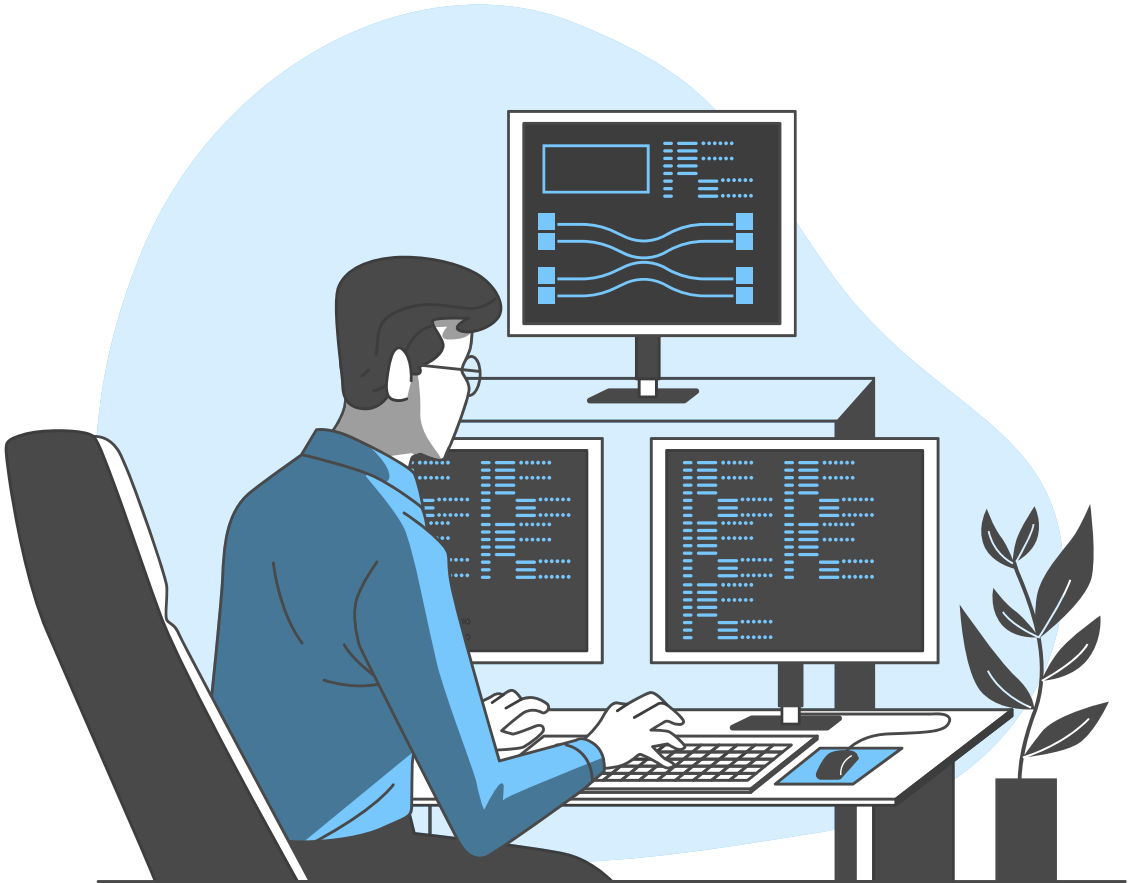

Marketing Response

Project by:
Erlando Febrian

About Me

I graduated of bachelor's degree from Bandung Institute of Technology, School of Business and Management, Business degree. I also graduated from Rakamin Data Science bootcamp with outstanding grade, awarded as best final project team, and also my role as team leader. I experienced in the following scope:

- Supervised & Unsupervised Learning
- Time Series Forecasting
- A/B Testing
- Deep learning using TensorFlow and Pytorch
- Recommender System
- Customer Lifetime Value
- SQL & Data Visualization (Tableau & Power BI)

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Table of Contents

Section 1

Project Background

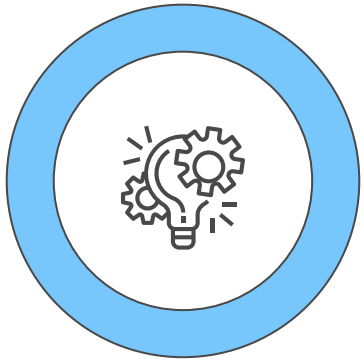
Objective

The objective is of the team is to develop a model that predicts customer behavior and to apply it to the rest of the customer base.

Moreover, other than maximizing the profit of the campaign, the CMO is interested in understanding to study the characteristic features of those customers who are willing to buy the gadget.

The steps are:

- Data Exploration;
- Segmentation;
- Classification Model;



Our Goal

Increase the company's **Conversion Rate** up to **20%** and **Revenue** up to **15%** in 2023

Section 2

Exploratory Data Analysis

Dataset Overview

2 Year Historical Data, contains 2240 rows, 1 row mean 1 unique customer

People

- ID
- Year_Birth
- Education
- Marital_Status
- Income
- Kidhome
- Teenhome
- Dt_Customer
- Recency
- Complain
- Country

Products

- MntWines
- MntFruits
- MntMeatProducts
- MntFishProducts
- MntSweetProducts
- MntGoldProds

Promotions

- NumDealsPurchases
- AcceptedCmp1
- AcceptedCmp2
- AcceptedCmp3
- AcceptedCmp4
- AcceptedCmp5

