Final Project

1. Scope the Project

Our plan is to use a supervised learning technique to predict which customers are most likely to cancel their subscription using **the past three months of customer data which includes subscription and listening history**.

2. Gather Data

Read the following files into Python:

- Customer data: *maven_music_customers.csv*
- Listing history: *maven_music_listening_history.xlsx*

```
# Import required libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

# Read in the customer data
df_customers = pd.read_csv('maven_music_customers.csv')

# Read in the listening history
df_listen_history =
pd.read_excel('maven_music_listening_history.xlsx', sheet_name =
'listening_history')

# Read in the audio data
df_audio = pd.read_excel('maven_music_listening_history.xlsx',
sheet_name = 'audio_files')

# Read in the session data
df_session = pd.read_excel('maven_music_listening_history.xlsx',
sheet_name = 'session_login_time')

df_customers.head()
```

```
   Customer ID   Customer Name                              Email  \
0         5001  Harmony Greene  Email: harmonious.vibes@email.com
1         5002       Aria Keys    Email: melodious.aria@email.edu
2         5004      Lyric Bell  Email: rhythmical.lyric@email.com
3         5267    Rock Bassett       Email: groovy.rock@email.com
4         5338    Rhythm Dixon   Email: beats.by.rhythm@email.edu

  Member Since Subscription Plan Subscription Rate Discount?
Cancellation Date
0      3/13/23       Basic (Ads)             $2.99       NaN
```

```
NaN
1      3/13/23                NaN          $2.99        NaN
NaN
2      3/13/23                NaN          $2.99        NaN
6/1/23
3      3/20/23        Basic (Ads)          $2.99        NaN
NaN
4      3/20/23                NaN          $2.99        NaN
NaN

df_listen_history.head()

   Customer ID  Session ID  Audio Order  Audio ID Audio Type
0         5001      100520            1       101       Song
1         5001      100520            2       102       Song
2         5001      100520            3       103       Song
3         5001      100520            4       104       Song
4         5001      100520            5       105       Song

df_audio.head()

         ID               Name      Genre  Popularity
0  Song-101    Dance All Night        Pop           1
1  Song-102   Unbreakable Beat        Pop           2
2  Song-103  Sunset Boulevard  Pop Music           5
3  Song-104    Glowing Hearts  Pop Music          10
4  Song-105          Pop Rocks  Pop Music          52

df_session.head()

   Session ID Session Log In Time
0      100520 2023-03-13 18:29:00
1      100522 2023-03-13 22:15:00
2      100525 2023-03-14 10:01:00
3      100527 2023-03-13 14:14:00
4      100538 2023-03-21 12:23:00
```

3. Clean Data

a. Convert Data Types

Check the data types of the data in the tables and convert to numeric and datetime values as necessary.

```
# Check the data types
df_customers.dtypes

Customer ID              int64
Customer Name           object
Email                   object
```

```
Member Since           object
Subscription Plan      object
Subscription Rate      object
Discount?              object
Cancellation Date      object
dtype: object
```

```
df_listen_history.dtypes
```

```
Customer ID      int64
Session ID       int64
Audio Order      int64
Audio ID         int64
Audio Type      object
dtype: object
```

```
df_audio.dtypes
```

```
ID              object
Name            object
Genre           object
Popularity       int64
dtype: object
```

```
df_session.dtypes
```

```
Session ID                        int64
Session Log In Time    datetime64[ns]
dtype: object
```

```
# Convert objects to numeric and datetime fields
df_customers['Member Since'] = pd.to_datetime(df_customers['Member
Since'])
temp = df_customers['Subscription Rate'].str.replace('$','')
df_customers['Subscription Rate'] = pd.to_numeric(temp)
df_customers['Cancellation Date'] =
pd.to_datetime(df_customers['Cancellation Date'])
```

```
C:\Users\luffy\AppData\Local\Temp\ipykernel_31100\1136408421.py:2:
UserWarning: Could not infer format, so each element will be parsed
individually, falling back to `dateutil`. To ensure parsing is
consistent and as-expected, please specify a format.
  df_customers['Member Since'] = pd.to_datetime(df_customers['Member
Since'])
C:\Users\luffy\AppData\Local\Temp\ipykernel_31100\1136408421.py:5:
UserWarning: Could not infer format, so each element will be parsed
individually, falling back to `dateutil`. To ensure parsing is
consistent and as-expected, please specify a format.
  df_customers['Cancellation Date'] =
pd.to_datetime(df_customers['Cancellation Date'])
```

b. Resolve Data Issues

Check for missing data, inconsistent text and typos, duplicate data and outliers.

