

# First-Year Members Renewal Analysis

Present by Mengtian Hu



The renewal rate for FY members is around **55%**.

# Project Scope

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Which behavior drives  
FY members to renew?



What does an “ideal” FY  
member look like?

# Data Cleaning

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19 variables  
8 billion observations  
**2017 - 2018 members'**  
**Point of Sale data**

23 variables  
50 million observations  
**Member information**



**1. Remove unneeded  
columns by python**

**2. Drop NA**

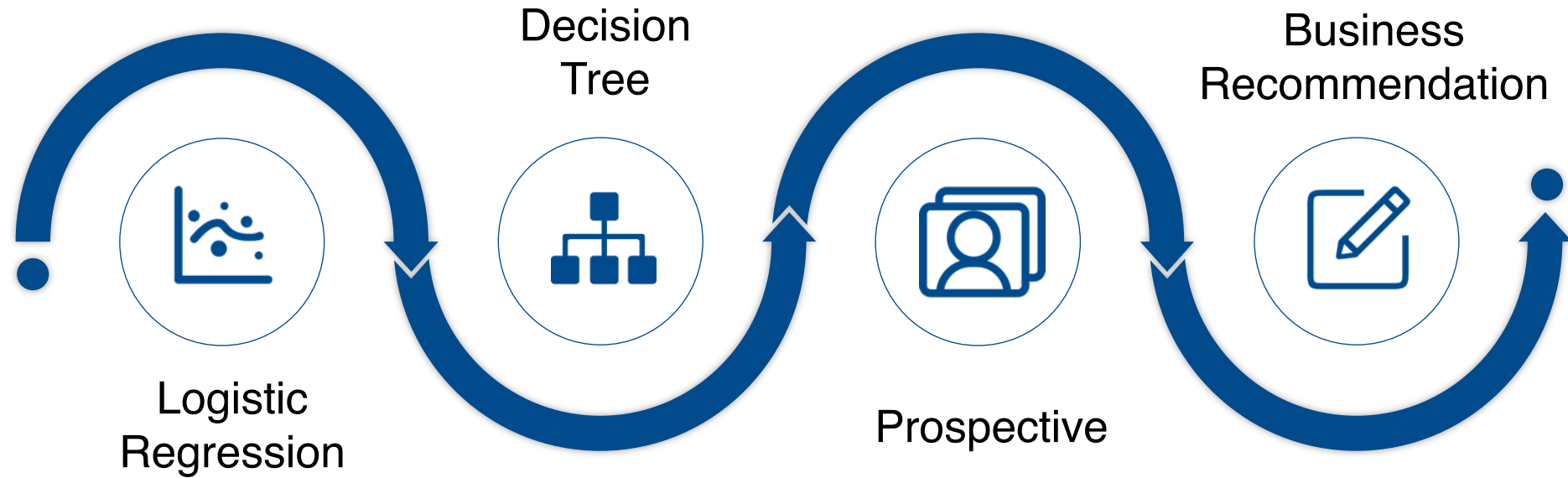
( judge the missing value  
based on data types [quality  
data & quantity data])



**Joining  
different  
dataset  
together**

# Agenda

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# Logistic Regression

# Python Packages Utilized

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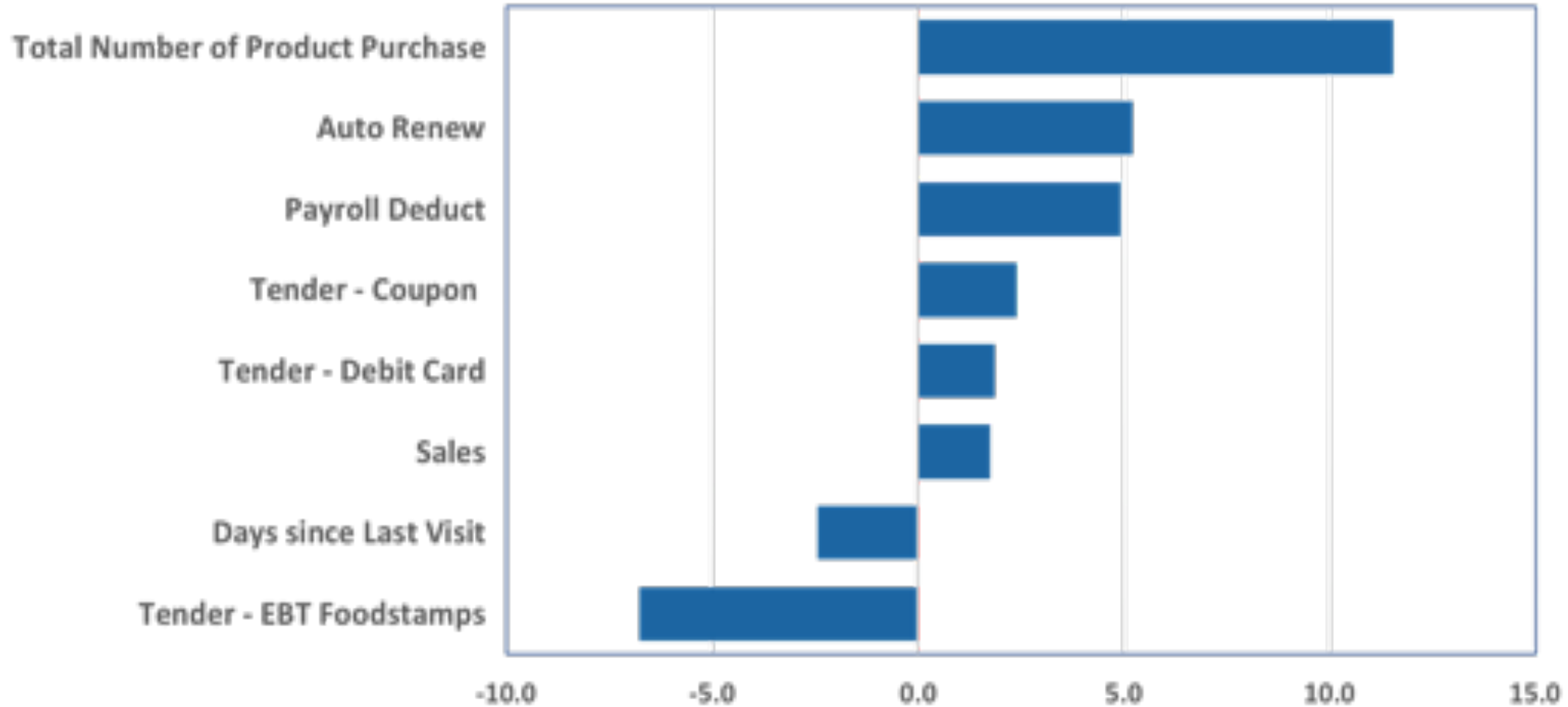
- From **sklearn.Preprocessing** import **minmax\_scale**
- From **sklearn.Linear\_model** import **logisticregression**
- From **sklearn.Model\_selection** import **train\_test\_split**  
import **cross\_validation\_score**
- From **sklearn.Feature\_selection** import **RFECV** – select features