Place

- NumWebPurchases
- NumCatalogPurchases
- NumStorePurchases
- NumWebVisitsMonth

*) Detail Features Dictionary Written On Appendix

Target Feature

86.48%

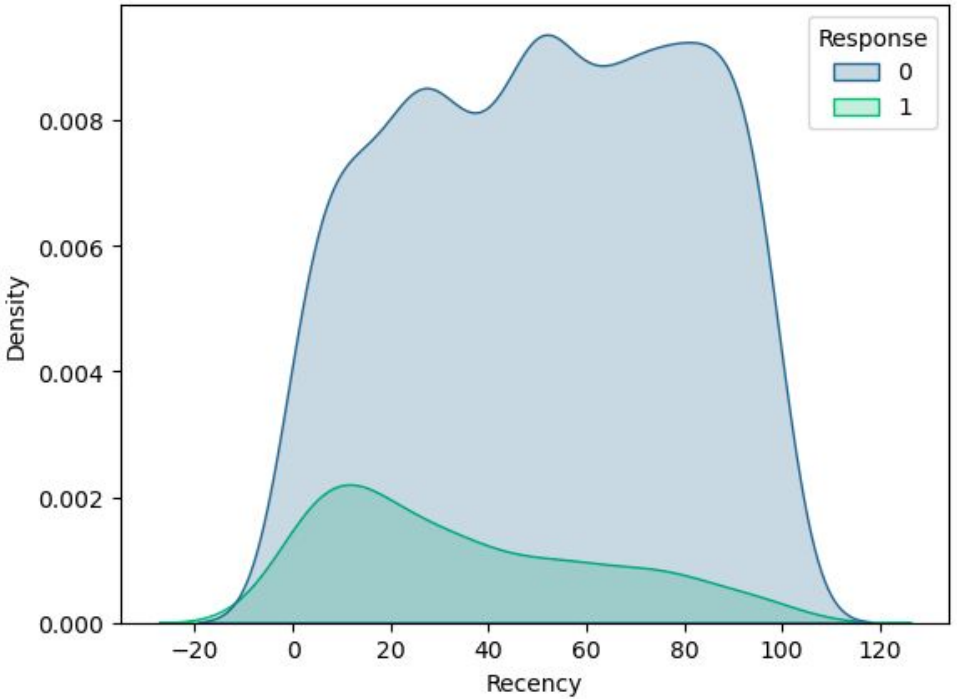
No Response

13.52%

Response

*) Response :1 if customer accepted the offer in the last campaign, 0 otherwise

Recency



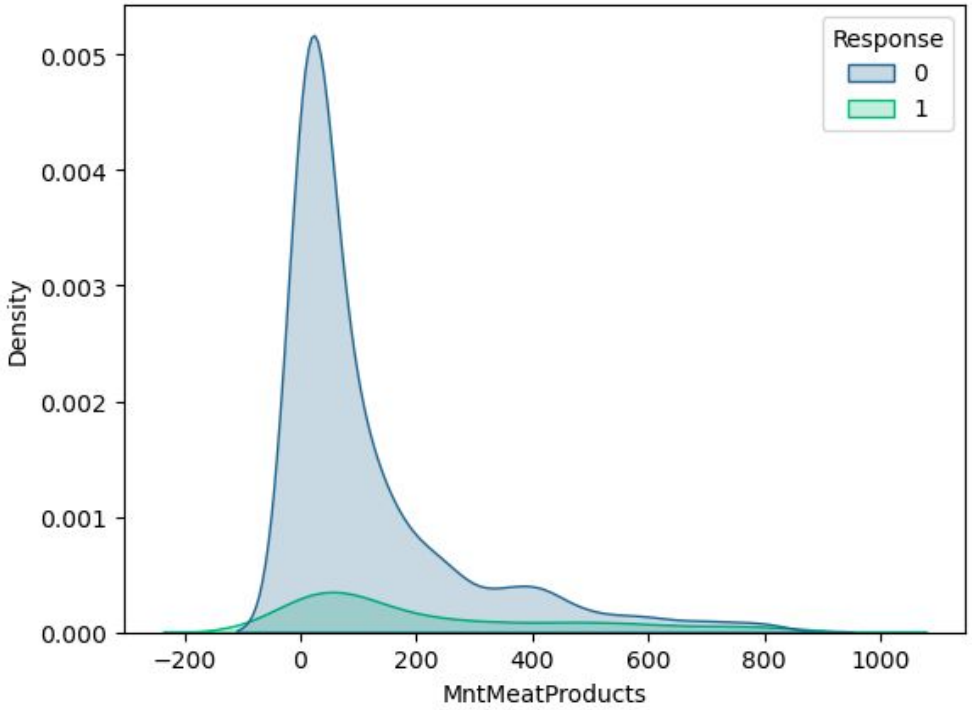
**) Recency is Number of days since customer's last purchase*

Avg Recency for **customer who response is 35 days** and for customer who **didn't response is 51 days.** This feature is normal, contains no extreme/strage values.

Insights:

- We need to explore the cause of high recency
- Need to know what made recency values stay high

MntMeatProducts



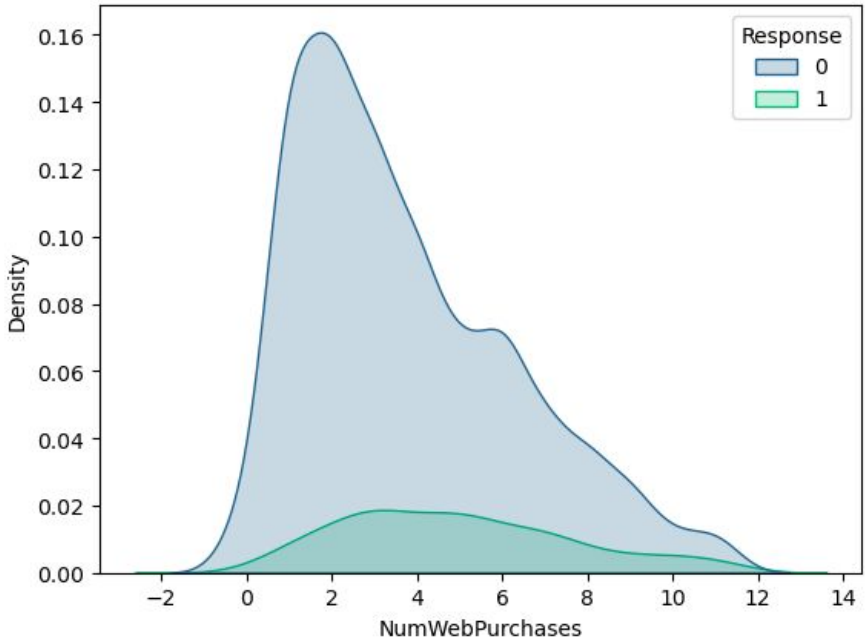
*) *MntMeatProducts Amount spent on meat in the last 2 years*

Avg Amount of Meat Products bought for **customer who response is 230 pcs** and for customer who **didn't response is 116 pcs.** This feature is normal, contains no extreme/strage values.