i. Missing Data

```
# Look for NaN values in the customers
df_customers.isna().sum()
```

```
Customer ID           0
Customer Name         0
Email                 0
Member Since          0
Subscription Plan     5
Subscription Rate     0
Discount?            23
Cancellation Date    17
dtype: int64
```

```
# Look for NaN values in the listening history
df_listen_history.isna().sum()
```

```
Customer ID    0
Session ID     0
Audio Order    0
Audio ID       0
Audio Type     0
dtype: int64
```

```
# Look for NaN values in the audio
df_audio.isna().sum()
```

```
ID            0
Name          0
Genre         0
Popularity    0
dtype: int64
```

```
# Look for NaN values in the session
df_session.isna().sum()
```

```
Session ID               0
Session Log In Time      0
dtype: int64
```

```
df_customers[df_customers.isnull().any(axis = 1)]
```

```
    Customer ID     Customer Name                              Email  \
0          5001   Harmony Greene    Email: harmonious.vibes@email.com

1          5002        Aria Keys      Email: melodious.aria@email.edu
```

```
2          5004        Lyric Bell    Email: rhythmical.lyric@email.com
3          5267     Rock Bassett          Email: groovy.rock@email.com
4          5338     Rhythm Dixon     Email: beats.by.rhythm@email.edu
5          5404       Jazz Saxton            Email: jazzy.sax@email.com
6          5581        Reed Sharp          Email: sharp.tunes@email.com
7          5759   Carol Kingbird      Email: songbird.carol@email.com
8          5761      Sonata Nash      Email: musical.sonata@email.com
9          5763     Jazz Coleman  Email: coleman.jazzmaster@email.com
10         5826       Chord Hayes      Email: harmonic.chord@email.com
11         5827  Rhythm Franklin   Email: rhythmic.franklin@email.edu
12         6029   Chord Campbell   Email: campbell.chordify@email.com
13         6092        Benny Beat      Email: rhythmic.benny@email.com
14         6163      Melody Parks    Email: park.of.melodies@email.com
15         6229  Symphony Rhodes     Email: rhodes.symphony@email.com
16         6406   Beatrice Sharp   Email: beats.by.beatrice@email.com
17         6584        Bobby Bass   Email: bass.master.bobby@email.edu
18         6586   Lyric Saunders    Email: lyrical.saunders@email.edu
19         6588     Harmony Bass        Email: bass.harmony@email.com
20         6821         Reed Flat          Email: flat.tunes@email.edu
21         6822         Kiki Keys     Email: kiki.keys.piano@email.com
24         7158  Harmony Wallace     Email: wallace.harmony@email.com
27         7579    Jazz Drummond       Email: drumming.jazz@email.com

   Member Since Subscription Plan  Subscription Rate Discount?  \
0    2023-03-13       Basic (Ads)               2.99       NaN
1    2023-03-13               NaN               2.99       NaN
2    2023-03-13               NaN               2.99       NaN
3    2023-03-20       Basic (Ads)               2.99       NaN
```

```
4    2023-03-20                NaN                 2.99        NaN
5    2023-03-20                NaN                 2.99        NaN
6    2023-03-21  Premium (No Ads)                 9.99        NaN
7    2023-03-22  Premium (No Ads)                 9.99        NaN
8    2023-03-28  Premium (No Ads)                 9.99        NaN
9    2023-03-28       Basic (Ads)                 2.99        NaN
10   2023-03-28       Basic (Ads)                 2.99        NaN
11   2023-03-28                NaN                 2.99        NaN
12   2023-03-29  Premium (No Ads)                 9.99        NaN
13   2023-04-01       Basic (Ads)                 2.99        NaN
14   2023-04-05  Premium (No Ads)                 9.99        NaN
15   2023-04-06  Premium (No Ads)                99.99        NaN
16   2023-04-08       Basic (Ads)                 2.99        NaN
17   2023-04-09       Basic (Ads)                 2.99        NaN
18   2023-04-16       Basic (Ads)                 2.99        NaN
19   2023-04-16       Basic (Ads)                 2.99        NaN
20   2023-04-24       Basic (Ads)                 2.99        NaN
21   2023-05-01  Premium (No Ads)                 7.99        Yes
24   2023-05-07       Basic (Ads)                 2.99        NaN
27   2023-05-15       Basic (Ads)                 2.99        NaN

   Cancellation Date
0                NaT
1                NaT
2         2023-06-01
3                NaT
4                NaT
5         2023-06-03
6                NaT
7         2023-06-02
8                NaT
9                NaT
10               NaT
11               NaT
12        2023-06-02
13        2023-06-01
14               NaT
15        2023-06-02
16               NaT
17               NaT
18               NaT
19        2023-06-01
20               NaT
21               NaT
24               NaT
27               NaT
```

```
df_customers['Discount?'].value_counts()
```

```
Discount?
Yes    7
Name: count, dtype: int64

df_customers['Discount?'] = np.where(df_customers['Discount?'].isna(),
'No', df_customers['Discount?'])

df_customers[df_customers['Subscription Plan'].isnull()]

    Customer ID    Customer Name
Email  \
1          5002         Aria Keys     Email: melodious.aria@email.edu

2          5004        Lyric Bell   Email: rhythmical.lyric@email.com

4          5338      Rhythm Dixon    Email: beats.by.rhythm@email.edu

5          5404       Jazz Saxton           Email: jazzy.sax@email.com

11         5827  Rhythm Franklin  Email: rhythmic.franklin@email.edu


   Member Since Subscription Plan  Subscription Rate Discount?  \
1    2023-03-13               NaN               2.99        No
2    2023-03-13               NaN               2.99        No
4    2023-03-20               NaN               2.99        No
5    2023-03-20               NaN               2.99        No
11   2023-03-28               NaN               2.99        No

   Cancellation Date
1                NaT
2         2023-06-01
4                NaT
5         2023-06-03
11               NaT

df_customers['Subscription Plan'] =
np.where(((df_customers['Subscription Plan'].isna()) &
(df_customers['Subscription Rate'] == 2.99)), 'Basic (Ads)',
df_customers['Subscription Plan'])
```

