Project 5

Samantha Staheli

Project Summary

This project uses the data from a Star Wars survey of about 800 respontents. The respondents were asked questions such as, "Do you consider yourself to be a fan of the Star Wars film franchise?". The end goal of the project was to create a model to determine if a Star Wars fan makes over $50,000 a year. Before doing this we cleaned the data by shortening the data and its headers.

Technical Details

Grand Question 1

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

The column names were shortened to be small but still be able to understand what the name means. For example, I shortened Star Wars to sw in all the names. I also shortened the questions to amout two words. An example of this is, changing 'Have you seen' to 'seen_any_'. The new and old column names are shown in the following tables.

	New Names
0	respondentid
1	have_seen_any
2	fan_sw
3	seen_any_i__the_phantom_menace
4	seen_any_ii__attack_of_the_clones
5	seen_any_iii__revenge_of_the_sith
6	seen_any_iv__a_new_hope
7	seen_any_v_the_empire_strikes_back

	New Names
8	seen_any_vi_return_of_the_jedi
9	film_rank_i__the_phantom_menace
10	film_rank_ii__attack_of_the_clones
11	film_rank_iii__revenge_of_the_sith
12	film_rank_iv__a_new_hope
13	film_rank_v_the_empire_strikes_back
14	film_rank_vi_return_of_the_jedi
15	char_rateing_han_solo
16	char_rateing_luke_skywalker
17	char_rateing_princess_leia_organa
18	char_rateing_anakin_skywalker
19	char_rateing_obi_wan_kenobi
20	char_rateing_emperor_palpatine
21	char_rateing_darth_vader
22	char_rateing_lando_calrissian
33	gender
34	age
35	household_income
36	education
37	location_(census_region)

	Old Names
0	nan
1	Response

	Old Names
2	Response
3	Star Wars: Episode I The Phantom Menace
4	Star Wars: Episode II Attack of the Clones
5	Star Wars: Episode III Revenge of the Sith
6	Star Wars: Episode IV A New Hope
7	Star Wars: Episode V The Empire Strikes Back
8	Star Wars: Episode VI Return of the Jedi
9	Star Wars: Episode I The Phantom Menace
10	Star Wars: Episode II Attack of the Clones
11	Star Wars: Episode III Revenge of the Sith
12	Star Wars: Episode IV A New Hope
13	Star Wars: Episode V The Empire Strikes Back
14	Star Wars: Episode VI Return of the Jedi
15	Han Solo
16	Luke Skywalker
17	Princess Leia Organa
18	Anakin Skywalker
19	Obi Wan Kenobi
20	Emperor Palpatine
21	Darth Vader
22	Lando Calrissian
33	Response
34	Response
35	Response

	Old Names
36	Response
37	Response

Grand Question 2

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.

The two summaries I chose to validate were of males who have seen a Star Wars movie and females who have seen a Star Wars movie. The following tables show the results.

Summary of males who has seen a Star Wars movie.

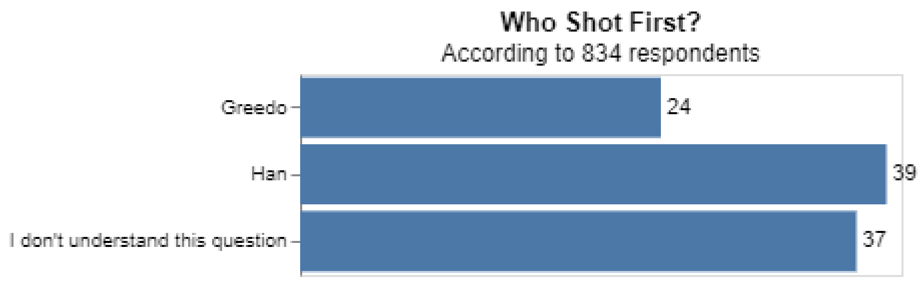
	have_seen_any (Male)
Yes	0.851107

Summary of females who has seen a Star Wars movie.

