



A large, abstract graphic in the background consists of numerous overlapping triangles in white and various shades of grey, creating a sense of depth and geometric complexity.

# Capstone Project

- AAA Northeast  
Member Analysis

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# Agenda

- ❖ Background
- ❖ Objectives
- ❖ Applied Methodology
  - ❖ Framework
  - ❖ Data Processing
  - ❖ Predictions
  - ❖ Clustering
- ❖ Market Segmentation
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- ❖ Sources

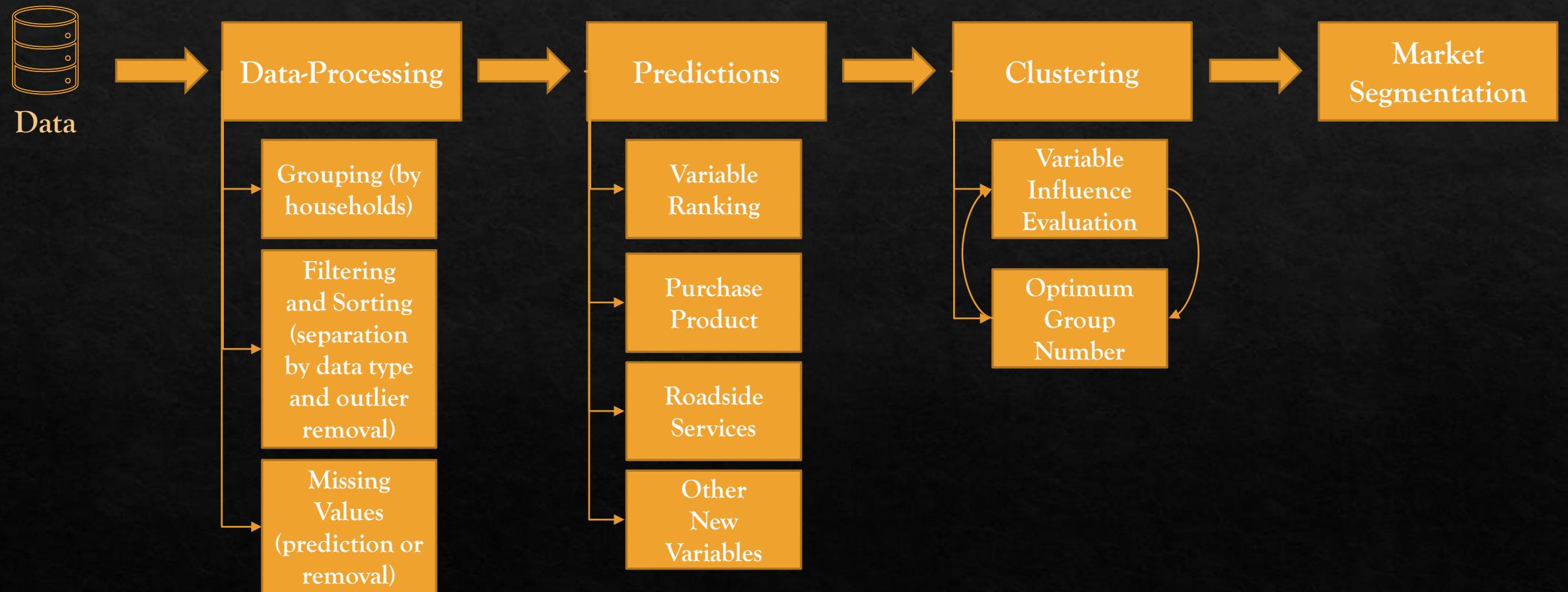
# Background

- ❖ American Automobile Association (AAA) is a North American federation motor clubs:
  - ❖ 117 years old
  - ❖ Over 60 million members
  - ❖ Not-for-Profit Organization
  - ❖ Several types of service (Travel Insurance, Mortgage, Roadside Assistance, etc)
  - ❖ 34 motor clubs (Grand areas)
    - ❖ 1.100 branch offices
    - ❖ Each club is independent
- ❖ Main club for this presentation: AAA- Northeast