# ML Logistic Regression **Input X**

| Input X                                  |                       |
|--|-----------------------|
| Behavior                                 | Demographic           |
| Category Number                          | Income                |
| Total Number of Visit                    | Household Size        |
| <b>Total Number of Product Purchased</b> | Ethnic                |
| Total Number of Category                 | Plus Membership       |
| Sales                                    | <b>Payroll Deduct</b> |
| Auto Renew                               | Marital Status        |
| <b>Days since Last Visit</b>             | Miles to Club         |
| <b>Tender Type Sales</b>                 | Membership Type       |



# ML Logistic Regression Coefficients



The accuracy of our model to predict the probability of renewal is **77%**.



# Decision Tree

# Python Packages Utilized

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- From **sklearn** import **tree**  
From **sklearn.Tree** import **decisiontreeclassifier** – segmentation
- From **sklearn.Metrics** import **accuracy\_score**

# Decision Tree **Process**

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## Significant Variables

- ✓ Total Number of Product Purchase
- ✓ Auto-Renew
- ✓ Payroll Deduct
- ✓ Tender - Coupon
- ✓ Tender - Debit Card
- ✓ Sales
- ✓ Days since Last Visit
- ✓ Tender - EBT Food stamps



# Decision Tree **Process**

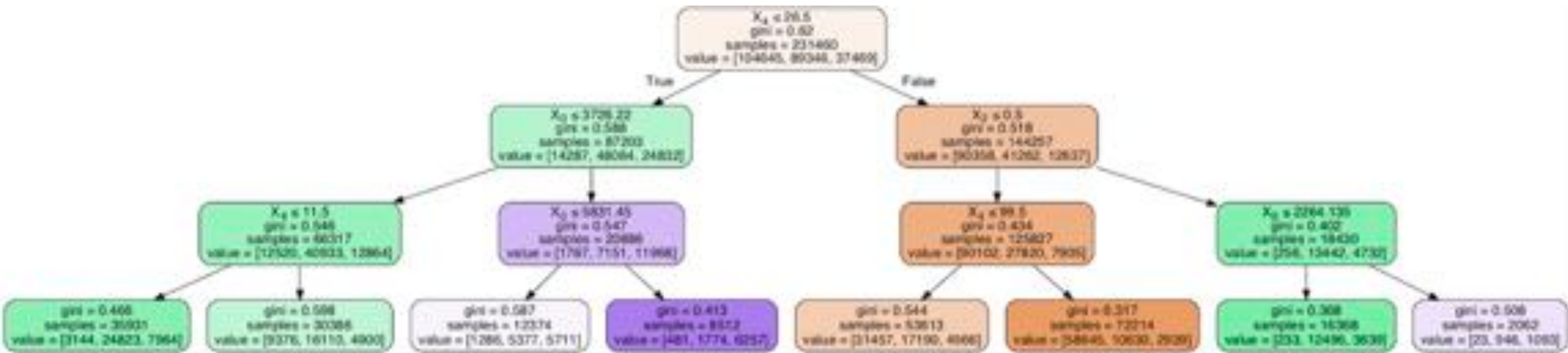
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## Significant Variables

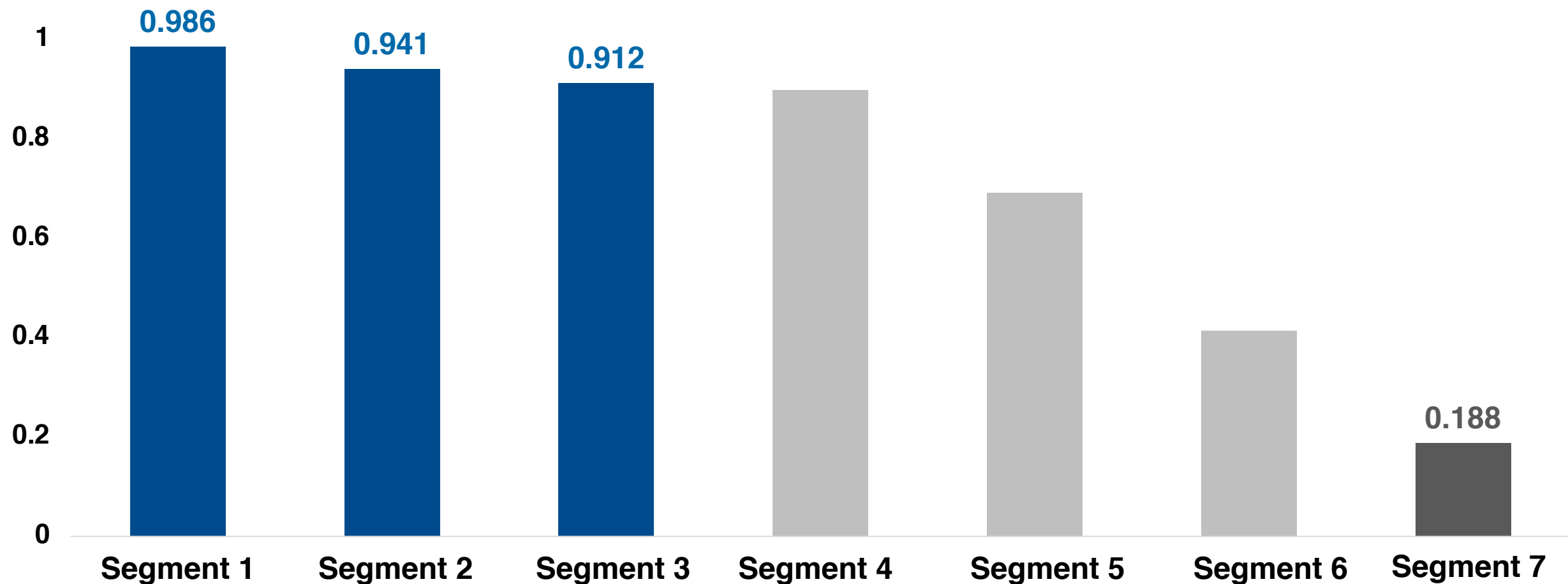
- ✓ Total Number of Product Purchase
- ✓ **Auto-Renew**
- ✓ Payroll Deduct
- ✓ Tender - Coupon
- ✓ Tender - Debit Card
- ✓ **Sales**
- ✓ **Days since Last Visit**
- ✓ Tender - EBT Food stamps