	have_seen_any (Female)
Yes	0.723133

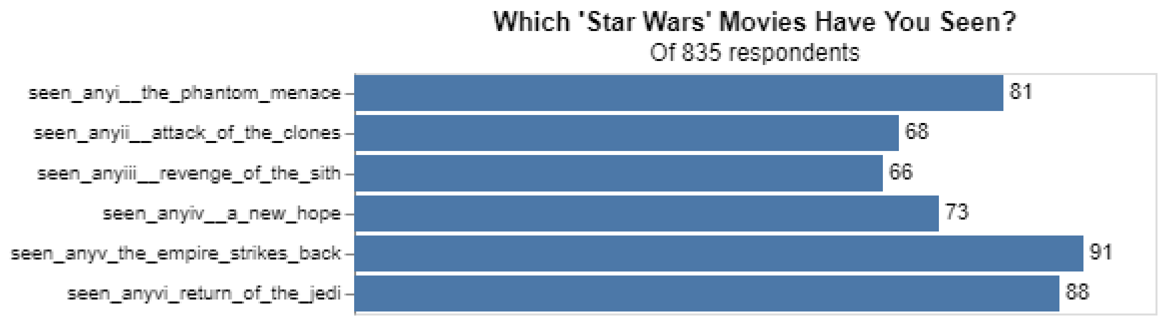
The first visuals I recreated was who shot first. The following chart shows the three answers: Han, Greedo, and I don't understand the question.

Visual of who shot first



The second visual I recreated was if they have seen any Star Wars movies.

Visual of movies seen



Grand Question 3

Clean and format the data so that it can be used in a machine learning model.

The first 3 rows of each of the tables are shown.

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

b. Create a new column that converts the age ranges to a single number. Drop the age range categorical column.

	age_min
0	18
2	18
3	18

c. Create a new column that converts the school groupings to a single number. Drop the school categorical column.

	education
0	12
2	12
3	14

d. Create a new column that converts the income ranges to a single number. Drop the income range categorical column.

	income_min

	income_min
0	nan
2	0
3	100000

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

```
starwars_ml = pd.concat([ml_onehot,
                         q3.filter(['film_ranki__the_phantom_menace', 'film_rankii__attack_of_th
       'film_rankiii__revenge_of_the_sith', 'film_rankiv__a_new_hope',
       'film_rankv_the_empire_strikes_back', 'film_rankvi_return_of_the_jedi']),
                         ml_age,
                         ml_school,
                         ml_income], axis=1)


features = starwars_ml.drop(['income_min'], axis=1)
target = (starwars_ml.income_min >= 50000) * 1
```

f. One-hot encode all remaining categorical columns.

```
ml_onehot = pd.get_dummies(q3.filter(['fan_sw', 'seen__i__the_phantom_menace',
       'seen__ii__attack_of_the_clones', 'seen__iii__revenge_of_the_sith',
       'seen__iv__a_new_hope', 'seen__v_the_empire_strikes_back',
       'seen__vi_return_of_the_jedi', 'viewhan_solo', 'viewluke_skywalker',
       'viewprincess_leia_organa', 'viewanakin_skywalker',
       'viewobi_wan_kenobi', 'viewemperor_palpatine', 'viewdarth_vader',
       'viewlando_calrissian', 'viewboba_fett', 'viewc-3p0', 'viewr2_d2',
       'viewjar_jar_binks', 'viewpadme_amidala', 'viewyoda', 'shotfirst',
       'familiar_eu', 'fan_eu', 'fan_st', 'gender', 'age', 'household_income',
       'education', 'location_(census_region)']), drop_first=True)
```

