Client Report - [The war with Star Wars]

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Elevator pitch

To distinguish if a house is built before 1980 or after. Data I got had more than 20,000 rows, so I didn't want to look up each row. I mainly used a python module called "scikit" to let machine to distinguish which is which. It's basically machine learning and accuracy never became 100%, but at least more than 90%, so it's pretty accurate. Here is the step I made to get the accuacy.

GRAND QUESTION 1

Shorten the column names and clean them up for easier use with pandas.

ANALYSIS

I first needed to find which column names were a wordy, useless name. While some columns were unnamed, some other column names were a sentence-like name, so I had to change those into a short and clear name.

TECHNICAL DETAILS

```
# %%
dat.rename(columns = {
  'Have you seen any of the 6 films in the Star Wars franchise?':
'haveSeenAny',
  'Do you consider yourself to be a fan of the Star Wars film franchise?':
'fan',
  'Which of the following Star Wars films have you seen? Please select all
that apply.': 'haveWatchedOne',
  'Unnamed: 4': 'haveWatchedTw',
  'Unnamed: 5': 'haveWatchedTh',
  'Unnamed: 6': 'haveWatchedFr',
  'Unnamed: 7': 'haveWatchedFv',
  'Unnamed: 8': 'haveWatchedSx',
  'Please rank the Star Wars films in order of preference with 1 being
your favorite film in the franchise and 6 being your least favorite
film.': 'epi1PhantomMenace',
  'Unnamed: 10': 'epi2AttackClones',
  'Unnamed: 11': 'epi3RevengeSith',
  'Unnamed: 12': 'epi4NewHope',
  'Unnamed: 13': 'epi5EmpireStrikesBack',
  'Unnamed: 14': 'epi6ReturnJedi',
  'Please state whether you view the following characters favorably,
unfavorably, or are unfamiliar with him/her.': 'likeHan',
  'Unnamed: 16': 'likeLuke',
  'Unnamed: 17': 'likeLeia',
  'Unnamed: 18': 'likeAnakin',
```

```
  'Unnamed: 19': 'likeObi',
  'Unnamed: 20': 'likePalpatine',
  'Unnamed: 21': 'likeDarth',
  'Unnamed: 22': 'likeLando',
  'Unnamed: 23': 'likeBoba',
  'Unnamed: 24': 'likeC3P0',
  'Unnamed: 25': 'likeR2D2',
  'Unnamed: 26': 'likeJar',
  'Unnamed: 27': 'likePadme',
  'Unnamed: 28': 'likeYoda',
  'Which character shot first?': 'shotFirst',
  'Are you familiar with the Expanded Universe?': 'FamiliarExpdUniv',
  'Do you consider yourself to be a fan of the Expanded Universe?  æ':
'fanExpdUniv',
  'Do you consider yourself to be a fan of the Star Trek franchise?':
'fanStarTrek',
}, inplace = True)
dat
```

I could change the inconvenient columns, and some examples are

1. 'Please state whether you view the following characters favorably, unfavorably, or are unfamiliar with him/her.' to 'likeHan',
2. 'Unnamed: 16' to 'likeLuke',
3. 'Unnamed: 17' to 'likeLeia',

GRAND QUESTION 2

Filter the dataset to those that have seen at least one film.

Analysis

When I run this code `dat.haveWatchedOne.unique()`, I only got two values in the array. One is the title of the first Star Wars movie, and the other is NaN.

TECHNICAL DETAILS

```
dat.haveWatchedOne.unique()
# array(['Star Wars: Episode I  The Phantom Menace', nan], dtype=object)

print(f"before === \nthe number of rows: {len(dat)}\n==========")
# the number of rows: 1187

onlyWatched = dat.haveWatchedOne.dropna()
print(f"after === \nthe number of rows: {onlyWatched.count()}\n=========")
# the number of rows: 674
```

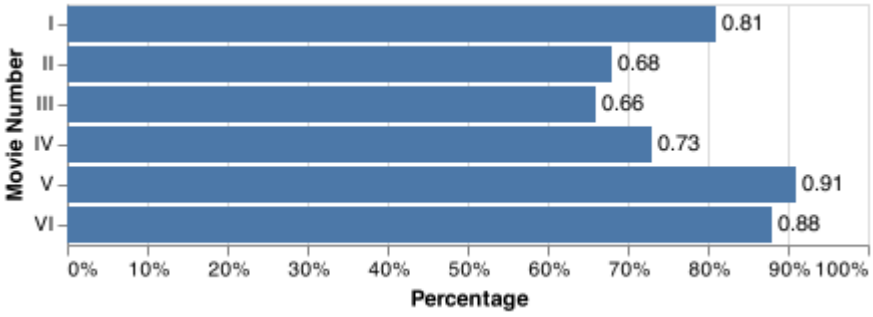
haveWatchedOne
Star Wars: Episode I The Phantom Menace
Star Wars: Episode I The Phantom Menace
Star Wars: Episode I The Phantom Menace
Star Wars: Episode I The Phantom Menace
Star Wars: Episode I The Phantom Menace
Star Wars: Episode I The Phantom Menace
Star Wars: Episode I The Phantom Menace
Star Wars: Episode I The Phantom Menace
Star Wars: Episode I The Phantom Menace
Star Wars: Episode I The Phantom Menace