# Decision Tree Prototype

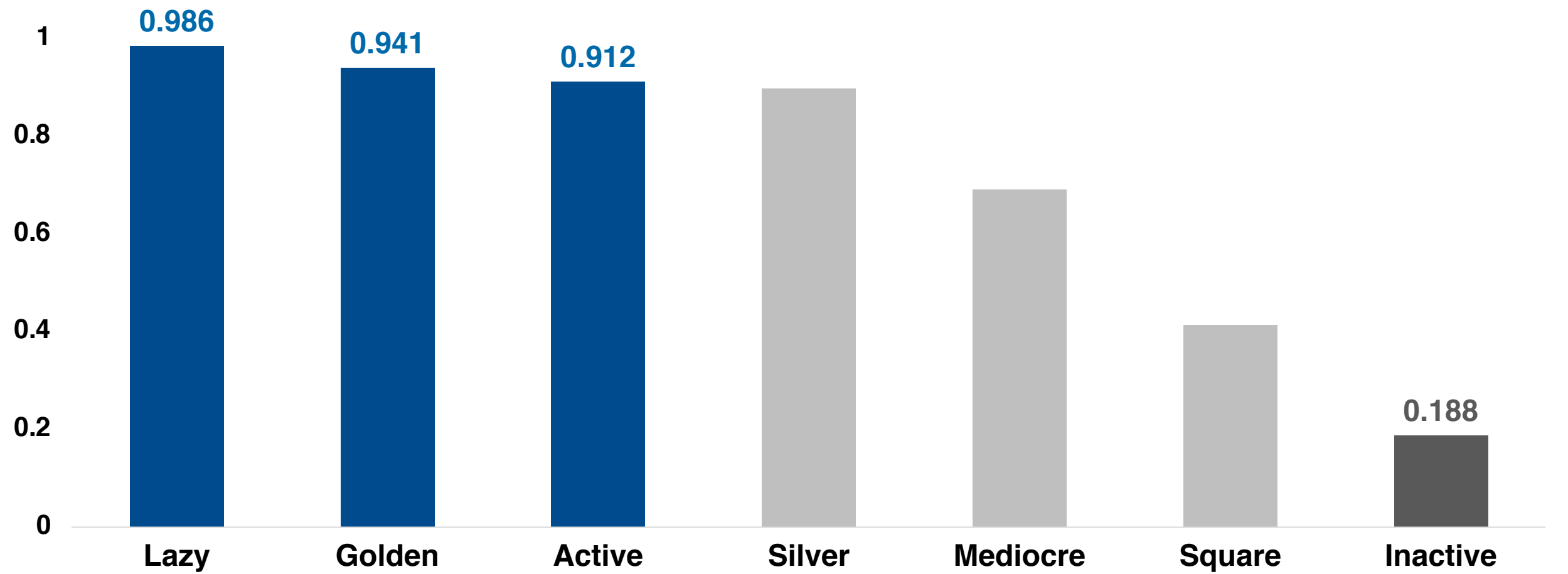


# Decision Tree **Renewal Rates**



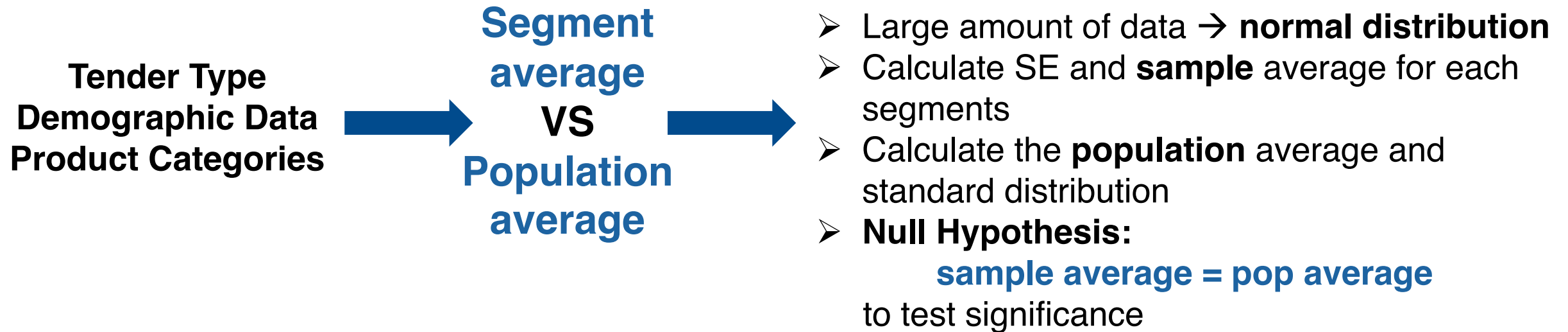


# Decision Tree **Renewal Rates**



# Find significant characteristics – Statistical Methods

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# Find significant characteristics – Statistical Methods