Grand Question 4

The model I choose was gradient booster. I chose this model because it gave me the hightest results. The result of my model was 1.0. This means it had a 100% accuracy.

```python
# have to drop all na values otherwise won't work
starwars_ml = starwars_ml.dropna()

x_train, x_test, y_train, y_test = train_test_split(
    features,
    target,
    test_size = .3,
    random_state = 76)

# create a classification model
classifier_GB = GradientBoostingClassifier()

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

# use your model to make predictions!
y_predicted = classifier_GB.predict(x_test)

# test how accurate those predictions are
metrics.accuracy_score(y_test, y_predicted)
```

Appendix A

```
# %%
import pandas as pd
import altair as alt
import numpy as np

from sklearn.model_selection import train_test_split
from sklearn.naive_bayes import GaussianNB
from sklearn import metrics

from sklearn.tree import DecisionTreeClassifier
from sklearn import tree
from sklearn.ensemble import RandomForestClassifier
from sklearn.ensemble import GradientBoostingClassifier

# %%
url = 'https://raw.githubusercontent.com/fivethirtyeight/data/master/star-wars-survey/StarWars.c
sw_responses = pd.read_csv(url, encoding='ISO-8859-1', header=None, skiprows=2) # skips first 2
sw_questions = pd.read_csv(url, encoding='ISO-8859-1', header=None, nrows=2) # reads in first 2

# %%
print(sw_questions)

# %% [markdown]
# ## Question 1

# %%
questions = (sw_questions.iloc[0,:]
                .replace('Have you seen any of the 6 films in the Star Wars franchise?', 'have_s
                .replace('Do you consider yourself to be a fan of the Star Wars film franchise?'
                .replace('Which of the following Star Wars films have you seen? Please select al
                .replace('Please rank the Star Wars films in order of preference with 1 being yc
                .replace('Please state whether you view the following characters favorably, unfa
                .replace('Which character shot first?', 'shot_first')
                .replace('Are you familiar with the Expanded Universe?', 'familiar_expanded')
                .replace('Do you consider yourself to be a fan of the Expanded Universe?Œæ', 'fa
                .replace('Do you consider yourself to be a fan of the Star Trek franchise?', 'st
                .str.lower()
                .str.replace(' ', '_')
                .ffill()
            )

response_questions = (sw_questions.iloc[1,:]
                        .replace('Response', '')
                        .str.replace('Star Wars: Episode ', '')
                        .str.lower()
                        .str.replace(' ', '_')
                        .fillna('')
                    )

column_names = questions + response_questions
```

```
# %%
sw_responses.columns = column_names
print(column_names.to_markdown())


# %% [markdown]
# ## Question 2

# %%
print(sw_responses.query('gender == "Male"')
                .have_seen_any
                .value_counts(normalize=True).to_markdown())

# %%
print(sw_responses.query('gender == "Female"')
                .have_seen_any
                .value_counts(normalize=True).to_markdown())

# %% [markdown]
# ### who shot first:

# %%
hanshotfirst = sw_responses.shot_first.value_counts(normalize=True).reset_index()
hanshotfirst['percent'] = round(hanshotfirst.shot_first*100, 0)
hanshotfirst

# %%
shot_chart = (alt.Chart(hanshotfirst)
.mark_bar().encode(
    x=alt.X('percent', axis=None),
    y=alt.Y('index', axis=alt.Axis(title=''))
).properties(
    width=300,
    height=100,
    title= {'text': 'Who Shot First?', 'subtitle': 'According to 834 respondents'}
))

shot_labels = shot_chart.mark_text(
    align='left',
    baseline='middle',
    dx=3  # Nudges text to right so it doesn't appear on top of the bar
).encode(
    text='percent'
)

(shot_chart + shot_labels).properties(height=900)