ii. Inconsistent Text & Typos

```
# Look for inconsistent text & typos
df_customers.describe()

       Customer ID         Member Since  Subscription Rate  \
count    30.000000                   30          30.000000
mean   6276.333333  2023-04-10 06:24:00           8.556667
min    5001.000000  2023-03-13 00:00:00           2.990000
25%    5759.500000  2023-03-23 12:00:00           2.990000
```

```
50%    6196.000000  2023-04-05 12:00:00           2.990000
75%    6823.500000  2023-05-01 00:00:00           7.990000
max    7583.000000  2023-05-16 00:00:00          99.990000
std     814.255587                  NaN          17.517840

                   Cancellation Date
count                             13
mean   2023-06-01 16:36:55.384615424
min              2023-06-01 00:00:00
25%              2023-06-01 00:00:00
50%              2023-06-02 00:00:00
75%              2023-06-02 00:00:00
max              2023-06-03 00:00:00
std                              NaN
```

```
df_customers['Subscription Rate'].value_counts()
```

```
Subscription Rate
2.99     17
7.99      7
9.99      5
99.99     1
Name: count, dtype: int64
```

```
df_customers['Subscription Rate'] =
np.where(df_customers['Subscription Rate'] == 99.99, 9.99,
df_customers['Subscription Rate'])
```

```
df_listen_history.describe()
```

```
       Customer ID     Session ID  Audio Order    Audio ID
count   505.000000     505.000000   505.000000  505.000000
mean   6112.247525  105225.554455     4.138614  112.063366
std     832.861221    3625.879577     2.669008   24.670285
min    5001.000000  100520.000000     1.000000  101.000000
25%    5267.000000  101925.000000     2.000000  103.000000
50%    6029.000000  105116.000000     4.000000  105.000000
75%    6822.000000  109654.000000     6.000000  109.000000
max    7583.000000  111333.000000    15.000000  205.000000
```

```
df_audio.describe()
```

```
       Popularity
count   17.000000
mean    21.058824
std     23.381271
min      1.000000
25%      4.000000
50%     10.000000
75%     28.000000
max     80.000000
```

```
df_session.describe()
```

```
          Session ID            Session Log In Time
count      90.000000                             90
mean   105619.788889  2023-04-27 08:18:34.000000512
min    100520.000000            2023-03-13 14:14:00
25%    102149.000000            2023-04-05 21:21:30
50%    105390.500000            2023-05-03 20:03:00
75%    109658.250000            2023-05-18 22:17:30
max    111333.000000            2023-05-31 06:03:00
std      3616.208569                            NaN
```

```
df_audio.Genre = np.where(df_audio.Genre == 'Pop
Music','Pop',df_audio.Genre)
```

```
df_audio.head()
```

```
         ID               Name Genre  Popularity
0  Song-101   Dance All Night   Pop           1
1  Song-102  Unbreakable Beat   Pop           2
2  Song-103  Sunset Boulevard   Pop           5
3  Song-104    Glowing Hearts   Pop          10
4  Song-105         Pop Rocks   Pop          52
```