# Project Objectives

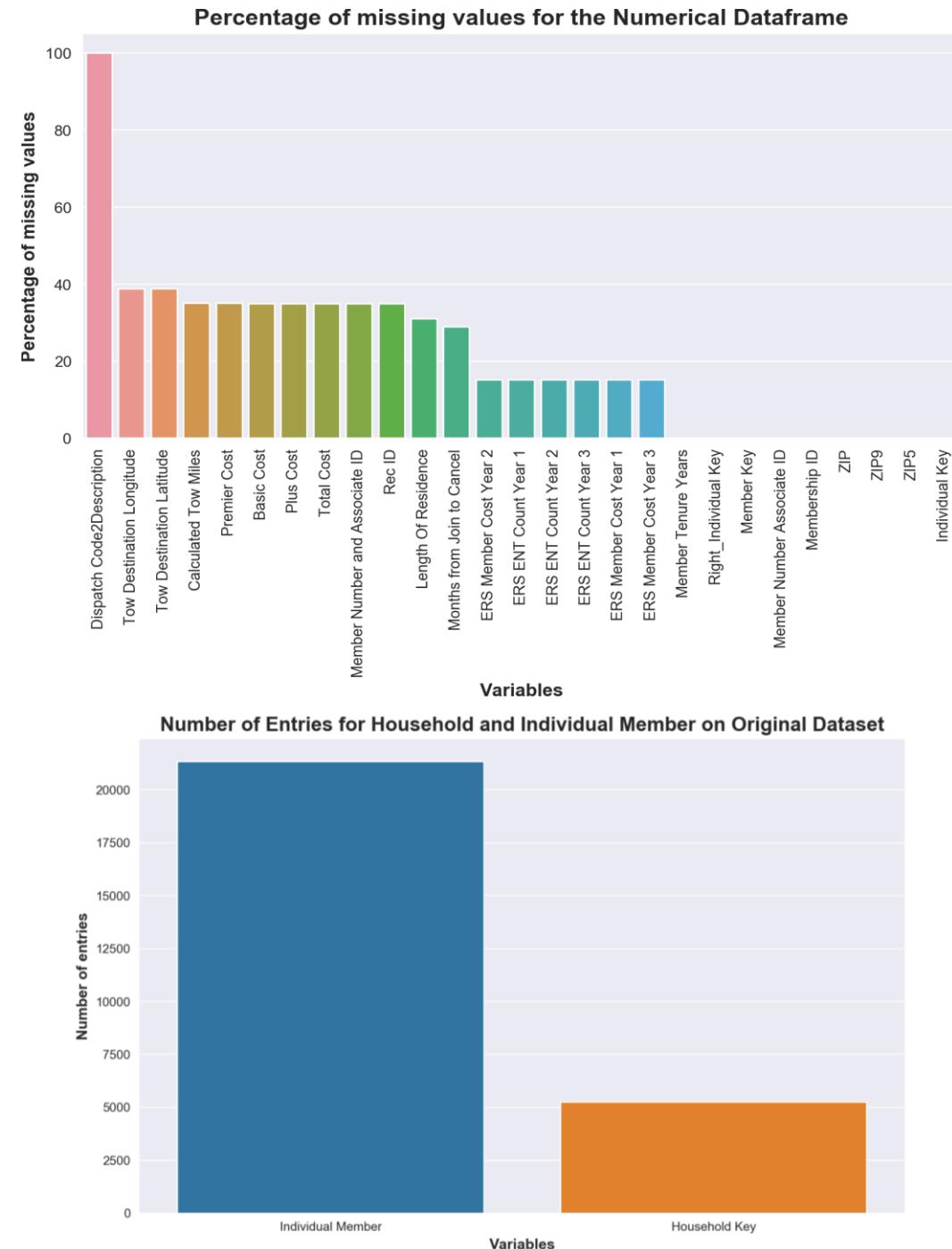
- ❖ Segmentation of AAA members (Household Level):
  - ❖ Types of Households
  - ❖ Target Products
  - ❖ Behavioral Analysis (last 3 years)
  - ❖ Associated Probabilities:
    - ❖ Product Acquisition
    - ❖ Usage of provided services
  - ❖ Higher Revenue Household Groups
  - ❖ Associated Household Groups Cost

# Framework



# Data Processing

- ❖ Grouping data by Household:
  - ❖ Spreadsheet originally sorted by Individual Members
- ❖ Filtering and Sorting:
  - ❖ Outliers Removal
  - ❖ Separation per Data Type
- ❖ Missing Values:
  - ❖ Prediction (when possible)
  - ❖ Removal