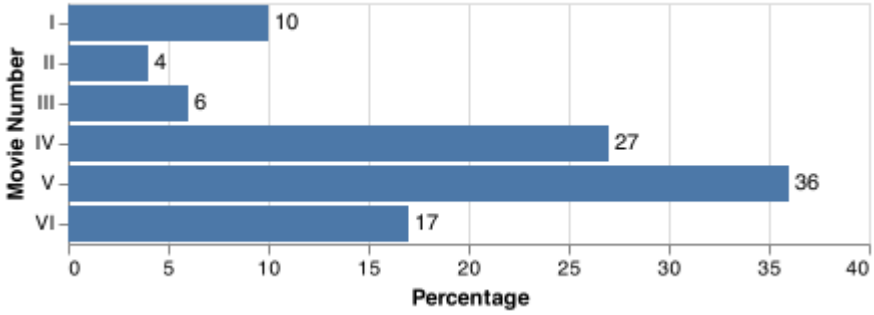
GRAND QUESTION 3

Please validate that the data provided on GitHub lines up with the article by recreating 2 of their visuals and calculating 2 summaries that they report in the article.

Anylysis

This question was kind of tricky because there were some people who answered 'Yes' to a question, "Have you watched at least one of the 6 Star Wars movies', and answered all 6 NaN to questions asking for each episode. As a Result, three of the four information they reported in the article (2 visuals and 2 summaries) were correct.





No	Yes	←Have Seen One, Gen↓
0.276867	0.723133	M

No	Yes	←Have Seen One, Gen↓
0.148893	0.851107	F
0.216061	0.783939	Ttl

For this one, I didn't get the same information they reported in the article. I tried both of dropping NaN values and including them.

Female	Male	←Gen, Fan of Star Trek↓
0.529412	0.470588	No
0.440389	0.559611	Yes
0.484737	0.515263	Ttl

TECHNICAL DETAILS

```
# Sum1
pd.crosstab(dat.Gender, dat.haveSeenAny, normalize="index",
margins=True).to_markdown(index=False)

# Sum2
q3_2 = q3.dropna(subset=["Gender", "fanStarTrek"])
print(len(q3_2))
pd.crosstab(q3_2.fanStarTrek, q3_2.Gender, normalize="index",
margins=True).to_markdown(index=False)
```

GRAND QUESTION 4

Clean and format the data so that it can be used in a machine learning model. Please achieve the following requests and provide examples of the table with a short description the changes made in your report.

Create an additional column that converts the age ranges to a number and drop the age range categorical column.

min_age: ["18": "1", '30': "2", "45": "3", "> 60": "4", np.nan: "0"] max_age: ["29": "1", '44': "2", "60": "3", "None": "4", np.nan: "0"]

min_age	max_age
1	1
1	1
1	1
1	1
1	1

Create an additional column that converts the school groupings to a number and drop the school categorical column.

np.nan: "0", "Less than high school degree": "1", 'High school degree': "2", 'Some college or Associate degree': "3", "Bachelor degree": "4", "Graduate degree": "5"

Education
2
2
3
3
4
2
2
3
3
4

Create an additional column that converts the income ranges to a number and drop the income range categorical column.

np.nan: "0", "$0 - $24,999": "1", '$25,000 - $49,999': "2", '$50,000 - $99,999': "3", "$100,000 - $149,999": "4", "$150,000+": "5" I dropped Age column and added min_age and max_age columns

Household Income
0
1
4
4
2
0
0
1
2
2

Create your target (also known as label) column based on the new income range column.

If Household Income is 4 or 5, place 1 as a value for is_rich column

Household Income	is_rich
0	0
1	0
4	1
4	1
2	0
0	0
0	0
1	0
2	0
2	0

One-hot encode all remaining categorical columns.

I could replace all values with a number in the dataframe. NaN value to -1 and others are from 1 to 6.