iii. Duplicate Rows

```
# Look for duplicate rows
df_customers.duplicated().sum()
```

```
0
```

```
df_listen_history.duplicated().sum()
```

```
0
```

```
df_audio.duplicated().sum()
```

```
0
```

```
df_session.duplicated().sum()
```

```
0
```

iv. Outliers

```
# Look for outliers
```

c. Create New Columns

Create two new columns that will be useful for EDA and modeling:

- Cancelled: whether a customer cancelled or not

- Email: Remove the "Email:" from the email addresses

```
# Create a 'Cancelled' column
df_customers['Cancelled'] = np.where(df_customers['Cancellation
Date'].notna(),1,0)

# Create an updated 'Email' column without the Email: portion
df_customers['Email'] = df_customers['Email'].str[6:]

# Create an updated 'Discount?' column with Yes=1 and No=0
df_customers['Discount?'] = np.where(df_customers['Discount?'] ==
'No', 0, 1)
```

4. EDA

Try to better understand the customers who cancelled:

- How long were they members before they cancelled?
- What percentage of customers who cancelled had a discount vs customers who didn't cancel?

```
df_customers[df_customers['Cancellation Date'].notna()]

    Customer ID      Customer Name                         Email
Member Since  \
2          5004         Lyric Bell     rhythmical.lyric@email.com
2023-03-13
5          5404       Jazz Saxton           jazzy.sax@email.com
2023-03-20
7          5759     Carol Kingbird       songbird.carol@email.com
2023-03-22
12         6029     Chord Campbell    campbell.chordify@email.com
2023-03-29
13         6092         Benny Beat       rhythmic.benny@email.com
2023-04-01
15         6229    Symphony Rhodes      rhodes.symphony@email.com
2023-04-06
19         6588       Harmony Bass         bass.harmony@email.com
2023-04-16
22         6824       Greta Groove         groovy.greta@email.com
2023-05-01
23         7087      Harmony Heart    heartfelt.harmony@email.com
2023-05-01
25         7224  Melody Fitzgerald    fitzgerald.melody@email.com
2023-05-08
26         7401        Reed Murphy    murphy.reed.music@email.com
2023-05-08
28         7581         Lyric Keys          keysoflyric@email.com
2023-05-16
29         7583      Melody Singer       melodic.singer@email.com
2023-05-16
```

```
   Subscription Plan  Subscription Rate  Discount? Cancellation
Date  \
2         Basic (Ads)               2.99          0          2023-06-01

5         Basic (Ads)               2.99          0          2023-06-03

7    Premium (No Ads)               9.99          0          2023-06-02

12   Premium (No Ads)               9.99          0          2023-06-02

13        Basic (Ads)               2.99          0          2023-06-01

15   Premium (No Ads)               9.99          0          2023-06-02

19        Basic (Ads)               2.99          0          2023-06-01

22   Premium (No Ads)               7.99          1          2023-06-02

23   Premium (No Ads)               7.99          1          2023-06-02

25   Premium (No Ads)               7.99          1          2023-06-01

26   Premium (No Ads)               7.99          1          2023-06-01

28   Premium (No Ads)               7.99          1          2023-06-03

29   Premium (No Ads)               7.99          1          2023-06-01


    Cancelled
2           1
5           1
7           1
12          1
13          1
15          1
19          1
22          1
23          1
25          1
26          1
28          1
29          1
```

```python
# How long were customers members before they cancelled?
time_before_cancel =  (df_customers['Cancellation Date'] -
df_customers['Member Since']).mean()
time_before_cancel
```

```
Timedelta('46 days 07:23:04.615384615')
```