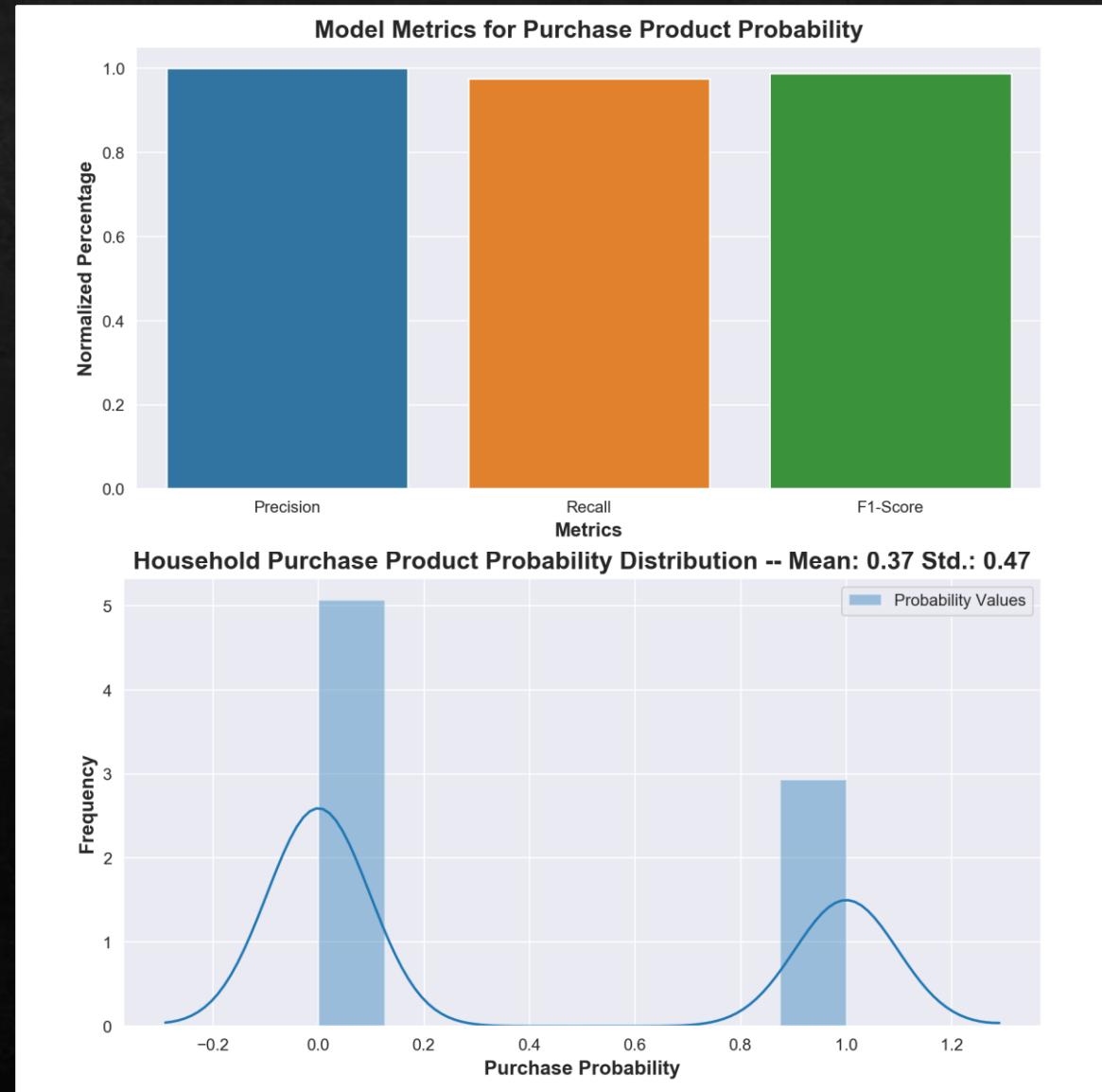


# Predictions

- ❖ Chosen Model:
  - ❖ Logistic-Regression
  - ❖ Motivation: Direct output of probability for a target variable
- ❖ Variable Ranking (Feature Selection) Methods:
  - ❖ Pearson Correlation
  - ❖ Recursive Feature Elimination
    - ❖ Test using several possible numbers of variables (3 to 10)
- ❖ Monitors:
  - ❖ Accuracy
  - ❖ Precision
  - ❖ Recall
  - ❖ F1-Score
- ❖ Build:
  - ❖ 30% for training data
  - ❖ 70% for validation (score calculation)

# Predictions - Purchase Product Probability

- ❖ Variable Ranking (Importance):
  1. Total Number of Purchase Products (new variable predicted)
  2. AAA Travel (TRV Globalware Flag)
  3. AAA Insurance (INS Client Flag)
  4. AAA Credit Card (FSV Credit Card Flag)
  5. AAA Financial Services (FSV CMSI Flag)
- ❖ Method of Variable Ranking chosen:
  - ❖ Recursive Feature Elimination
- ❖ Absolute Value of Metrics:
  - ❖ Accuracy: 98%
  - ❖ Precision: 100%
  - ❖ Recall: 98%
  - ❖ F1-Score: 99%



# Predictions – Roadside Service Usage Probability

## ❖ Variable Ranking (Importance):

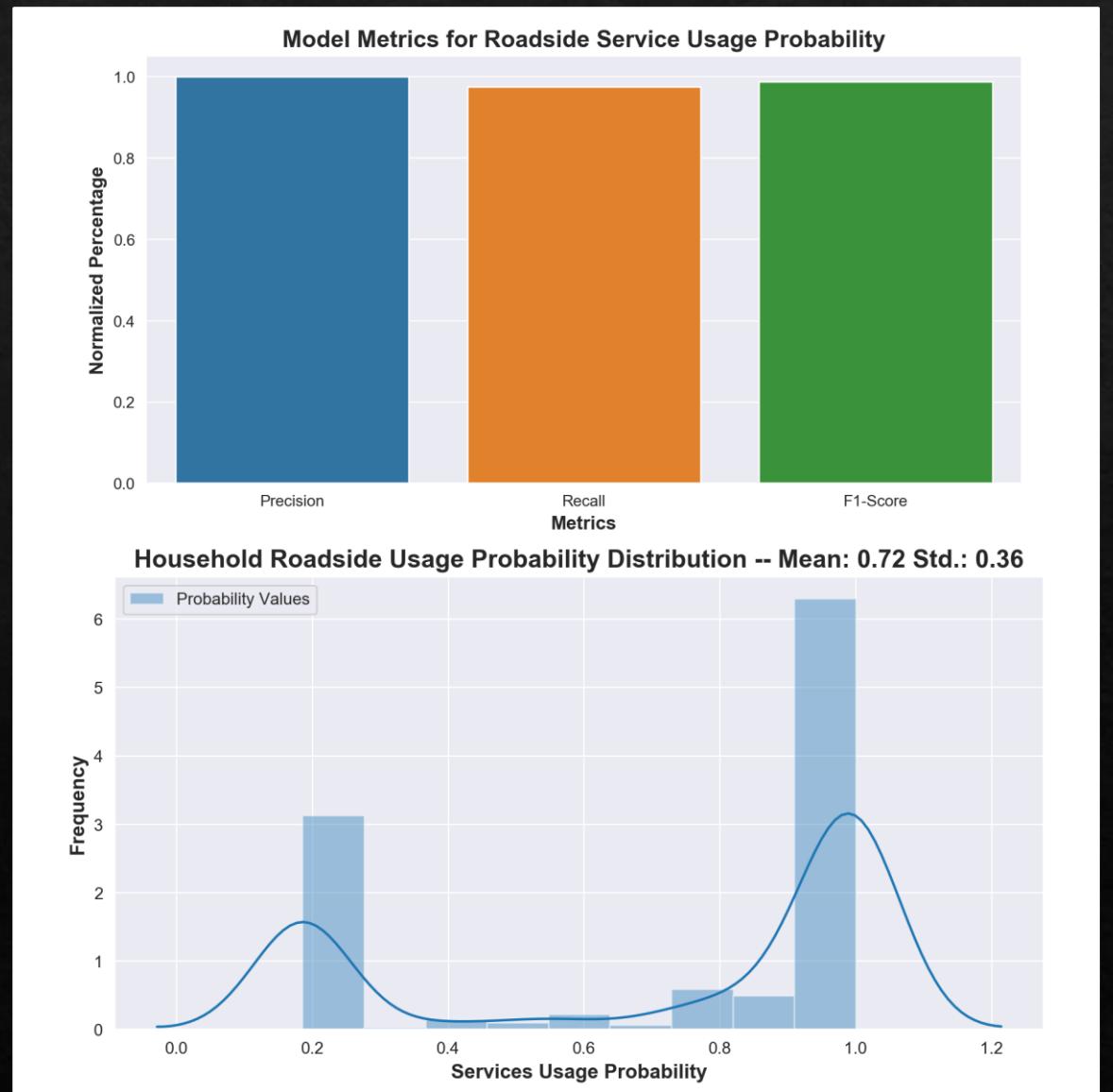
1. Frequency of Roadside Services Use (new variable predicted)
2. Total Number of Roadside Calls (new variable predicted)
3. Number of Roadside Calls for Year 3 (ERS ENT Count Year 3)
4. Number of Roadside Calls for Year 2 (ERS ENT Count Year 2)

