers.

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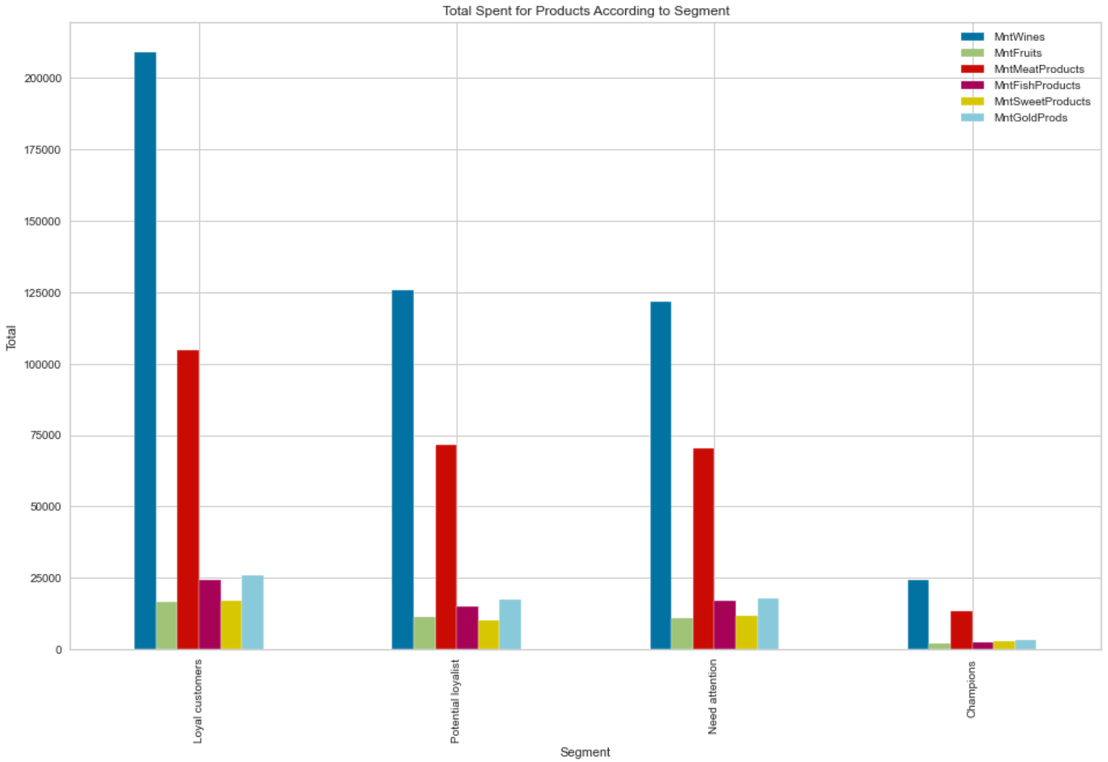
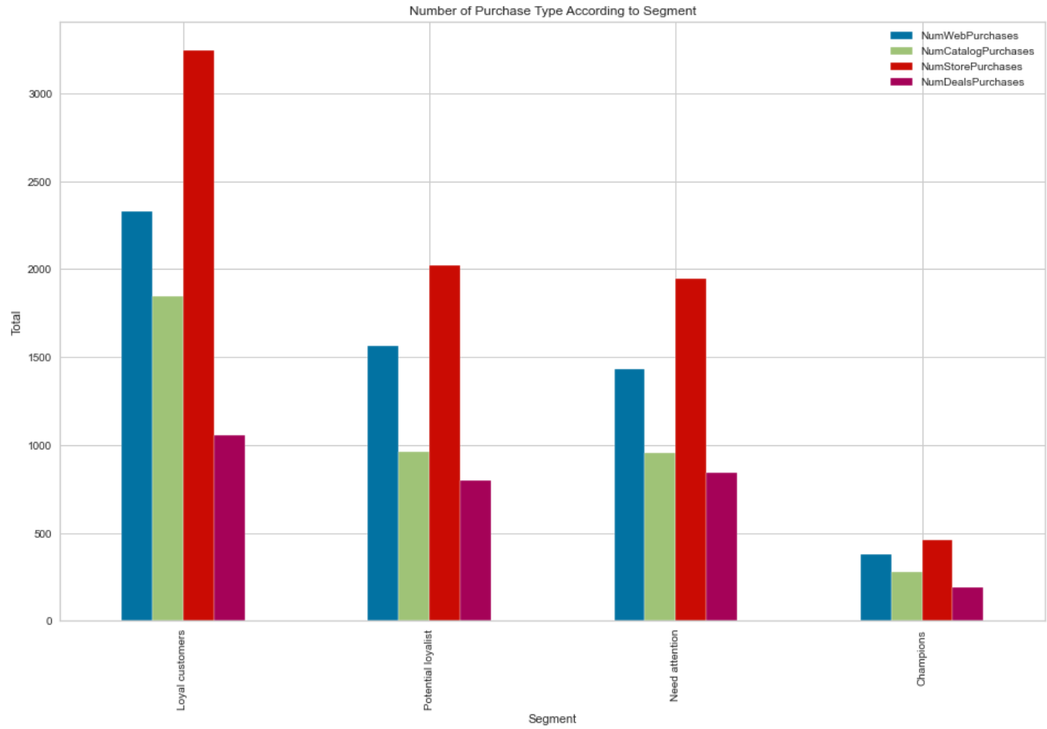
Modeling and Evaluation