| CATEGORIES                     | Lazy Buyers | Golden Buyers | Active Buyers | Silver Buyers | Mediocre Buyers | Square Buyers | Inactive Buyers | All |
|--------------------------------|-------------|---------------|---------------|---------------|-----------------|---------------|-----------------|-----|
| DMM                            | -0.71       | 5.69          | -0.75         | -0.65         | -0.75           | -0.74         | -0.73           | 1   |
| DMM ADULT BEVERAGES            | -0.32       | 2.61          | -0.23         | 0.39          | -0.31           | -0.34         | -0.35           | 1   |
| DMM APPAREL AND JEWELRY        | -0.21       | 2.16          | -0.17         | 0.59          | -0.22           | -0.19         | -0.45           | 1   |
| DMM CANDY-SNACKS-BEV-TOB-WHSL  | -0.45       | 6.03          | -0.25         | 0.83          | -0.31           | -0.30         | -0.57           | 1   |
| DMM CONSUMABLES                | -0.30       | 3.49          | -0.07         | 0.86          | -0.16           | -0.23         | -0.60           | 1   |
| DMM CONSUMER ELECTRONICS       | -0.02       | 1.12          | -0.36         | 0.18          | -0.31           | -0.09         | -0.01           | 1   |
| DMM DRY GROCERY                | -0.38       | 4.30          | -0.19         | 0.87          | -0.22           | -0.23         | -0.56           | 1   |
| DMM ENTERTAINMENT AND OFFICE S | -0.29       | 2.78          | -0.48         | -0.06         | -0.47           | -0.18         | 0.04            | 1   |
| DMM FREEZER - DELI - COOLER    | -0.40       | 3.92          | -0.14         | 1.17          | -0.21           | -0.24         | -0.60           | 1   |
| DMM FUEL                       | -0.59       | 1.83          | 0.16          | 1.03          | -0.18           | -0.42         | -0.74           | 1   |
| DMM HBA - OTC AND BABY         | -0.29       | 2.13          | -0.02         | 0.89          | -0.12           | -0.23         | -0.53           | 1   |
| DMM HEALTH CARE                | 0.80        | 1.23          | -0.46         | 0.10          | -0.51           | -0.23         | 0.24            | 1   |
| DMM HOME - HARDLINES - TIRE -  | -0.09       | 1.80          | -0.18         | 0.59          | -0.24           | -0.19         | -0.33           | 1   |
| DMM MEAT - SEAFOOD             | -0.40       | 3.76          | -0.22         | 0.79          | -0.25           | -0.21         | -0.54           | 1   |
| DMM MOBILE AND SERVICES        | -0.06       | 1.01          | -0.51         | 0.34          | -0.42           | -0.07         | 0.15            | 1   |
| DMM PREPARED MEALS             | -0.49       | 4.91          | -0.26         | 0.25          | -0.37           | -0.42         | -0.49           | 1   |
| DMM PRODUCE AND BAKERY         | -0.44       | 3.96          | -0.05         | 1.31          | -0.19           | -0.28         | -0.66           | 1   |
| DMM SEASONAL                   | -0.11       | 1.56          | -0.22         | 0.44          | -0.23           | -0.18         | -0.32           | 1   |
| DMM TOBACCO                    | -0.92       | 3.17          | -0.97         | -0.95         | -0.98           | -0.78         | -0.35           | 1   |

| Demographic Data          | Lazy Buyers | Golden Buyers | Active Buyers | Silver Buyers | Mediocre Buyers | Square Buyers | Inactive Buyers | All |
|---------------------------|-------------|---------------|---------------|---------------|-----------------|---------------|-----------------|-----|
| Miles away avg            | 0.35        | -0.52         | -0.34         | -0.61         | -0.33           | -0.20         | 0.56            | 1   |
| Age avg                   | 0.03        | -0.04         | 0.02          | -0.03         | 0.01            | -0.01         | 0.00            | 1   |
| Marital rate avg          | 0.04        | 0.08          | 0.02          | 0.05          | 0.01            | -0.01         | -0.03           | 1   |
| Income lower interval avg | 0.02        | 0.13          | 0.01          | 0.10          | 0.00            | -0.02         | -0.03           | 1   |
| Income upper interval avg | 0.03        | 0.10          | 0.02          | 0.08          | 0.01            | -0.01         | -0.04           | 1   |
| Household size avg        | 0.01        | 0.07          | 0.01          | 0.05          | 0.00            | 0.00          | -0.03           | 1   |
| Nbr of children avg       | -0.02       | 0.21          | -0.01         | 0.20          | -0.01           | 0.01          | -0.07           | 1   |
| Plus membership rate avg  | -0.20       | 1.41          | -0.04         | 0.76          | -0.05           | -0.04         | -0.18           | 1   |
| Auto renew avg            | 4.67        | 0.59          | 0.64          | 0.61          | 0.13            | -1.00         | -1.00           | 1   |
| Payroll deduct avg        | -1.00       | 0.36          | 0.67          | 0.17          | -0.23           | -0.36         | 0.21            | 1   |