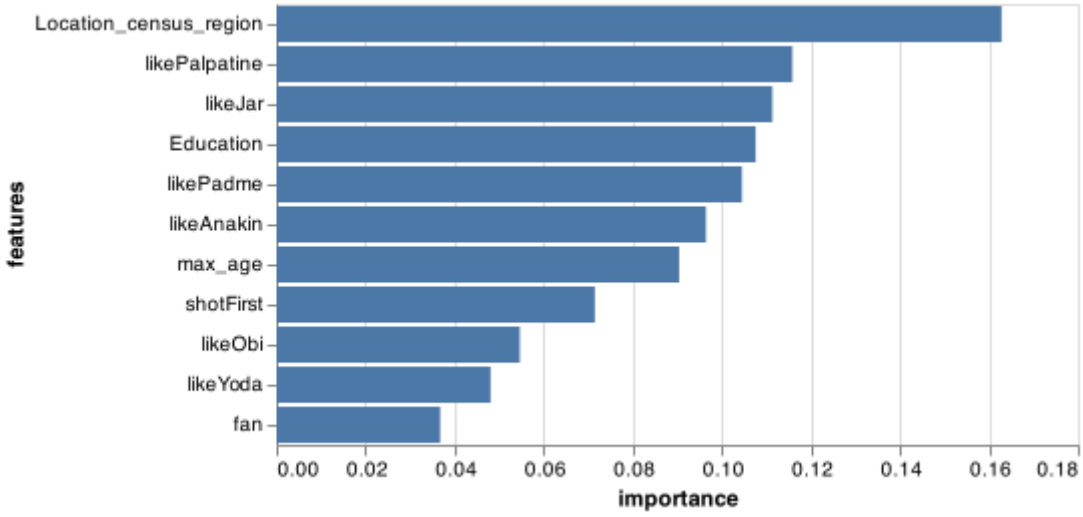
GRAND QUESTION 5

Build a machine learning model that predicts whether a person makes more than $50k.

Anylysis

I reused code Written in project 4 to create a classification model and an accuracy. Unlikely the data used in the last project, I didn't get a high accuracy this time. The highest was around 30%.

Here is the chart of feature importances I used to get an accuracy.



TECHNICAL DETAILS

Appendix

Q1

Q2

Q3

Q4

1

```
# aaaaaaaaa
two_columns = day3_at_least_watched_one["Age"].str.split("-", expand =
True).rename(columns = {0: 'min_age', 1: 'max_age'})
separatedAge = pd.concat([day3_at_least_watched_one, two_columns], axis=1)
separatedAge.drop(columns="Age")

# replace values in min_age and max_age columns.
(q3
  .min_age.replace({"18": "1", '30': "2", "45": "3", "> 60": "4", np.nan:
"0"}, inplace=True)
  )

(q3
  .max_age.replace({"29": "1", '44': "2", "60": "3", "None": "4", np.nan:
"0"}, inplace=True)
  )

# bbbbbbbbb
(q3
  .Education.replace(
    {
      np.nan: "0",
      "Less than high school degree": "1",
      'High school degree': "2",
      'Some college or Associate degree': "3",
      "Bachelor degree": "4",
      "Graduate degree": "5",
```

```
    }, inplace=True)
  )

# ccccccccc
(q3
  ["Household Income"].replace(
    {
      np.nan: "0",
      "$0 - $24,999": "1",
      '$25,000 - $49,999': "2",
      '$50,000 - $99,999': "3",
      "$100,000 - $149,999": "4",
      "$150,000+": "5",
    }, inplace=True)
  )

# ddddddddddd
q3['is_rich'] = ["1" if x == "4" or x == "5" else "0" for x in
q3['Household Income']]

# eeeeeeeeeee
q3['locationCensusRegion'].replace(
  {
    'South Atlantic': "0",
    'West South Central': "1",
    'West North Central': "2",
    'Middle Atlantic': "3",
    'East North Central': "4",
    'Pacific': "5",
    'Mountain': "6",
    'New England': "7",
    'East South Central': "8"
  },
  inplace=True
)
q3['shotFirst'].replace({"I don't understand this question": "0",
"Greedo": "1", "Han": "2"}, inplace=True)

q3["Gender"].replace({"Male": "1", "Female": "0"}, inplace=True)
(q3
  .WatchedTw.replace(
    {
      "Star Wars: Episode II  Attack of the Clones": "1",
      np.nan: "0",
    }, inplace=True)

  .replace(
    {
      "Very favorably": "6",
      "Somewhat favorably": "5",
      "Neither favorably nor unfavorably (neutral)": "4",
      "Unfamiliar (N/A)": "3",
      "Very unfavorably": "1",
      "Somewhat unfavorably": "2",
```

```
    }, inplace=True)
  )

q3.rename(columns = {"Which character shot first?": "shotFirst",
"Household Income": "income", "Location (Census Region)":
"locationCensusRegion"}, inplace=True)
```

Q5

```
#%%
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import train_test_split
from sklearn import metrics
#%%
x = q5_with_minmaxx_age_COPY.filter(['fan', 'likeAnakin', 'likeObi',
'likePalpatine', 'likeJar',
       'likePadme', 'likeYoda', 'shotFirst','Education',
'Location_census_region',
       'max_age'])
y = q5_with_minmaxx_age_COPY["income"]

#%%
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = .25,
random_state = 376)
#%%
# create the model
classifier = DecisionTreeClassifier()

# train the model
classifier.fit(x_train, y_train)

# make predictions
y_predictions = classifier.predict(x_test)

# test how accurate predictions are
metrics.accuracy_score(y_test, y_predictions)

bars = alt.Chart(feature_df).mark_bar().encode(
    x="importance",
    y=alt.Y("features", sort='-x')
)
bars
```