Clustering Results





The most purchased product is wines and The most frequent type of purchase is store purchases

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Business Recommendation

- Recommendation
- Business Impact
- Simulation

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Business Recommendations

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Discount/Flash Sale

price reduction with a certain period of time

especially **for customers who have never response a campaign or 1x response the campaign** only

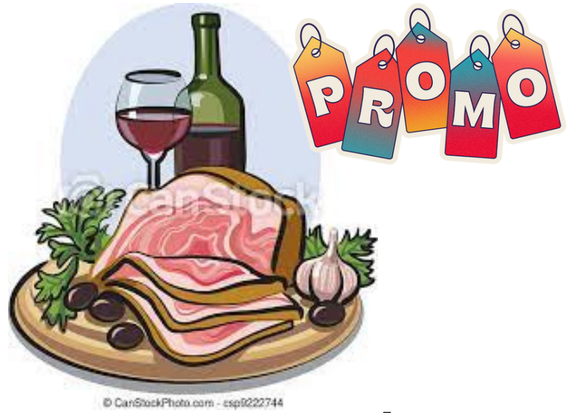
Goals:
to **increase** customers **shopping/purchasing interest**

Vouchers/Rewards

especially **for customers who have response the campaign at least 2 campaigns**

customers will get coupons and can be exchanged for discounts or other benefits such as points, free shipping, free gifts, etc.

Goals:
maintain customer's interest and retention



Promo Bundling/Special Offer

can implement **for all customers**

combining the main product with supporting products for more economical price for customers such as Gold Products + Wines, Wines + Meats, etc.

Goals:
encourage customers to buy more products

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Business Recommendations

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CUSTOMER SEGMENTATION

(Customer's characteristic based on RFM analysis)

1 CHAMPIONS

- Very active for shopping
- Spending quite much of money
- Very high shopping intensity

Recommendations:

- Promo Bundling/Special Offer
- Vouchers/Rewards

2 LOYAL

- Active for shopping
- Spending very much of money
- Very high shopping intensity

Recommendations:

- Promo Bundling/Special Offer
- Vouchers/Rewards

3 POTENTIAL

- Very active for shopping
- Spending quite much of money
- Quite high shopping intensity

Recommendations:

- Discount/Flash Sale
- Vouchers/Rewards
- Promo Bundling/Special Offer

4 NEED ATTENTION

- Quite active for shopping
- Spending quite much of money
- Quite high shopping intensity

Recommendations:

- Discount/Flash Sale
- Promo Bundling/Special Offer

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Business Simulation

Business metrics are quantifiable measures used to track business processes to judge the performance level of your business.

Response Rate

ROI

Net Profit Margin

Response Rate

63,66 %

True Positive (TP)= 44

False Positive (FP)= 12

response rate = TP/(TP+FP)

14,91%

before model

78,57%

after model

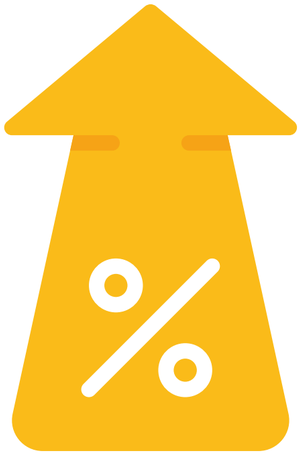
Net Profit Margin / NPM

-82,90 %

Before Modelling

Total Response (1=accept response)		334
Total Campaign (all customers)		2239
Total Cost ($)	= Total campaign*cost = 2239 * 3	6717
Total Revenue ($)	= Total response * revenue = 334 * 11	3674
Total Profit ($)	= Total Revenue - Total Cost = 3674 - 6717	-3043
NPM (%)	= (Total Profit/ Total Revenue) *100	-82.83

148,19



a customer

Revenue ($)	11
Cost ($)	3

65,29 %

After Modelling

Total Campaign (TP+FP)		56
Total Cost ($)	= Total campaign*cost = 56 * 3	168
Total Revenue ($)	= TP * revenue = 44 * 11	484
Total Profit ($)	= Total Revenue-Total Cost = 484-168	316
NPM (%)	= (Total Profit/ Total Revenue) *100	65.29

Return of Investment

Average Order Size (AOS)	= Total Revenue/Total Customer = 3674/2239	1.64
Average Order Frequency (AOF)	= Total Order/Total Customer = 2239/2239	1
Average Customer Value (ACV)	= AOS/AOF	1.64
Average Customer Llifetime (ACL)	= first order date-last order date	2
Customer Lifetime Value (CLV) ($)	= ACL*ACV	3.28

ROI > 1.0x

Before Modelling		
	number of new customers	12
CAC	= Total Marketing Cost/Number of new Customers = 6717 / 12	559.75
CLV		3.28
ROI	= CLV : CAC	0.006

After Modelling		
	number of new customers	56
CAC	= Total Marketing Cost/Number of new Customers = (TP*cost) / 56 = (44*3) / 56	2.36
CLV		3.28
ROI	= CLV : CAC	1.39

Gorcery
Store

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Thank You

END OF SLIDE