Insights:

- We need to explore the cause of low amount of meat products bought
- Need to know what made amount of meat products bought values stay high

NumWebPurchases



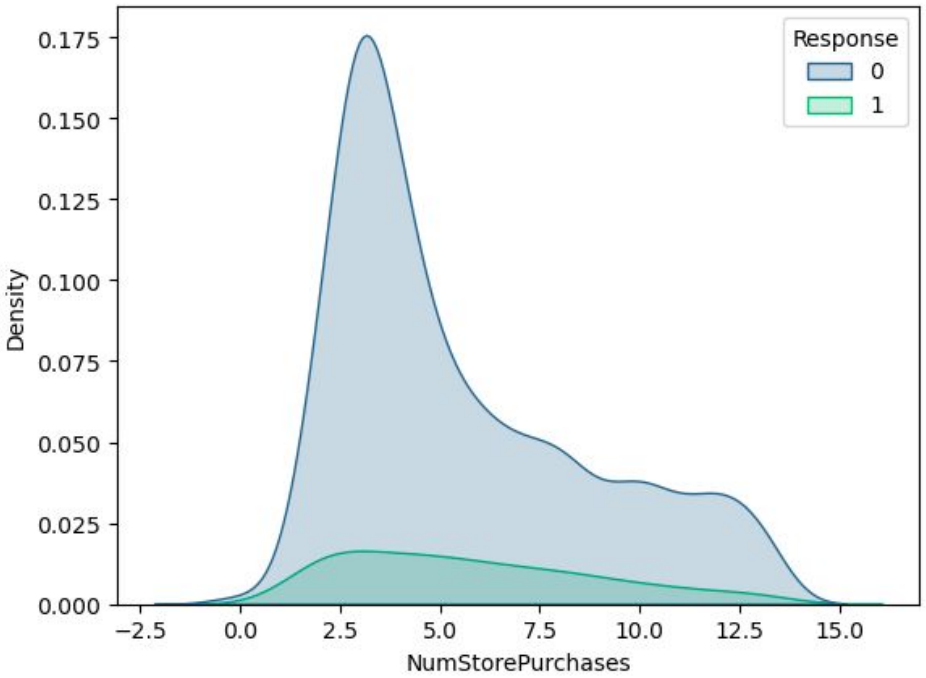
Avg Num of web purchase for **customer who response is 5 times** and for customer who **didn't response is 4 times.** This feature is normal, contains no extreme/strage values.

Insights:

- We need to explore the cause of low num of web purchases
- Need to know what made num of web purchases values stay high

**) NumWebPurchases is Number of purchases made through the company's web site*

NumStorePurchases



Avg Num of store purchase for **customer who response is 6 times** and for customer who **didn't response is 5 times.** This feature is normal, contains no extreme/strage values.

Insights:

- We need to explore the cause of high num of store purchases
- Need to know what made num of store purchases values stay low

**) NumStorePurchases is Number of purchases made directly in store*

Section 3

Data Pre Processing

Data Pre Processing

Feature Extraction

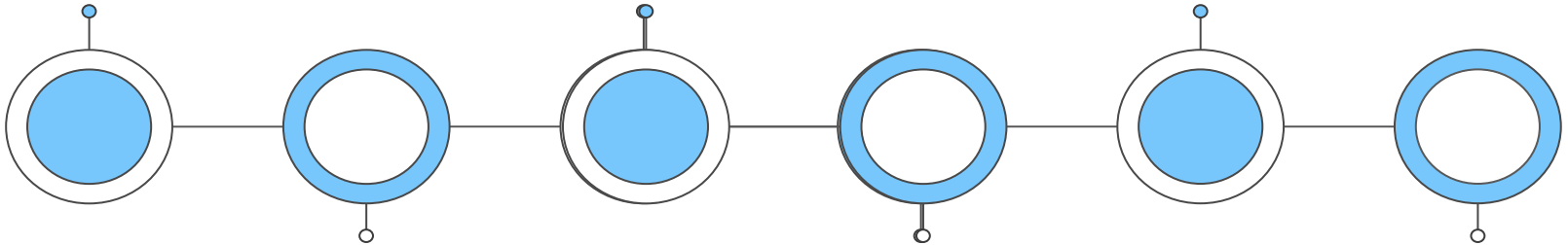
Age, Tenure, Day Registered, Month Registered, and Register on Weekend

Outlier Handling

Using Z-score method, we dropped 229 outlier values

Feature Selection

Using Quasi Constant, Chi Square, and Univariate Feature Selection Method



Missing Values Handling

Impute 24 median values on Income feature

Feature Encoding & Transformation

Using One Hot Encoder and RobustScaler Method

Handling Imbalaced

- SMOTE-NC (sampling strategy : 0.6)
- SMOTEENN

Section 4
Modeling

Basic Classification Model (SMOTE-NC)

	Model	Accuracy	Precision	Recall	F1 Score	AUC
0	Logistic Regression	0.866005	0.420290	0.674419	0.517857	0.781654
1	Decision Tree	0.826303	0.315068	0.534884	0.396552	0.697997
2	Random Forest	0.888337	0.479167	0.534884	0.505495	0.732720
3	Ada Boost	0.866005	0.420290	0.674419	0.517857	0.781654
4	Gradient Boost	0.900744	0.529412	0.627907	0.574468	0.780620
5	XG Boost	0.903226	0.550000	0.511628	0.530120	0.730814

We decided to do hyperparameter tuning on Gradient Boost and XGBoost, because:

- High AUC score
- Pretty much balance on Recall and Precision

Basic Classification Model (SMOTEENN)

	Model	Accuracy	Precision	Recall	F1 Score	AUC
0	Logistic Regression	0.866005	0.420290	0.674419	0.517857	0.781654
1	Decision Tree	0.826303	0.315068	0.534884	0.396552	0.697997
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5	XG Boost	0.903226	0.550000	0.511628	0.530120	0.730814

We decided to do hyperparameter tuning on Random Forest, Gradient Boost, and XGBoost, because:

- High AUC score
- Pretty much balance on Recall and Precision

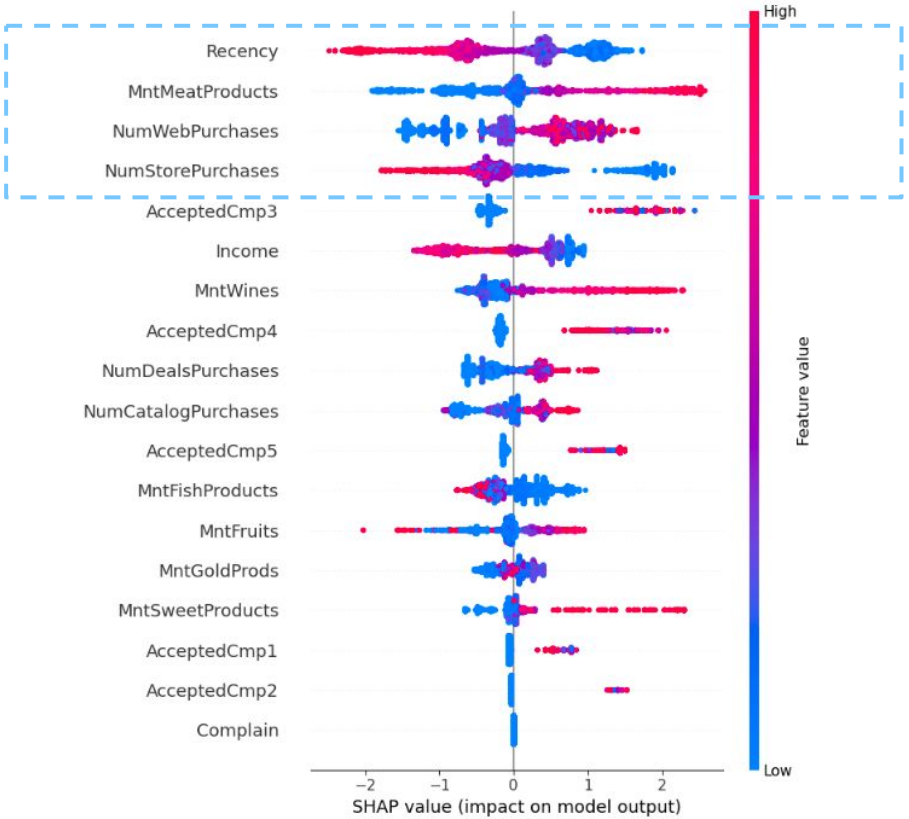
Hyperparameter Tuning

Model	Train AUC	Test AUC
Random Forest SMOTEENN	0.823564	0.801938
Gradient Boosting SMOTEENN	0.859136	0.801776
XGB SMOTEENN	0.849670	0.825032
Gradient Boosting Classifier SMOTE-NC	0.803604	0.828521
XGBClassifier SMOTE-NC	0.970898	0.755975

We decided to do interprete **XGB - SMOTEENN,** because:

- High AUC score
- Less Overfitting

Feature Importance



We will use top 4 important feature for business insights and simulation, those are:

- Recency
- MntMeatProducts
- NumWebPurchase
- NumStorePurchase

Section 5

Clustering

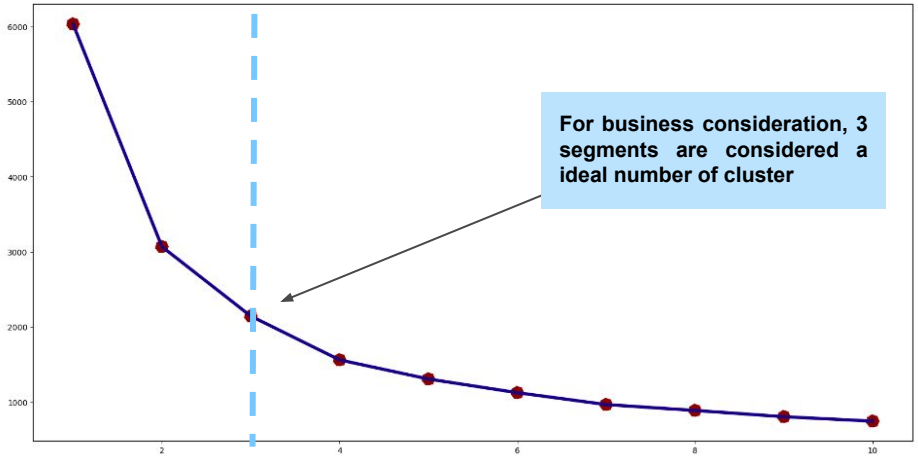
Recency, Frequency, & Monetary (RFM)

- **Recency**
  Refers to when the customer did the most recent transaction using our product (we already have Recency feature)

- **Frequency**
  Refers to how often customers do transactions using our product (sum all the feature placement type (eg: NumWebPurchases, NumCatalogPurchases, and NumStorePurchases)

- **Monetary Value**
  Refers to how much does a customer spend in our product (add up all the items purchased (eg: MntWines & MntFruits) by the customer and multiply by the price of each item based on additional data)[1]

Feature Standardization and Elbow Method



We used **StandardScaler** to standardize our data, then we tried to find the proper number of cluster, Elbow method shows 2 is the proper number of cluster, but we consider to **make 3 cluster due to business consideration**

Kmeans Segmentation Result

Segment 1

Active customers with low recency, low spending amount and less frequent

Segment 2

Inactive customers with high recency, low spending amount and less frequent transaction