| Tender Type             | Lazy Buyers | Golden Buyers | Active Buyers | Silver Buyers | Mediocre Buyers | Square Buyers | Inactive Buyers | All |
|-------------------------|-------------|---------------|---------------|---------------|-----------------|---------------|-----------------|-----|
| American Express        | -0.45       | 6.30          | -0.59         | -0.09         | -0.60           | -0.52         | -0.53           | 1   |
| Associate Discount Card | -0.56       | 1.38          | -0.34         | 0.06          | -0.48           | -0.21         | 0.30            | 1   |
| Cash (change)           | -0.57       | 7.55          | -0.41         | 0.52          | -0.43           | -0.34         | -0.52           | 1   |
| Check                   | 0.69        | 3.23          | -0.73         | -0.75         | -0.59           | -0.63         | -0.36           | 1   |
| Coupon                  | 0.07        | 0.59          | -0.16         | 0.09          | -0.13           | -0.06         | -0.04           | 1   |
| DOTCOM                  | 0.15        | 2.56          | -0.57         | -0.22         | -0.54           | -0.48         | -0.27           | 1   |
| Debit Card              | -0.39       | 5.28          | -0.17         | 1.16          | -0.26           | -0.25         | -0.61           | 1   |
| Discover                | -0.31       | 3.93          | -0.42         | 0.25          | -0.41           | -0.30         | -0.39           | 1   |
| EBT Cash                | -0.18       | 0.16          | -0.35         | 0.17          | -0.23           | 0.23          | 0.12            | 1   |
| EBT Foodstamps          | -0.44       | 1.94          | -0.45         | 0.73          | -0.21           | 0.03          | -0.24           | 1   |
| Electronic Check (ECA)  | -0.66       | 4.95          | -0.76         | -0.61         | -0.74           | -0.48         | -0.31           | 1   |
| Fleet                   | -1.00       | 0.36          | 0.01          | -1.00         | -0.76           | -0.76         | -1.00           | 1   |
| Mastercard              | -0.39       | 6.60          | -0.45         | 0.39          | -0.46           | -0.45         | -0.56           | 1   |
| Payroll Check           | -0.12       | 0.61          | -0.34         | 0.20          | -0.24           | 0.09          | -0.42           | 1   |
| Rx third party sales    | -0.12       | 0.71          | -0.14         | 0.06          | -0.23           | -0.17         | -0.21           | 1   |
| Sams Business Credit    | -0.39       | 3.66          | -0.87         | -0.80         | -0.84           | -0.64         | -0.11           | 1   |
| Sams Consumer Credit    | 0.03        | 5.52          | -0.46         | 0.24          | -0.50           | -0.51         | -0.47           | 1   |
| Sams Direct Credit      | -0.29       | 2.91          | -0.70         | -0.60         | -0.70           | -0.62         | -0.57           | 1   |
| Service Income          | 0.10        | 0.38          | -0.19         | -0.10         | -0.17           | -0.02         | 0.18            | 1   |
| Shopping Card           | -0.31       | 4.11          | -0.28         | 0.67          | -0.29           | -0.23         | -0.50           | 1   |
| Unknown                 | 0.02        | 0.40          | -0.17         | -0.07         | -0.18           | -0.04         | 0.15            | 1   |
| Visa                    | -0.45       | 7.05          | -0.31         | 0.84          | -0.38           | -0.40         | -0.66           | 1   |
| Wal-Mart Credit Card    | 0.27        | 1.15          | -0.34         | -0.07         | -0.23           | -0.10         | 0.00            | 1   |
| Coin Voucher            | -1.00       | -1.00         | -1.00         | -1.00         | -0.53           | 0.53          | -1.00           | 1   |

# Lazy Buyers



Renew Rate: **99%**

- Income range: **\$68K~\$73K**
- Household distance: **56 miles**
- Marriage rate: **85%**
- Auto-renew: **Yes**
- Days since last visit: **27 ~ 365**
- Purchase trend: **Decreasing**
- Favorite good: **Healthcare**

# Golden Buyers



Renew Rate: **94%**

- Income range: **\$75K~\$78K**
- Household distance: **20 miles**
- Marriage rate: **89%**
- Purchase value: **> \$5,800**
- Days since last visit: **< 27**
- Purchase trend: **Increasing**
- Favorite good: **Tobacco (whole year)**
- Shopping pattern: Special tender type used:  
American express, Mastercard,  
electronic check, Sam's credit  
card

# Active Buyers



Renew Rate: **91%**

- Income range: **\$67K~\$73K**
- Household distance: **27 miles**
- Marriage rate: **84%**
- Purchase value: **< \$3,700**
- Days since last visit: **< 12**
- Purchase trend: **Increasing**
- Favorite good: **Fuel** (whole year)
- Shopping pattern: **Crazy shopping** before the renew deadline

# Inactive Buyers



Renew Rate: **19%**

- Income range: **\$64K~\$68K**
- Household distance: **65 miles**
- Marriage rate: **79%**
- Auto-renew: **No**
- Days since last visit: **~ 100 days**
- Purchase (\$): **Decreasing trend**
- Favorite good: **Tobacco** (first 3 months only)