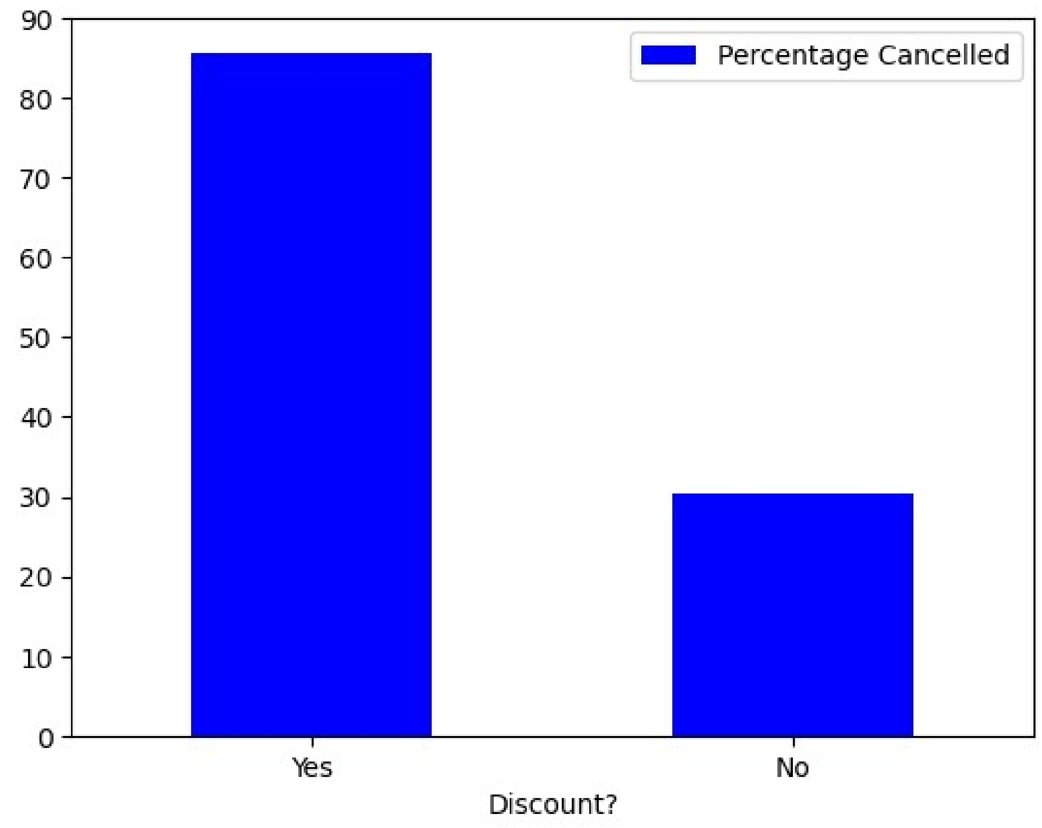
```
# Cancellation rate for those who had a discount

discount_cancelled = df_customers[df_customers['Discount?'] == 1]
discount_cancelled.Cancelled.sum()/discount_cancelled.Cancelled.count(
)*100
```

```
85.71428571428571
```

```
# Cancellation rate for those who did not have a discount
no_discount_cancelled = df_customers[df_customers['Discount?'] == 0]
no_discount_cancelled.Cancelled.sum()/no_discount_cancelled.Cancelled.
count()*100
```

```
30.434782608695656
```

```
# Visualize the cancellation rate for those with a discount vs those
without a discount
pd.DataFrame([["Yes" ,85.71428571428571],
              ["No",30.434782608695656]],
             columns = ["Discount?","Percentage Cancelled"]).plot.bar(x
= "Discount?",y = "Percentage Cancelled", color = "blue");
plt.xticks(rotation = 0);
```