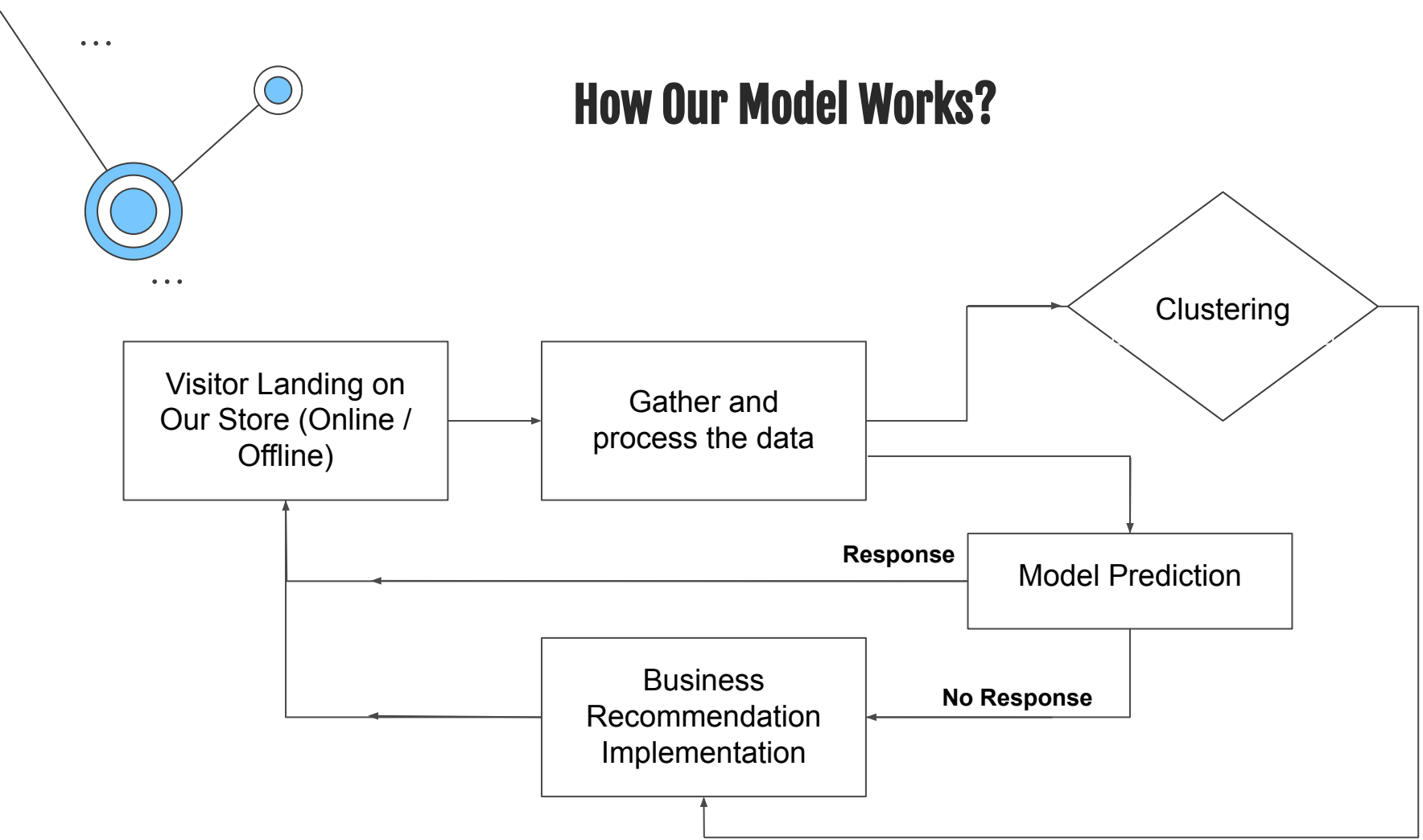
Segment 3

Quite active in shopping, high spending, and frequent transaction

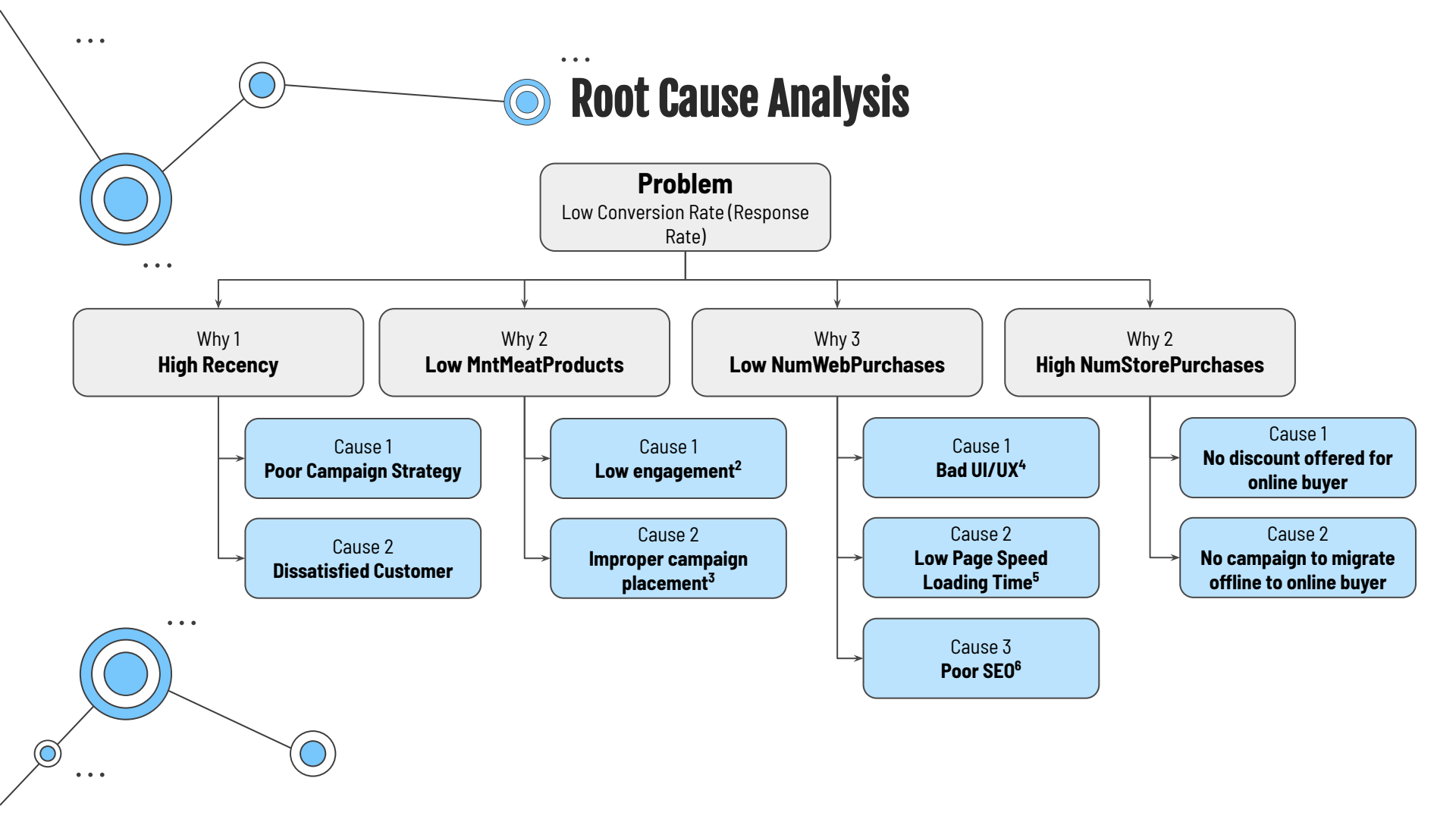
**) On python notebook, cluster 0 = segment 1, cluster 1 = segment 2, and cluster 2 = segment 3*

