***Background***

Imagine driving through town and a coupon is delivered to your cell phone for a restaurant near where you are driving. Would you accept that coupon and take a short detour to the restaurant? Would you accept the coupon but use it on a subsequent trip? Would you ignore the coupon entirely? What if the coupon was for a bar instead of a restaurant? What about a coffee house? Would you accept a bar coupon with a minor passenger in the car? What about if it was just you and your partner in the car? Would weather impact the rate of acceptance? What about the time of day?

Obviously, proximity to the business is a factor on whether the coupon is delivered to the driver or not, but what are the factors that determine whether a driver accepts the coupon once it is delivered to them? How would you determine whether a driver is likely to accept a coupon?

Data stored in a csv file was analyzed to answer the following question:

*Will the customer accept the coupon?*

There were five different types of coupons for the following places:

1. less expensive restaurants

2. coffee houses

3. carryout and takeaway

4. bars

5. more expensive restaurants

The data was collected via a survey that described different driving scenarios, like for example, the destination, current time, weather, and passenger, etc. and then asked people whether they will accept the coupon if they were the driver.

There were three possible answers people could choose from:

1. “Right away”

2. “Later, before the coupon expires”

3. “No, I do not want the coupon”

Answers that the user will drive there ‘right away’ or ‘later before the coupon expires’ are labeled as ‘Y = 1’ and answers ‘no, I do not want the coupon’ are labeled as ‘Y = 0’.

***Data Description***

Keep in mind that these values mentioned below are average values.

The attributes of this data set include:

1. User attributes

- Gender: male, female

- Age: below 21, 21 to 25, 26 to 30, etc.

- Marital Status: single, married partner, unmarried partner, or widowed

- Number of children: 0, 1, or more than 1

- Education: high school, bachelors degree, associates degree, or graduate degree

- Occupation: architecture & engineering, business & financial, etc.

- Annual income: less than \\$12500, \\$12500 - \\$24999, \\$25000 - \\$37499, etc.

- Number of times that he/she goes to a bar: 0, less than 1, 1 to 3, 4 to 8 or greater than 8

- Number of times that he/she buys takeaway food: 0, less than 1, 1 to 3, 4 to 8 or greater

than 8

- Number of times that he/she goes to a coffee house: 0, less than 1, 1 to 3, 4 to 8 or

greater than 8

- Number of times that he/she eats at a restaurant with average expense less than \\$20 per

person: 0, less than 1, 1 to 3, 4 to 8 or greater than 8

- Number of times that he/she goes to a bar: 0, less than 1, 1 to 3, 4 to 8 or greater than 8

2. Contextual attributes

- Driving destination: home, work, or no urgent destination

- Location of user, coupon and destination: we provide a map to show the geographical

location of the user, destination, and the venue, and we mark the distance between each

two places with time of driving. The user can see whether the venue is in the same

direction as the destination.

- Weather: sunny, rainy, or snowy

- Temperature: 30F, 55F, or 80F

- Time: 10AM, 2PM, or 6PM

- Passenger: alone, partner, kid(s), or friend(s)

3. Coupon attributes

- time before it expires: 2 hours or one day

***Histograms Observations***

*Destination and Passenger*

Coupons were more likely to be accepted when the destination was ‘No Urgent Place’(63%). The chances were about even for those going to work (51%) or home (50%).

When Friend(s) (67%) or a Partner (59%) was the passenger of the car, coupons were more accepted compared to when Alone (52%) or Kid(s) (50%) were the passenger.

*Weather and Temperature*

Coupons were more accepted during sunny (59%) weather and temperatures of 80 (60%), 55 (54%) and 30 (53%) compared to rainy (46%) and snowy (47%) weather.

The temperature histogram showed that the acceptance of coupons increased exponentially as the weather warmed up. This could be investigated further with a regression analysis.

*Time and Coupon*

There was more acceptance of coupons at 10AM (61%), 2PM (66%), 6PM (58%) as opposed to 10PM (51%) and in the morning at 7AM (50%). 10AM to 2PM would seem to be the prime time for the acceptance of coupons.

‘Carry out & Take away’ (73%) and ‘Restaurant(<20)’ (71%) were the popular coupons against ‘Coffee House’ (50%), ‘Restaurant (20-50)’ (44%) and ‘Bar’ (41%).

*Expiration and Gender*

Coupons with 1d expiration (62%) were favored against 2h (50%).

While both female (55%) and male (59%) were likely to accept coupons, males were more likely to accept coupons.

*Age and Marital Status*

Those whose ages were below 21 (63%), 21 (60%), 26 (60%) were more likely to accept coupons compared to 31 (55%), 36 (54%), 41 (57%), 46 (57%) and above 50 (51%).

Single (60%), unmarried (56%) and married partners (54%) were likely to accept coupons compared to divorced (52%) and widowed (48%).

*‘Has\_children’ and Education*

Those with no kids (59%) were more likely to accept coupons than those with kids (54%).

‘Some high school’ (72%), ‘Some college – no degree’ (60%) and ‘High School Graduate’ (59%) were more likely to accept coupons compared to ‘Bachelors degree’ (55%), ‘Associate Degree’ (55%) and ‘Graduate degree (Masters or Doctorate) (52%).