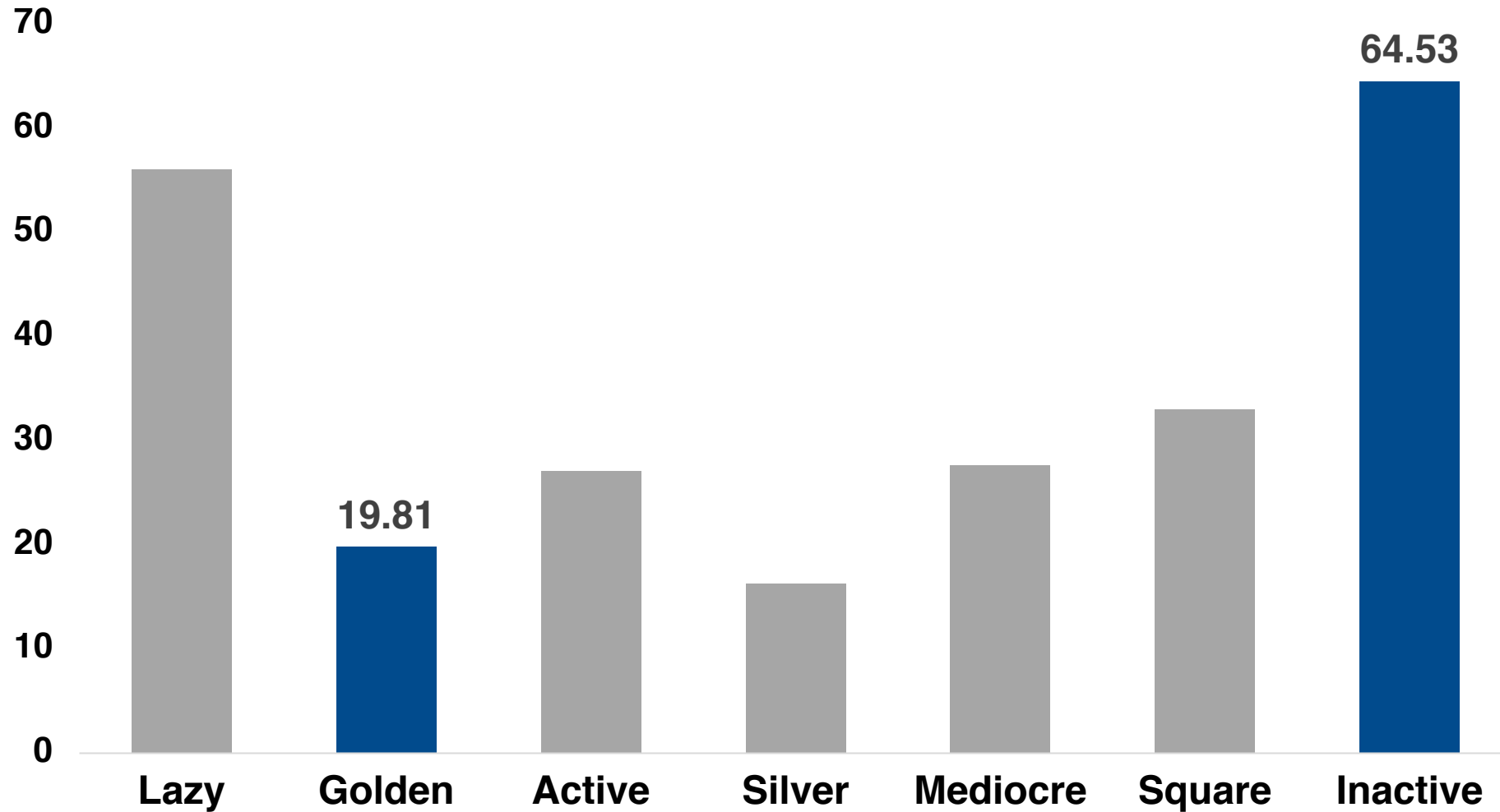


# Prospective



# Launch marketing campaign near Sam's Club to target potential Golden buyers

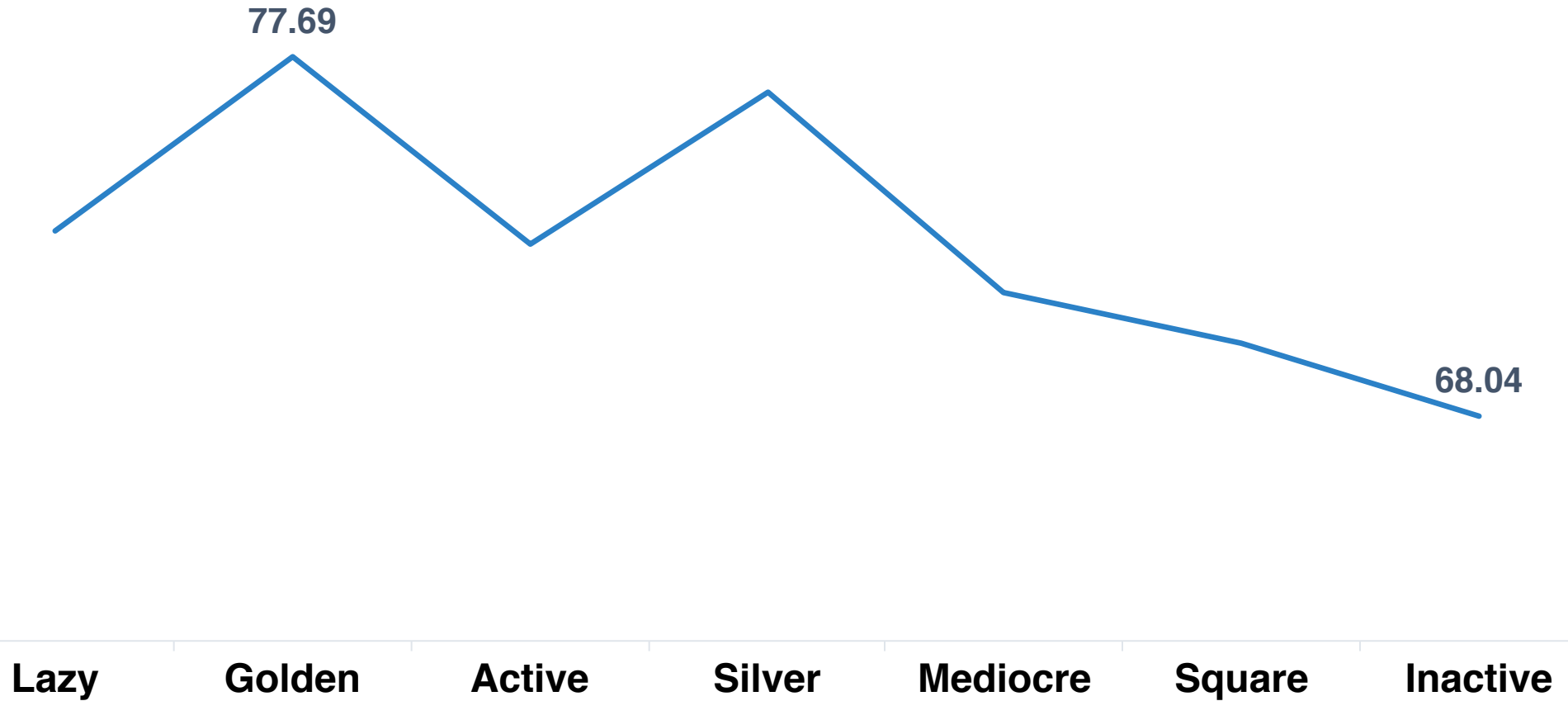
Miles to Club



# Target the richest prospects: they are probably our Golden Buyers.

Income (\$K)