Section 6
Business Insights and Recommendation

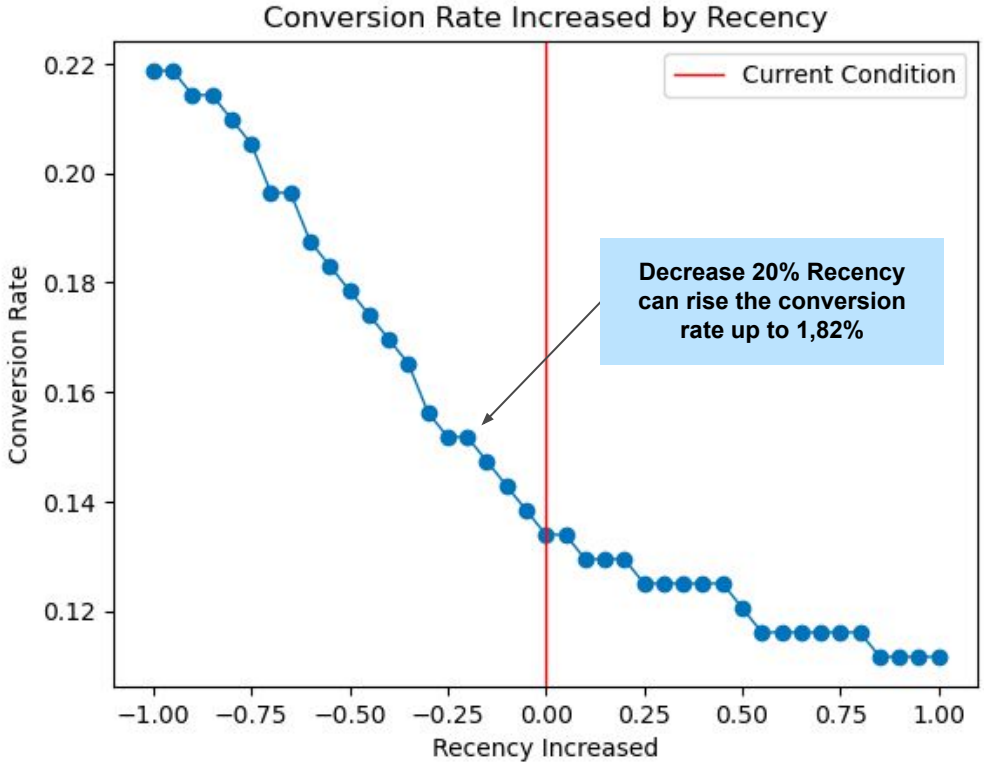
How Our Model Works?



Root Cause Analysis



Recency Sensitivity Analysis



Note

If the existing average Recency is 49 days, then after decreasing 20% Recency it becomes 39 days, it means that we will only target customer with Recency 39 days or less.

**) Recency is Number of days since customer's last purchase*

Recommendation 1

How to Deal with High Recency Values?

Root Cause	Recommendation	How to do	Pros	Cons
Poor Campaign Strategy: After conduct exploratory data analysis on campaign type, we know that campaign4 and campaign5 have highest average recency	Analyze and Improve campaign strategy	• Analyze why campaign4 and campaign5 have bad performace • Modify and implement existing succesfuly campaign to campaign5 and campaign 4	• Improving campaign means improving conversion rate indirectly. • Improve only 2 campaign means save marketing cost rather than improve all campaign	• It keep needs cost • Need long working time to make a good campaign
Dissatisfied Customers	Give loyalty membership	Make loyalty membership program based on RFM segmentation. Member : • **Gold**: Segement 3 • **Silver**: Segement 1 • **Bronze**: Segment 2	• Increase conversion rate indirectly • Quite effective method to retain customers	• it costs money to make this program depending on how many members join
	Audit all matters directly related to customers and improve it	Audit product quality, customer service, and marketing campaign	• We can know the problem of our customer	• Need cost based on the problem • Need long working time

Simulation 1 - Target Customer who have low Recency

Using 20% Recency Reduction

Before		*After*
49.10 Days Avg Recency / Year	→	**39.28 Days** Avg Recency / Year
13.53 % Conversion Rate / Year	→	**15.35 %** Conversion Rate / Year
2.12 M Revenue / Year	→	**2.22 M** Revenue / Year

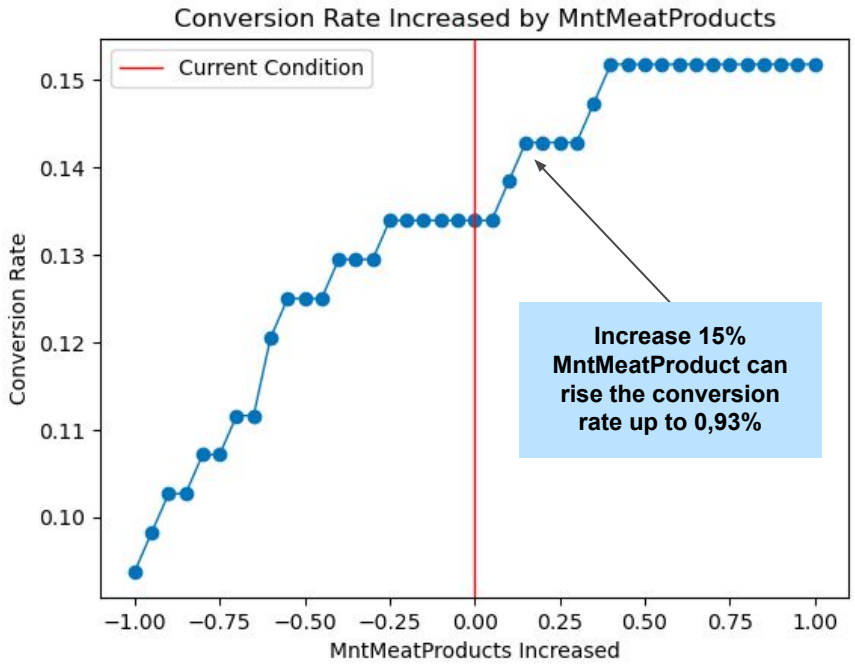
Assumption

1. *Num of Customers = 2011 / Year*
2. *Treatment Efficiency Rate = 1%*
3. *Treatment Cost = 10% of Average Monetary*