# %% [markdown]
# ### seen movie
# %%
watched = sw_responses.filter(regex='^seen_').dropna(how='all')
len(watched)
watched


# %%
watched_percent = round(watched.notnull().sum() / len(watched), 2).reset_index(name='percent')
watched_percent['percentfull'] = round(watched_percent.percent*100, 0)
watched_percent

# %%
watched_chart = (alt.Chart(watched_percent)
.mark_bar().encode(
    x=alt.X('percent', axis=None),
    y=alt.Y('index', axis=alt.Axis(title=''))
).properties(
    title= {'text': "Which 'Star Wars' Movies Have You Seen?", 'subtitle': 'Of 835 respondents'}
))

watched_labels = watched_chart.mark_text(
    align='left',
    baseline='middle',
    dx=3  # Nudges text to right so it doesn't appear on top of the bar
).encode(
    text='percentfull'
)

(watched_chart + watched_labels).properties()

# %% [markdown]
# ## Question 3

# %%
# drop no for seen any
q3 = sw_responses.query('have_seen_any == "Yes"')

# %%
#Create a new column that converts the age ranges to a single number. Drop the age range categor
ml_age = (q3.age
    .str.split("-", expand= True)
    .rename(columns = {0:'age_min', 1:'age_max'})
    .apply(lambda x: x.str.replace("> ", ""))
    .astype('float')
    .age_min
    )

# %%
#Create a new column that converts the school groupings to a single number. Drop the school cate
ml_school = (q3.education.
        str.replace('Less than high school degree', '9').
        str.replace('High school degree', '12').
        str.replace('Some college or Associate degree', '14').
        str.replace('Bachelor degree', '16').
        str.replace('Graduate degree', '20').
        astype('float'))

# %%
#Create a new column that converts the income ranges to a single number. Drop the income range c
ml_income = (q3.household_income
    .str.replace("\$|,|\+", "")
    .str.split("-", expand=True)
    .rename(columns = {0:'income_min', 1:'income_max'})
    .astype('float')
    .income_min
)

# %%
#One-hot encode all remaining categorical columns.
ml_onehot = pd.get_dummies(q3.filter(['fan_sw', 'seen__i__the_phantom_menace',
       'seen__ii__attack_of_the_clones', 'seen__iii__revenge_of_the_sith',
       'seen__iv__a_new_hope', 'seen__v_the_empire_strikes_back',
       'seen__vi_return_of_the_jedi', 'viewhan_solo', 'viewluke_skywalker',
       'viewprincess_leia_organa', 'viewanakin_skywalker',
       'viewobi_wan_kenobi', 'viewemperor_palpatine', 'viewdarth_vader',
       'viewlando_calrissian', 'viewboba_fett', 'viewc-3p0', 'viewr2_d2',
       'viewjar_jar_binks', 'viewpadme_amidala', 'viewyoda', 'shotfirst',
       'familiar_eu', 'fan_eu', 'fan_st', 'gender', 'age', 'household_income',
       'education', 'location_(census_region)']), drop_first=True)


# %%
# combine all the new columns into a machine learning dataset
starwars_ml = pd.concat([ml_onehot,
                        q3.filter(['film_ranki__the_phantom_menace', 'film_rankii__attack_of_th
       'film_rankiii__revenge_of_the_sith', 'film_rankiv__a_new_hope',
       'film_rankv_the_empire_strikes_back', 'film_rankvi_return_of_the_jedi']),
                        ml_age,
                        ml_school,
                        ml_income], axis=1)

# %%
starwars_ml = starwars_ml.dropna()

# %%
# Create features (x) and target (y)
features = starwars_ml.drop(['income_min'], axis=1)
target = (starwars_ml.income_min >= 50000) * 1
target.value_counts(dropna=False)

# %% [markdown]
# ## Question 4
```

```python
# %%
x_train, x_test, y_train, y_test = train_test_split(
    features,
    target,
    test_size = .3,
    random_state = 76)

# %%
# create a classification model
classifier_GB = GradientBoostingClassifier()

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

# use your model to make predictions!
y_predicted = classifier_GB.predict(x_test)

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

# %%
print(metrics.classification_report(y_test, y_predicted))
```