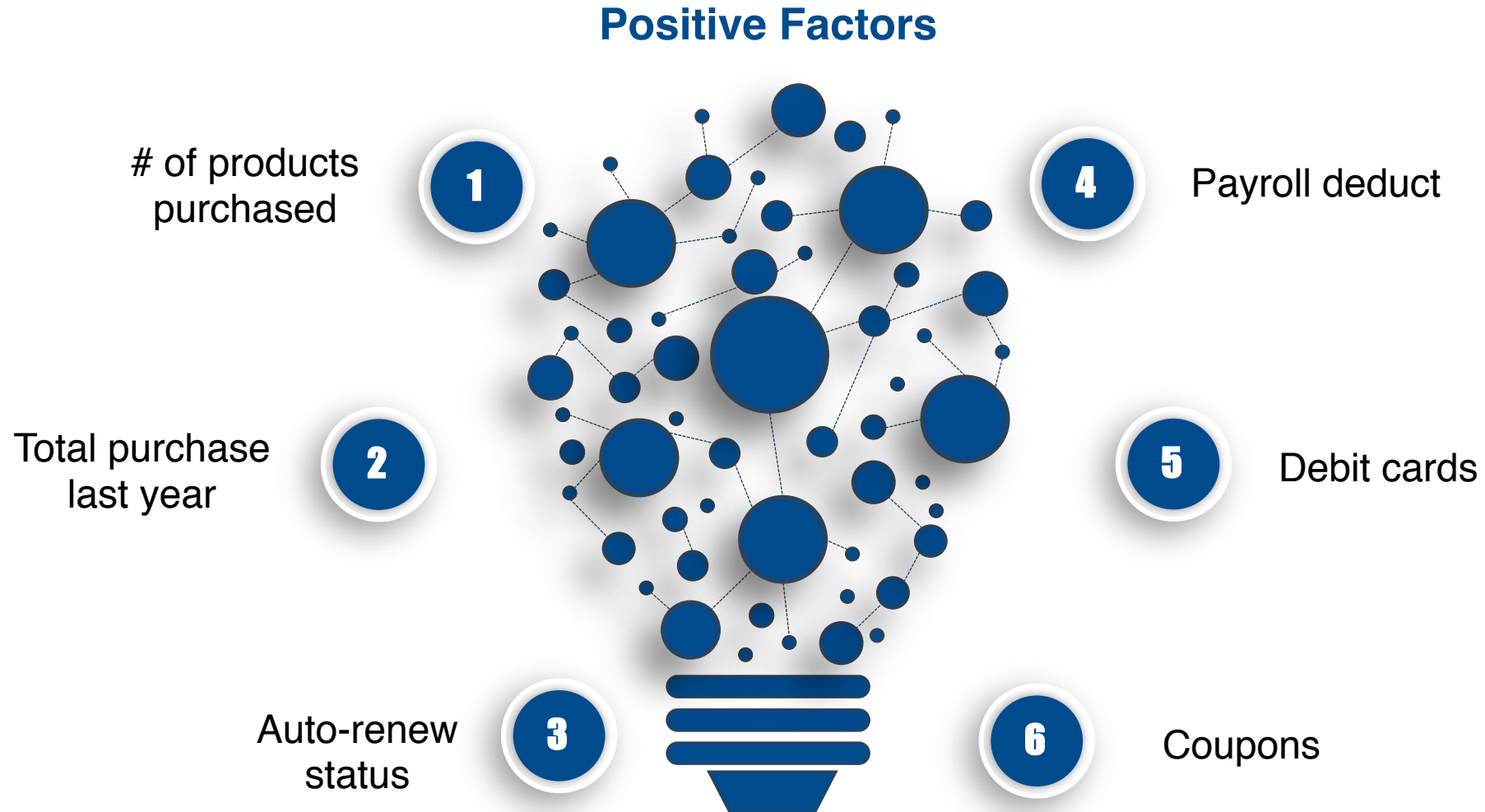
80  
78  
76  
74  
72  
70  
68  
66  
64  
62





# Business Recommendations

# Which behavior drives FY members to renew?



# Which behavior drives FY members to renew?

## Negative Factors



Food stamps

Days since  
last visit



# What does an “ideal” FY member look like?

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**Lazy Buyers**



**Golden Buyers**



**Active Buyers**

# Business recommendation

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**Lazy Buyers**

**Remain auto renew**

**Golden Buyers**

**Provide tobacco promotion**

**Active Buyers**

**Provide fuel promotion  
(1 month ahead of the renew deadline)**

**Inactive Buyers**

**Provide tobacco promotion after 3 months  
Send newsletters in 10<sup>th</sup> & 12<sup>th</sup> month  
Encourage online shopping by coupons**