## ❖ Method of Variable Ranking chosen:

- ❖ Recursive Feature Elimination

## ❖ Absolute Value of Metrics:

- ❖ Accuracy: 98%
- ❖ Precision: 94%
- ❖ Recall: 100%
- ❖ F1-Score: 97%



# Clustering

- ❖ Multiple Variable Selection:

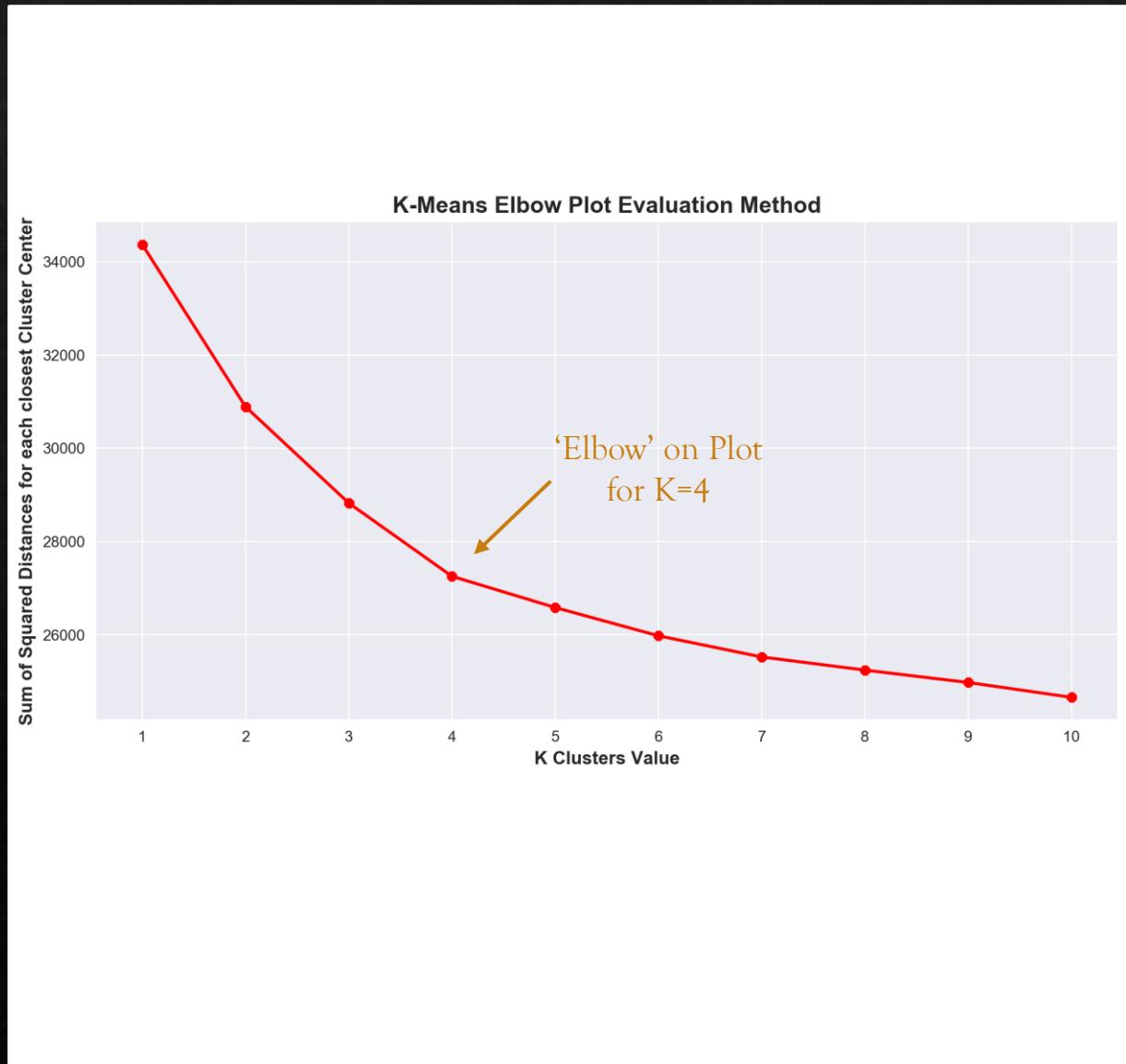
- ❖ Combination of a different set of variables:
    - ❖ Features most related to cost
    - ❖ Features most related to profit
    - ❖ Cultural Information
    - ❖ Test on entire post-processed data