Better understand the customers' listening histories:

- Join together the listening history and audio tables
- How many listening sessions did each customer have in the past 3 months?
- What were the most popular genres that customers listened to?

```
# Split the ID in the audio data so the column can be joined with
other tables
temp_audio =
pd.DataFrame(df_audio.ID.str.split('-').to_list()).rename(columns =
{0: 'Type',1: 'New_Id'})
new_audio = pd.concat([temp_audio,df_audio], axis = 1)
new_audio.head()

   Type New_Id       ID              Name Genre  Popularity
0  Song    101 Song-101   Dance All Night   Pop           1
1  Song    102 Song-102  Unbreakable Beat   Pop           2
2  Song    103 Song-103  Sunset Boulevard   Pop           5
3  Song    104 Song-104    Glowing Hearts   Pop          10
4  Song    105 Song-105         Pop Rocks   Pop          52

# Hint: Check the data type of Audio ID in the audio table
new_audio.dtypes
new_audio.New_Id = pd.to_numeric(new_audio.New_Id)

new_audio.dtypes

Type          object
New_Id         int64
ID            object
Name          object
Genre         object
Popularity     int64
dtype: object

# The number of listening sessions that each customer had in the past
3 months
df_listen_history.groupby('Customer ID')['Session ID'].nunique()

Customer ID
5001    8
5002    4
5004    1
5267    7
5338    4
5404    1
5581    3
5759    2
5761    3
5763    6
5826    3
5827    1
6029    2
```

```
6092    3
6163    3
6229    2
6406    3
6584    2
6586    2
6588    3
6821    2
6822    3
6824    4
7087    3
7158    3
7224    4
7401    3
7579    2
7581    2
7583    1
Name: Session ID, dtype: int64
```

```
# The most popular genres that customers listened to
new_df = df_listen_history.merge(new_audio, how = 'left', left_on =
'Audio ID', right_on = 'New_Id')
new_df.head()
```

```
   Customer ID  Session ID  Audio Order  Audio ID Audio Type  Type
New_Id  \
0         5001      100520            1       101       Song  Song
101
1         5001      100520            2       102       Song  Song
102
2         5001      100520            3       103       Song  Song
103
3         5001      100520            4       104       Song  Song
104
4         5001      100520            5       105       Song  Song
105

         ID              Name Genre  Popularity
0  Song-101   Dance All Night   Pop           1
1  Song-102  Unbreakable Beat   Pop           2
2  Song-103  Sunset Boulevard   Pop           5
3  Song-104    Glowing Hearts   Pop          10
4  Song-105         Pop Rocks   Pop          52
```

```
new_df.Genre.value_counts()
```

```
Genre
Pop           267
Hip Hop        88
Country        68
```

```
Jazz            48
Comedy          19
True Crime      15
Name: count, dtype: int64
```

5. Prep for Modeling

Create a DataFrame that is ready for modeling with each row representing a customer and the following numeric, non-null columns:

- Customer ID
- Whether a customer cancelled or not
- Whether a customer received a discount or not
- The number of listening sessions
- Percent of listening history consisting of Pop
- Percent of listening history consisting of Podcasts

```
# Create a dataframe ready for modeling
model = df_customers[['Customer ID','Cancelled','Discount?']]
model.head()

   Customer ID  Cancelled  Discount?
0         5001          0          0
1         5002          0          0
2         5004          1          0
3         5267          0          0
4         5338          0          0

# Calculate the number of listening sessions for each customer
number_of_listening_sessions = new_df.groupby('Customer ID')['Session
ID'].nunique()
number_of_listening_sessions.head()

Customer ID
5001    8
5002    4
5004    1
5267    7
5338    4
Name: Session ID, dtype: int64

number_of_listening_sessions =
number_of_listening_sessions.to_frame().reset_index().rename(columns
={'Session ID' : 'Total Sessions'})
number_of_listening_sessions.head()

   Customer ID  Total Sessions
0         5001               8
1         5002               4
2         5004               1
```

```
3         5267                 7
4         5338                 4
```

```
model = model.merge(number_of_listening_sessions,how = 'left', on =
'Customer ID')
model.head()
```

```
   Customer ID  Cancelled  Discount?  Total Sessions
0         5001          0          0               8
1         5002          0          0               4
2         5004          1          0               1
3         5267          0          0               7
4         5338          0          0               4
```

```
# Percent pop
pd.get_dummies(new_df.Genre,dtype = int)
```

```
     Comedy  Country  Hip Hop  Jazz  Pop  True Crime
0         0        0        0     0    1           0
1         0        0        0     0    1           0
2         0        0        0     0    1           0
3         0        0        0     0    1           0
4         0        0        0     0    1           0
..      ...      ...      ...   ...  ...         ...
500       0        0        0     1    0           0
501       1        0        0     0    0           0
502       0        0        1     0    0           0
503       0        0        1     0    0           0
504       0        0        1     0    0           0

[505 rows x 6 columns]
```

```
genre = pd.concat([new_df['Customer
ID'],pd.get_dummies(new_df.Genre,dtype = int)], axis =
1).groupby('Customer ID').sum().reset_index()
genre.head()
```

```
   Customer ID  Comedy  Country  Hip Hop  Jazz  Pop  True Crime
0         5001       0        0       26     0   34           0
1         5002       0       22        0     0    0           0
2         5004       0        0        0     0    9           0
3         5267       0        0       22     0   23           0
4         5338       0       18        0     0    0           0
```

```
Total_audio = df_listen_history.groupby('Customer ID')['Audio
ID'].count().to_frame().rename(columns={'Audio
ID':'Total'}).reset_index()
Total_audio.head()
```

```
   Customer ID  Total
0         5001     60
```

```
1          5002      22
2          5004       9
3          5267      45
4          5338      18

audio_final = genre.merge(Total_audio, how = 'left', on = 'Customer
ID')

audio_final.head()

   Customer ID  Comedy  Country  Hip Hop  Jazz  Pop  True Crime  Total
0         5001       0        0       26     0   34           0     60
1         5002       0       22        0     0    0           0     22
2         5004       0        0        0     0    9           0      9
3         5267       0        0       22     0   23           0     45
4         5338       0       18        0     0    0           0     18

model['Percent Pop'] = audio_final.Pop/audio_final.Total *100
model.head()

   Customer ID  Cancelled  Discount?  Total Sessions  Percent Pop
0         5001          0          0               8    56.666667
1         5002          0          0               4     0.000000
2         5004          1          0               1   100.000000
3         5267          0          0               7    51.111111
4         5338          0          0               4     0.000000

model.head()

   Customer ID  Cancelled  Discount?  Total Sessions  Percent Pop
0         5001          0          0               8    56.666667
1         5002          0          0               4     0.000000
2         5004          1          0               1   100.000000
3         5267          0          0               7    51.111111
4         5338          0          0               4     0.000000

# Percent podcasts
model['Percent Podcast'] = ((audio_final['Comedy'] + audio_final['True
Crime'])/audio_final.Total)*100
```

Visualize the relationships in the modeling DataFrame using a pair plot:

- What are some of your observations?
- What variables might do a good job predicting customer cancellation?

```
model.corr()

                Customer ID  Cancelled  Discount?  Total Sessions  \
Customer ID        1.000000   0.269942   0.648514       -0.337083
Cancelled          0.269942   1.000000   0.471825       -0.333739
Discount?          0.648514   0.471825   1.000000       -0.048877
Total Sessions    -0.337083  -0.333739  -0.048877        1.000000
```

```
Percent Pop        -0.076129   0.585630   0.112675       -0.131156
Percent Podcast     0.083083  -0.035414   0.062938       -0.125459

                 Percent Pop  Percent Podcast
Customer ID        -0.076129         0.083083
Cancelled           0.585630        -0.035414
Discount?           0.112675         0.062938
Total Sessions     -0.131156        -0.125459
Percent Pop         1.000000        -0.487193
Percent Podcast    -0.487193         1.000000
```

- Percent Pop can be a good predictor for model