Recommendation

For remarketing strategy, target only customer in Segment 1 who have Average Recency less than 39 Days

MntMeatProduct Sensitivity Analysis



Note

15% increment of MntMeatProduct can increase the conversion rate (response rate). It could be offer best deals for customer to stimulate them to buy more on Meat Products.

**) MntMeatProducts Amount spent on meat in the last 2 years*

Recommendation 2

How to Deal with Low Amount of Meat Product Bought?

Root Cause	Recommendation	How to do	Pros	Cons
Low Product Engagement	Create product based campaign and content about the product	• Analyze what interesting about the product • Create blog post, social media post, and video post about the product	• Improving campaign means improving conversion rate indirectly. • Improve only 2 campaign means save marketing cost rather than improve all campaign	• It keep needs cost • Need long working time to make a good campaign
Improper Campaign Placement	Find the proper placement about this product (either online or offline)	• Find the place on our platform using heatmap software which placement is better for this product • Choose proper placement for product offline placement	• We can know our customer behavior when surfing our product on our platform	• Need cost and time to do an experimentation design • Need additional working time to do ab testing

Simulation 2 - Increase Meat Products Sales

Using 15% MntMeatProducts Increment

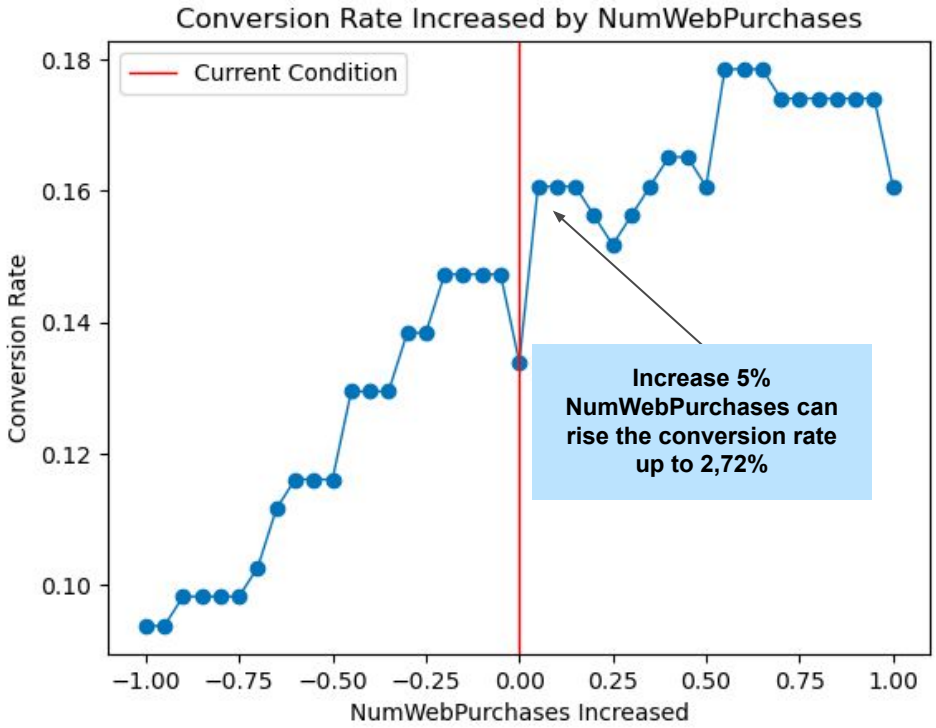
Before		***After***
13.53 % Conversion Rate / Year	→	**14.46 %** Conversion Rate / Year
2.12 M Revenue / Year	→	**2.22 M** Revenue / Year

Assumption

1. *Num of Customers = 2011 / Year*
2. *Treatment Efficiency Rate = 1%*
3. *Treatment Cost = 10% of Average Monetary*

Second recommendation can potentially **increase 0.93% conversion rate** (response rate) and **increase 4.6% Revenue**

NumWebPurchases Sensitivity Analysis



Note

Based on the result, we are looking for optimal increment of Num Web Purchases for cost efficiency, we decided to **increase it 5%** and it potentially lead up to **2,72% increment of conversion rate.**

**) NumWebPurchases is Number of purchases made through the company's web site*

Recommendation 3

How to Deal with Low Num Web Purchases?

Root Cause	Recommendation	How to do	Pros	Cons
Bad UI/UX	Improve UI/UX Design[8]	• Conduct Through Research • Simplicity is a Must • Experimental Design	• Have a long-term effect • Relatively cheap	• Requires long working time • Need additional working time to do A/B testing
Low Page Speed Loading Time	Improve Page Loading Time[9]	• Upgrade web hosting • Optimize image (compression) • Upgrade CMS and it's plugin	Potentially increase conversion rate higher than other recommendation	• Requires good hosting and it's quite expensive • Need high technical skill team and it is costly to get qualified employees
Poor SEO	SEO Improvement[7]	• Create content based on keyword7 • Optimize on page SEO • Go after featured snippets	• Relatively cheap • Have a long term effect	• Need regularly improvement • It needs longer time to work on than other recommendation