- ❖ Optimum Number of Clusters:

- ❖ Several Numbers of clusters tested (1 tp 10)
  - ❖ Elbow Method:
    - ❖ Plot based Method
    - ❖ Monitors the Sum of Squared Distances of each sample to their closest cluster center

- ❖ Build:

- ❖ Using the entire post-processed database restrained on selected features

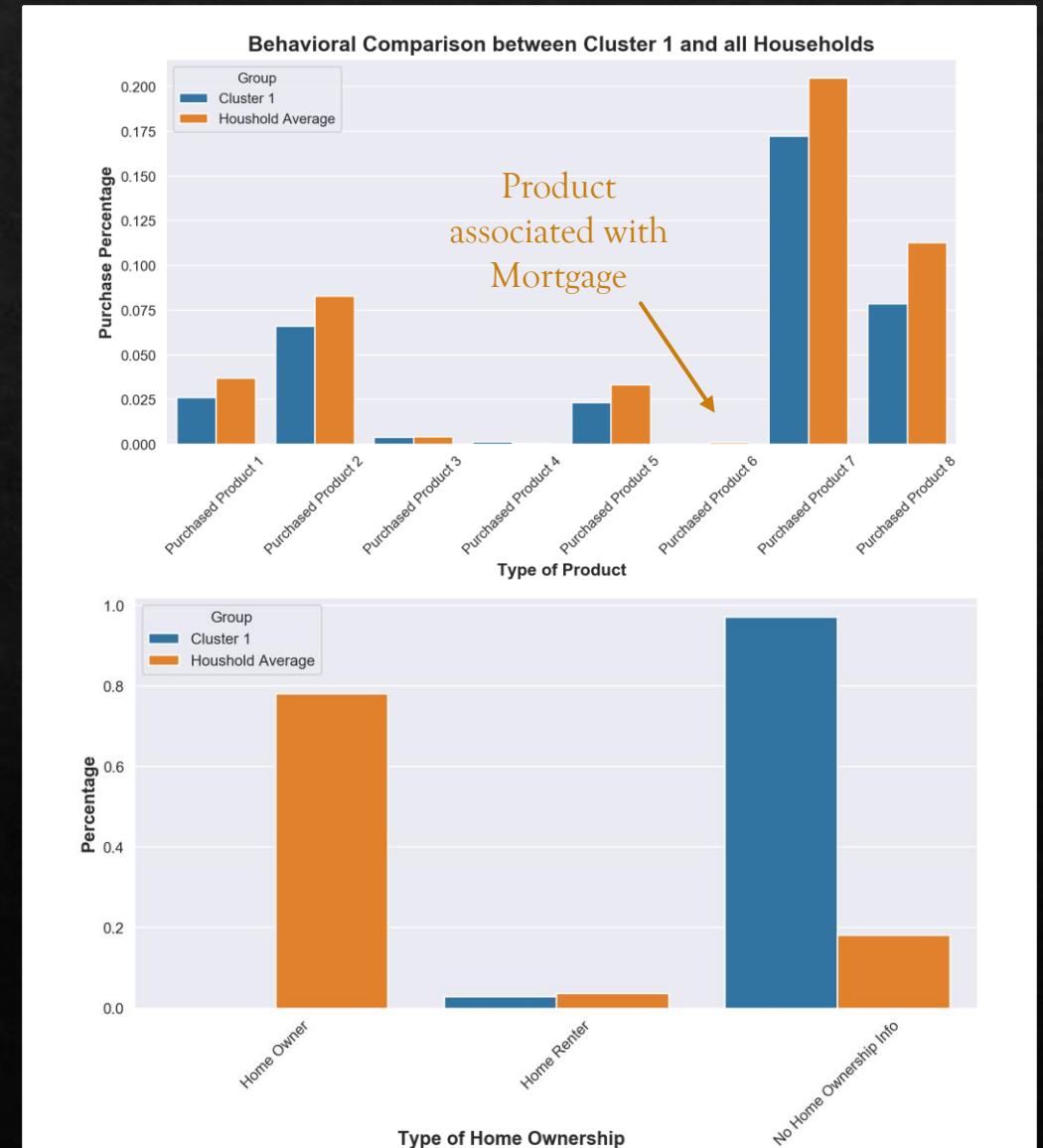


# Segment Labels

- ❖ The Households were grouped into 4 different clusters:
  - ❖ Cluster 1:
    - ❖ Labeled as “No Home - No Mortgage”
    - ❖ Group Highlights:
      - ❖ No home ownership info or mainly Renters
      - ❖ Did not purchase Mortgage Product (FSV Mortgage Flag)
  - ❖ Cluster 2:
    - ❖ Labeled as “The Big Problem”
    - ❖ Group Highlights:
      - ❖ Have not purchased any type of product in the last three years
      - ❖ Total Cost for AAA above average
  - ❖ Cluster 3:
    - ❖ Labeled as “Stick to the Basics”
    - ❖ Group Highlights:
      - ❖ All Basic Membership
      - ❖ They buy but also cost
  - ❖ Cluster 4:
    - ❖ Labeled as “The Big Target”
    - ❖ Group Highlights:
      - ❖ 98% of Purchase Probability
      - ❖ Open for Email Approach (lower cost associated)