# Appendix – Shiny Dashboard 1

## Demographic Distribution in Each Segment

### Sam's Club Dashboard

This is to visualize inter-segment data

Variable

Last visit date

Age

First visit date

Last visit date

Days since last visit

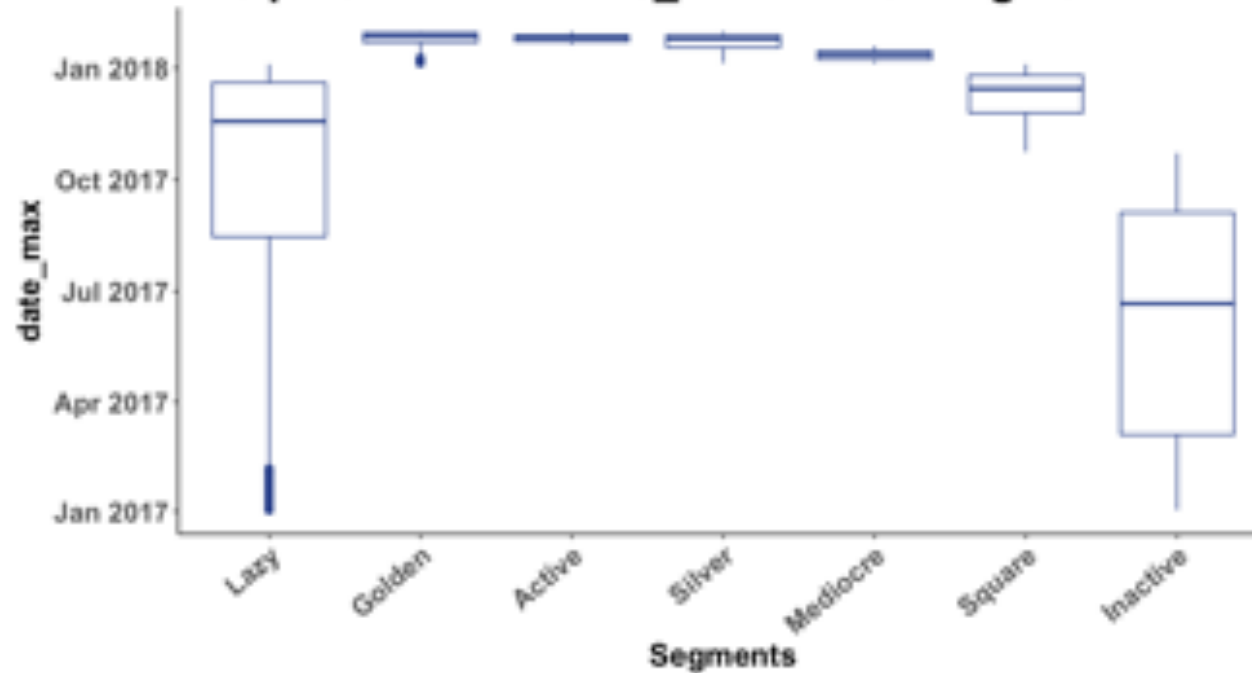
Lower income

Household size

Visit frequency

Count category

The percentiles of date\_max in each segment





# Appendix – Shiny Dashboard 2

## Sales Trend in Each DMM

### Sam's Club Dashboard - 2

This is to visualize sales trend in the whole year

Variable

DMM HEALTH CARE

DMM HEALTH CARE

DMM HOME - HARDLINES - TIRE -

DMM MEAT - SEAFOOD

DMM MOBILE AND SERVICES

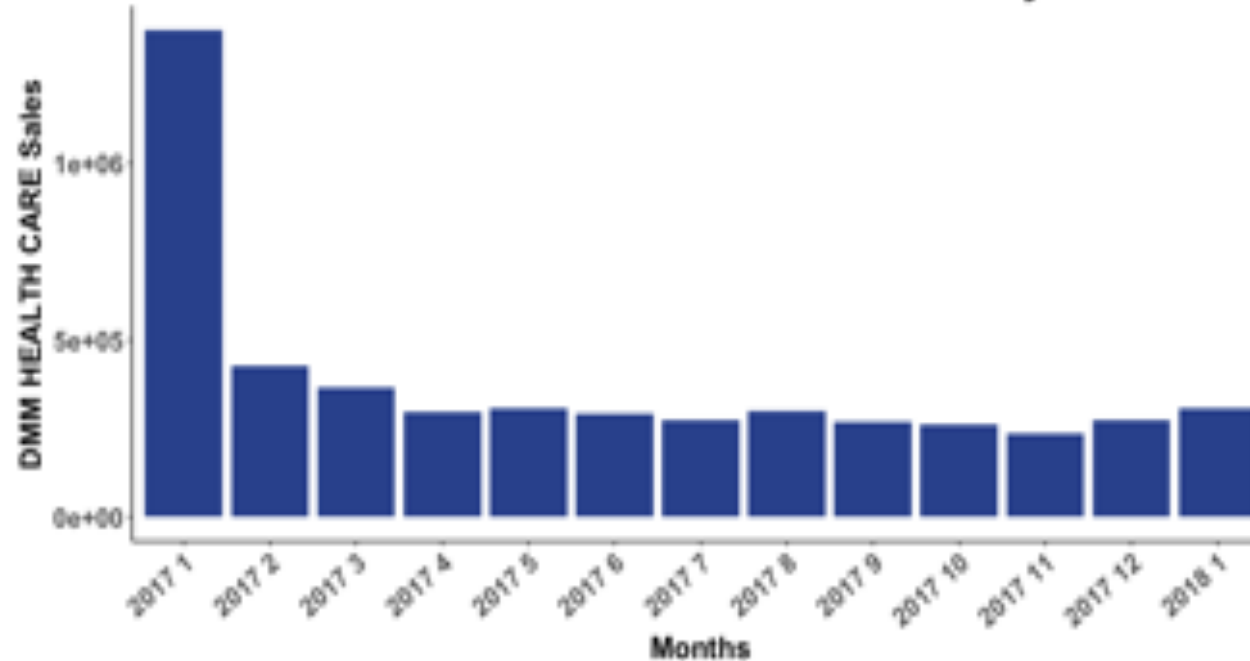
DMM PREPARED MEALS

DMM PRODUCE AND BAKERY

DMM SEASONAL

DMM TOBACCO

The sales of DMM HEALTH CARE in the whole year



This is to visualize sales trend in the whole year of each group

**Group**

Lazy

- Golden
- Active
- Silver
- Mediocre
- Square
- Inactive



**Thank you!**  
**Q&A**