Simulation 3 - Increase Num Web Purchase

Using 5% NumWebPurchase Increment

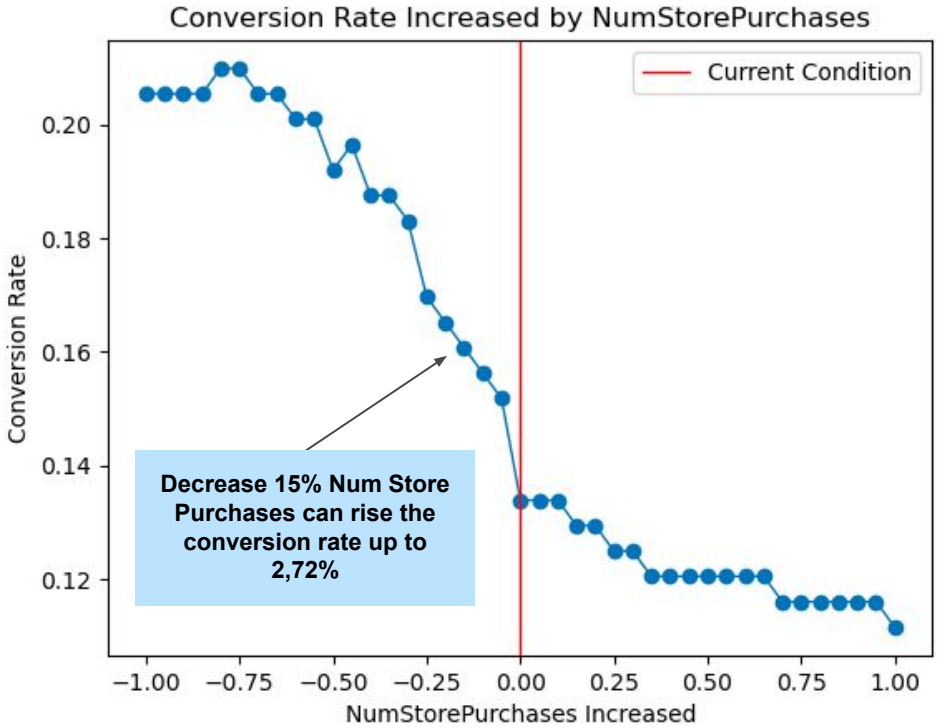
Before		After
13.53 % Conversion Rate / Year	→	14.46 % Conversion Rate / Year
2.12 M Revenue / Year	→	2.50 M Revenue / Year

Assumption

1. *Num of Customers = 2011 / Year*
2. *Treatment Efficiency Rate = 1%*
3. *Treatment Cost = 10% of Average Monetary*

Third recommendation can potentially **increase 2.72% conversion rate** (response rate) and **increase 17.8 % Revenue**

NumStorePurchases Sensitivity Analysis



Note

Based on the result, we are looking for optimal increment of Num Store Purchases for cost efficiency, we decided to **decrease it 15%** and it potentially lead up to **2,72% increment of conversion rate.**

**) NumStorePurchases is Number of purchases made directly in store*

Recommendation 4

How to Deal with High Num of Store Purchases?

Root Cause	Recommendation	How to do	Pros	Cons
No Discount Offered for Online Buyer	Offer best deal and discount to offline buyer	• Conduct Through Research type of discount is proper for migrating customer	• Decrease Num of Store Purchase cause increment of conversion rate • Deal with online customer is quite easier to analyze rather than offline customers	• Need budget/cost to build campaign and discount offer
No Campaign is Running in purpose to Migrate Offline to Online Buyer	Running campaign on this purpose	• Analyze the what campaign is suitable for this purpose		

Simulation 4 - Decrease Num Store Purchase

Using 15% Num Store Purchase Reduction

Before		***After***
13.53 % Conversion Rate / Year	→	**14.46 %** Conversion Rate / Year
2.12 M Revenue / Year	→	**2.50 M** Revenue / Year

Assumption

1. *Num of Customers = 2011 / Year*
2. *Treatment Efficiency Rate = 1%*
3. *Treatment Cost = 10% of Average Monetary*

Fourth recommendation can potentially **increase 2.72% conversion rate** (response rate) and **increase 17.8 % Revenue**

Combine Simulation 2,3, and 4

- Using 15% MntMeatProducts Increment
- Using 5% NumWebPurchase Increment
- Using 15% Num Store Purchase Reduction

Before		***After***
13.53 % Conversion Rate / Year	→	**19.37 %** Conversion Rate / Year
2.12 M Revenue / Year	→	**2.50 M** Revenue / Year

Assumption

1. *Num of Customers = 2011 / Year*
2. *Treatment Efficiency Rate = 1%*
3. *Treatment Cost = 10% of Average Monetary*

Fourth recommendation can potentially **increase 5.84% conversion rate** (response rate) and **increase 40.91 % Revenue**

Thank You

Appendix

Data Dictionary

People:

- ID : Customer's unique identifier
- Year_Birth : Customer's birth year
- Education : Customer's education level
- Marital_Status : Customer's marital status
- Income : Customer's yearly household income
- Kidhome : Number of children in customer's household
- Teenhome : Number of teenagers in customer's household
- Dt_Customer : Date of customer's enrollment with the company
- Recency : Number of days since customer's last purchase
- Complain : 1 if customer complained in the last 2 years, 0 otherwise
- Country : Customer's location

Products:

- MntWines : Amount spent on wine in the last 2 years
- MntFruits : Amount spent on fruits in the last 2 years
- MntMeatProducts : Amount spent on meat in the last 2 years
- MntFishProducts : Amount spent on fish in the last 2 years
- MntSweetProducts : Amount spent on sweets in the last 2 years
- MntGoldProds : Amount spent on gold in the last 2 years

Data Dictionary

Promotions:

- NumDealsPurchases : Number of purchases made with a discount
- AcceptedCmp3 : 1 if customer accepted the offer in the 3rd campaign, 0 otherwise
- AcceptedCmp4 : 1 if customer accepted the offer in the 4th campaign, 0 otherwise
- AcceptedCmp5 : 1 if customer accepted the offer in the 5th campaign, 0 otherwise
- AcceptedCmp1 : 1 if customer accepted the offer in the 1st campaign, 0 otherwise
- AcceptedCmp2 : 1 if customer accepted the offer in the 2nd campaign, 0 otherwise
- Response : 1 if customer accepted the offer in the last campaign, 0 otherwise

Places:

- NumWebPurchases : Number of purchases made through the company's web site
- NumCatalogPurchases : Number of purchases made using a catalogue
- NumStorePurchases : Number of purchases made directly in stores
- NumWebVisitsMonth : Number of visits to company's web site in the last month

References

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