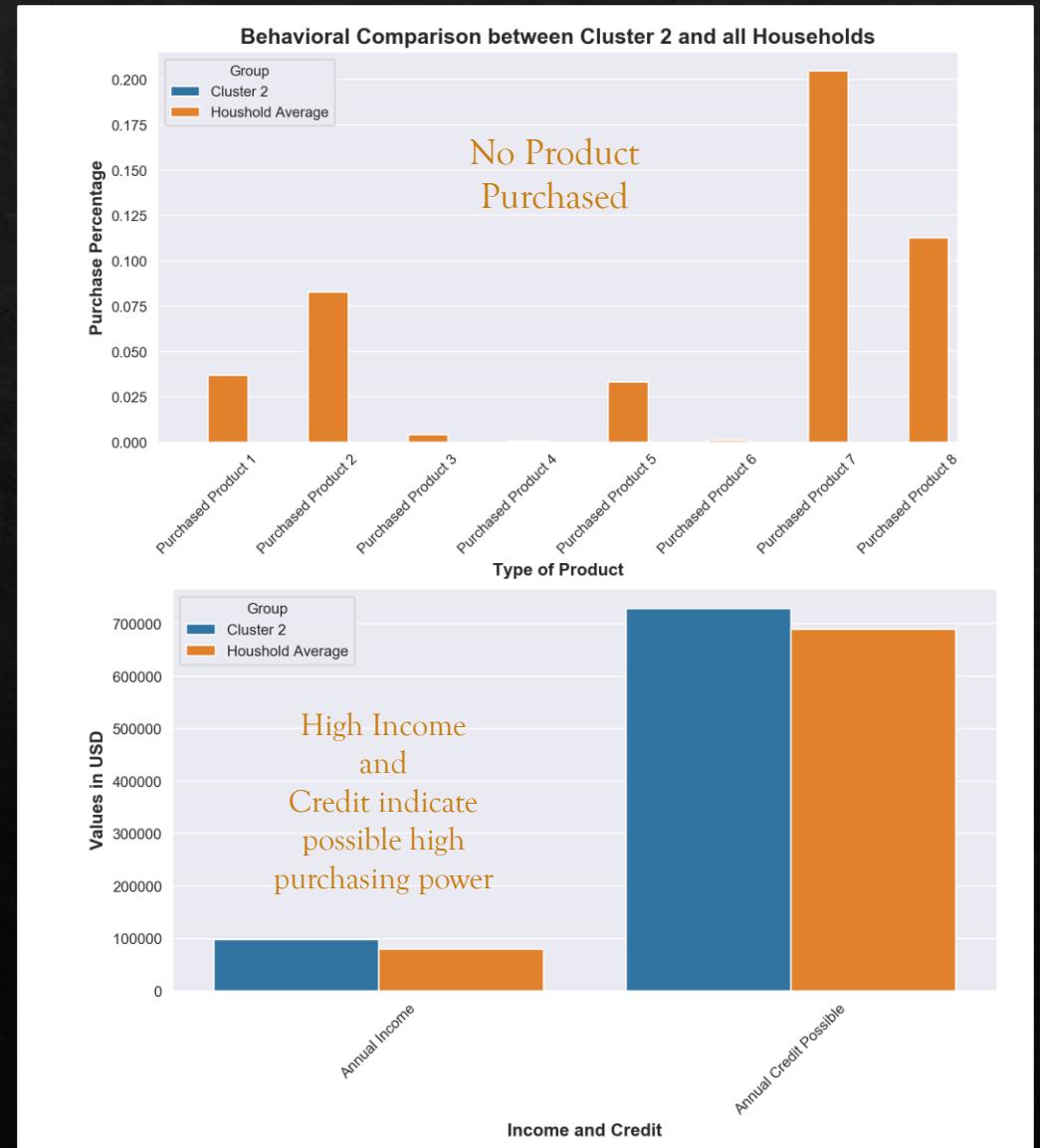
# Segment Analysis - “No Home - No Mortgage”

- ❖ Household group main characteristics:
  - ❖ Number of Households in this group: 725
  - ❖ Below Average on cost (Approximately USD 918.13) [Avg. = USD 991.48]
  - ❖ Average Mean Member Tenure Years (Approximately 369 Years) [Avg. = 362 Years]
  - ❖ They haven't purchased any Mortgage Service (FSV Mortgage Flag)
  - ❖ They still purchase other products, but with a low percentage of probability (30 %)
  - ❖ None of them are Home Owners
  - ❖ 2% are Renters, however, 98% have no record of Home Ownership status
  - ❖ They prefer communication via e-mail and respond to contacts made by the same
  - ❖ Average users of the Roadside Services (73% of chance for usage)