*Occupation*

The occupations more likely to accept coupons were led by Healthcare Support (70%), Construction & Extraction (69%), Healthcare Practitioners & Technical (68%), Protective Service (64%), Architecture & Engineering (63%), Production Occupations (62%), Student (61%), Office & Administrative Support (60%), Transportation & Material Moving (60%), Building & Grounds Cleaning & Maintenance (59%), Management (59%), Food Preparation & Serving Related (58%), Life Physical Social Science (58%), Business & Financial (57%), Computer & Mathematical (57%) and Sales & Related (56%). Those who were unlikely to accept coupons: Community & Social Services (49%), Legal (47%), Retired (46%)

*Income*

Coupons were likely to be accepted at the following income levels: ) 0 to less than 12500 (59%), 12500 to less than 25000 (57%), 25000 to less than 37500 (59%), 37500 to less than 50000 (56%), 50000 to less than 62500 (59%), then became less likely at 62500 to less than 75000 (52%), went down at 75000 to less than 87500 (48%) and then went up a little bit at 87500 to less than 100000 (53%) and higher at more than 100000 (58%).

*‘Bar’ and ‘Coffeehouse’*

‘Bar’ coupons were more likely to be accepted for ‘4-8’ (64%), ‘1-3’ (62%), ‘gt8’ (58%), ‘less1’ (56%), ‘never’ (53%) and ‘0’ (51%).

‘Coffeehouse’ coupons were popular for ‘1-3’(65%), ‘4-8’ (63%), ‘gt8’ (58%), ‘less1’ (54%), and ‘0’ (51%) but unlikely for ‘never’ (46%).

*‘Carryaway’ and ‘Restaurantlessthan20’*

‘Carryaway’ coupons were accepted more at ‘0’ (67%), ‘4-8’ (58%), ‘1-3’ (58%), ‘gt8’ (57%), ‘never’ (53%) and less at ‘less1’ (50%).

‘Restaurantlessthan20’ coupons were accepted more at ‘0’ (69%), ‘gt8’ (61%), ‘4-8’ (58%), ‘1-3’ (56%), ‘never’ (53%) and ‘less1’ (53%).

*‘Restaurant20to50’ and ‘Tocoupon\_geq5min’*

‘Restaurant20to50’ coupons were more likely to be accepted for ‘gt8’ (66%), ‘4-8’ (66%), ‘1-3’ (59%), ‘less1’ (56%), ‘0’ (56%) and ‘never’ (52%).

‘Tocoupon\_geq5min’ was likely to accept coupons (57%) at ‘1’.

*‘Tocoupon\_geq15min’ and ‘Tocoupon\_geq25min’*

‘Tocoupon\_geq15min’ was likely to accept coupons at ‘0’ (61%) and ‘1’ (53%).

‘Tocoupon\_geq25min’ was likely to accept coupons at ‘0’ (59%) but unlikely to accept coupons at ‘1’ (42%).

*‘Direction\_same’ and ‘Direction\_opp’*

‘Direction\_same’ was accepting coupons at ‘1’ (58%) and ‘0’ (56%). ‘Direction\_opp’ was the opposite as expected.

***Scatter Plot of Income vs. Age***

The plot showed the following:

1. Most 16-year olds would accept coupons spread over the income levels.

2. Forty-year olds and above would accept coupons at low income level.

3. Most 26-year olds would not accept coupons at almost all income levels save for the highest income level.

4. Most 50-year olds would accept coupons spread over all income levels especially at high income levels.

5. At low income level, 26-year olds to 36-year olds would not accept coupons while 16-year olds and 21-year olds would.

***Bar Coupons Observations***

The acceptance rate for bar coupons for those who went to a bar 3 or fewer times a month was less (0.56) compared to those who went more (0.62).

The acceptance rate for those who go to a bar more than once a month and are over the age of 25 was (0.62) which was more than all the others (0.54).

Acceptance rate was (0.58) for those who go to a bar more than once a month and had passengers that were not a kid and had occupations other than farming, fishing, or forestry compared to all others which was (0.54).

Acceptance rate for those who go to a bar more than once a month and had passengers that were not a kid and were not widowed was (0.58).

Acceptance rate for those who go to a bar more than once a month and are under the age of 30 was (0.58).

Acceptance rate for those who go to a cheap restaurant more than four times a month and income is less than 50k was (0.58).

Hypothesis about drivers who accepted the bar coupons based on these observations:

* the drivers frequented bars more than the others
* the highest acceptance rate included drivers who go to a bar more than once a month and are over the age of 25

***Independent Investigation - Coffeehouse coupons***

The acceptance rate for coffeehouse coupons for those who went to a coffeehouse 3 or fewer times a month was less (0.55) compared to those who went more (0.61).

The acceptance rate for those who go to a coffeehouse more than once a month and are over the age of 25 was (0.63) which was less than all the others (0.73).

Acceptance rate was (0.58) for those who go to a coffeehouse more than once a month and had passengers that were not a kid and had occupations other than farming, fishing, or forestry compared to all others which was (0.54).

Acceptance rate for those who go to a coffeehouse more than once a month and had passengers that were not a kid and were not widowed was (0.58).

Acceptance rate for those who go to a coffeehouse more than once a month and are under the age of 30 was (0.58).

Acceptance rate for those who go to a cheap restaurant more than four times a month and income is less than 50k was (0.58).

Hypothesis about drivers who accepted the coffeehouse coupons based on these observations:

* the drivers frequented coffeehouses more than the others
* younger people and those who got to a coffeehouse less than once a month got the highest score (0.73) although the acceptance rate for those who go to a coffeehouse more than once a month and are over the age of 25 was still high (0.63).

***Next steps***

It will be interesting to see how the other coupons would perform when a similar investigation is done on them – this is being recommended.

Identifying a suitable classification or regression model based on the features earlier analyzed to confidently predict who are most likely to accept coupons might also be a good idea.

*References:* Jupyter Notebook “2Accept\_Coupons.ipynb”

https://github.com/RonaldoBantayan27/Mauban1