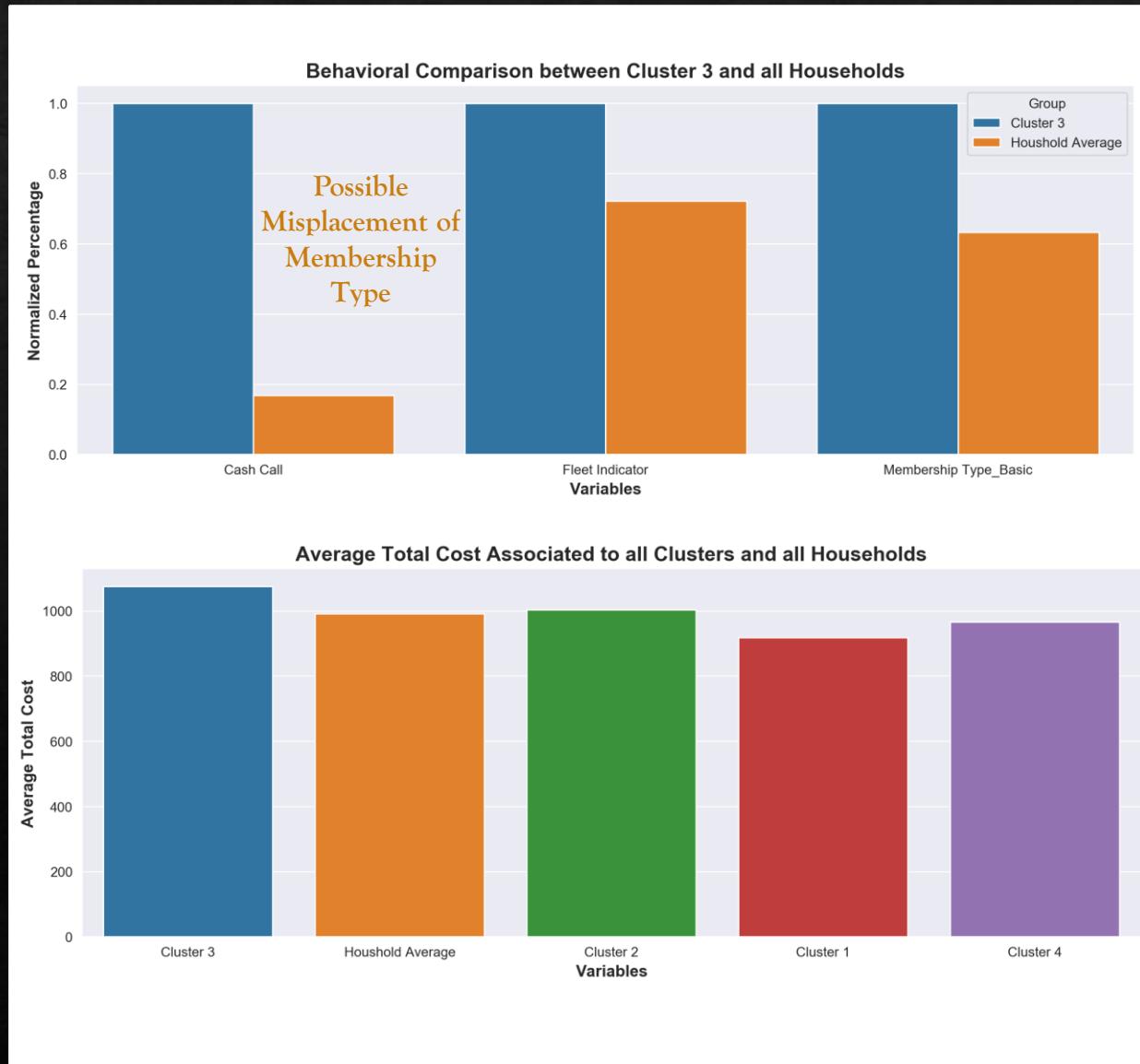
# Segment Analysis - “The Big Problem”

- ❖ Household group main characteristics:
  - ❖ Number of Households in this group: 1653
  - ❖ Above Average on cost (Approximately USD 1004.00)
  - ❖ Average Mean Member Tenure Years (Approximately 360 Years)
  - ❖ They havent purchased any product on the register
  - ❖ 70% have their e-mails available and 97% respond to AAA e-mails (Reachable Clients)
  - ❖ High Annual Income and Possible Credit (Households with purchasing power)
  - ❖ They prefer communication via e-mail and respond to contacts made by the same
  - ❖ Average users of the Roadside Services (73% of chance for usage)



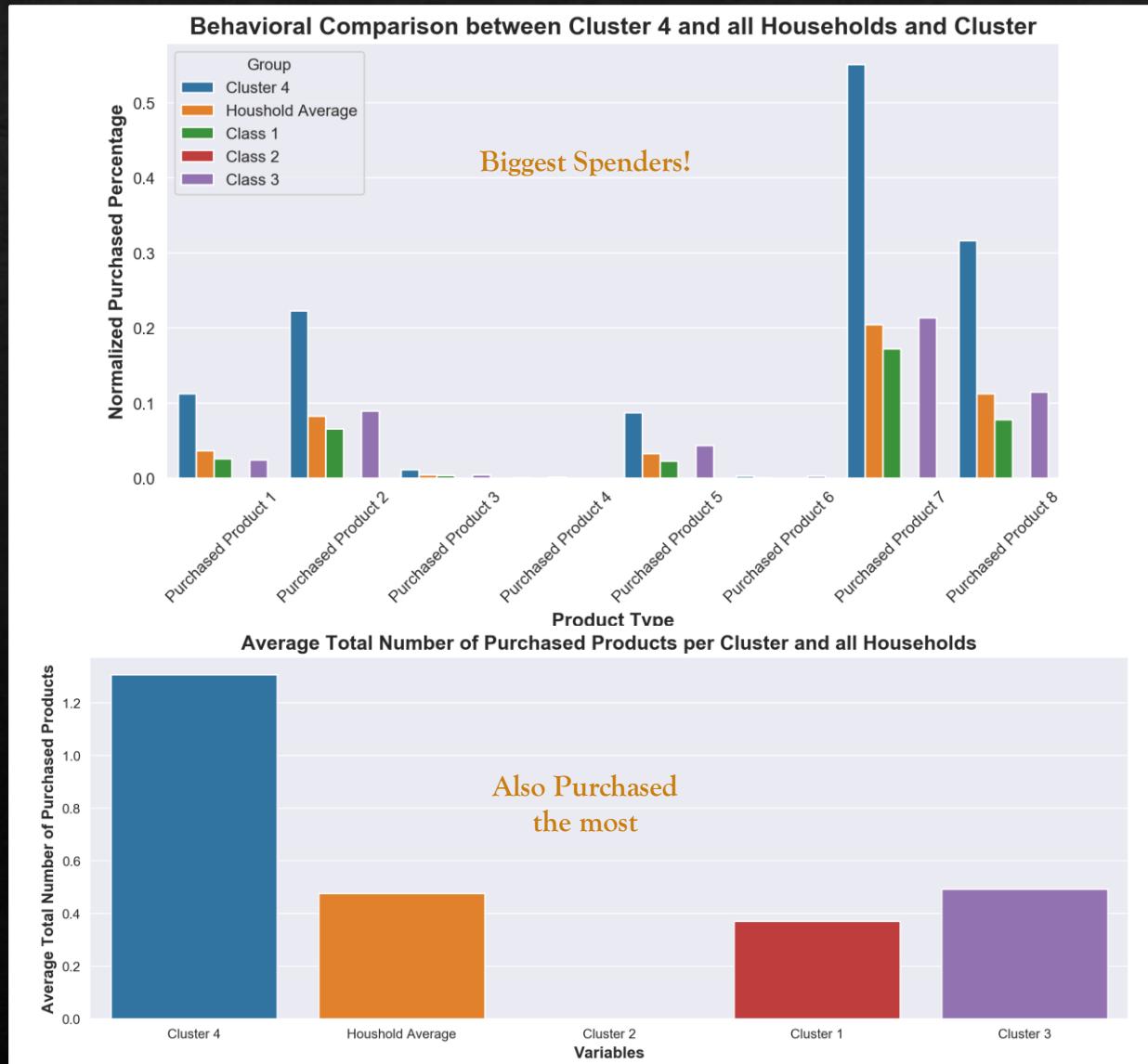
# Segment Analysis - “Stick to the Basics”

- ❖ Household group main characteristics:
  - ❖ Number of Households in this group: 688
  - ❖ Highest Total Cost of all Groups (Approximately USD 1075.00)
  - ❖ All of them have used beyond the allotted tow miles (Cash Call)
  - ❖ All of them have used the truck from AAA when needed (Fleet Indicator)
  - ❖ All households within this group are Basic Members
  - ❖ Average users of the Roadside Services (71% of chance for usage)
  - ❖ None of them have a motorcycle registered on the database



# Segment Analysis - “The Big Target”

- ❖ Household group main characteristics:
  - ❖ Number of Households in this group: 1029
  - ❖ Above-average on Total Cost (Approximately USD 967.00)
  - ❖ They have a significant chance to buy a product (99%)
  - ❖ Higher possibility of purchasing more than one product between all groups
  - ❖ All of them prefer e-mail as an approach for communication and they tend to respond
  - ❖ High Annual Income and Possible Credit (Households with purchasing power)
  - ❖ Average users of the Roadside Services (71% of chance for usage)



# Recommendations

## Cluster 1

### “No Home – No Mortgage”

1. Target other types of products for this group (Insurance was the most purchased product by this group)
2. Better engagement with the client (second-lowest group on purchasing product) (30% of purchase probability)
3. Reassess Mortgage offering for this group (no adhesion to this product)
4. Input missing information about homeownership (may provide important insights regarding no adhesion of Mortgage product)

## Cluster 2

### “The Big Problem”

1. Highly increase engagement with this Household group
2. Review the AAA approach within this specific group
3. All statistics point out that this group have purchasing power
4. Different offers, if possible, aimed at this group to attract their attention
5. With no client's engagement, assess advantage on maintaining or not these Households
6. They still cost to AAA as an average user of roadside service

## Cluster 3

### “Stick to the Basics”

1. The combination, for this group, to use Cash Call, AAA Fleet for a tow and they all have Basic Membership may indicate a possible Membership Misplacement
2. Offer different advantages for the Households within this group migrate to an improved Membership
3. This group has the higher total cost associated
4. In this sense, one may also evaluate the advantage of maintaining Households that are in this group

## Cluster 4

### “The Big Target”

1. Target group to maximize profit
2. Highly increase engagement with this Household group for possible new offers, new products, and new opportunities
3. They have 99% to purchase any of the products that are already available, it's a good target to increase the number of products per Household
4. This group also has by far the higher rate of the number of purchased products, use it an advantage

# Sources

- ❖ Source Code Repository: [https://github.com/rmozart/MLPGD\\_Capstone\\_Project](https://github.com/rmozart/MLPGD_Capstone_Project)
- ❖ Data Source:
  - ❖ AAA Database
  - ❖ Third Party Data Acquisition
- ❖ Other sources of information used:
  - ❖ <https://northeast.aaa.com/>
  - ❖ <https://newsroom.aaa.com/about-aaa/aaa-fact-sheet/>
  - ❖ <https://newsroom.aaa.com/2019/09/driven-to-success-aaa-membership-is-60-million-strong/>