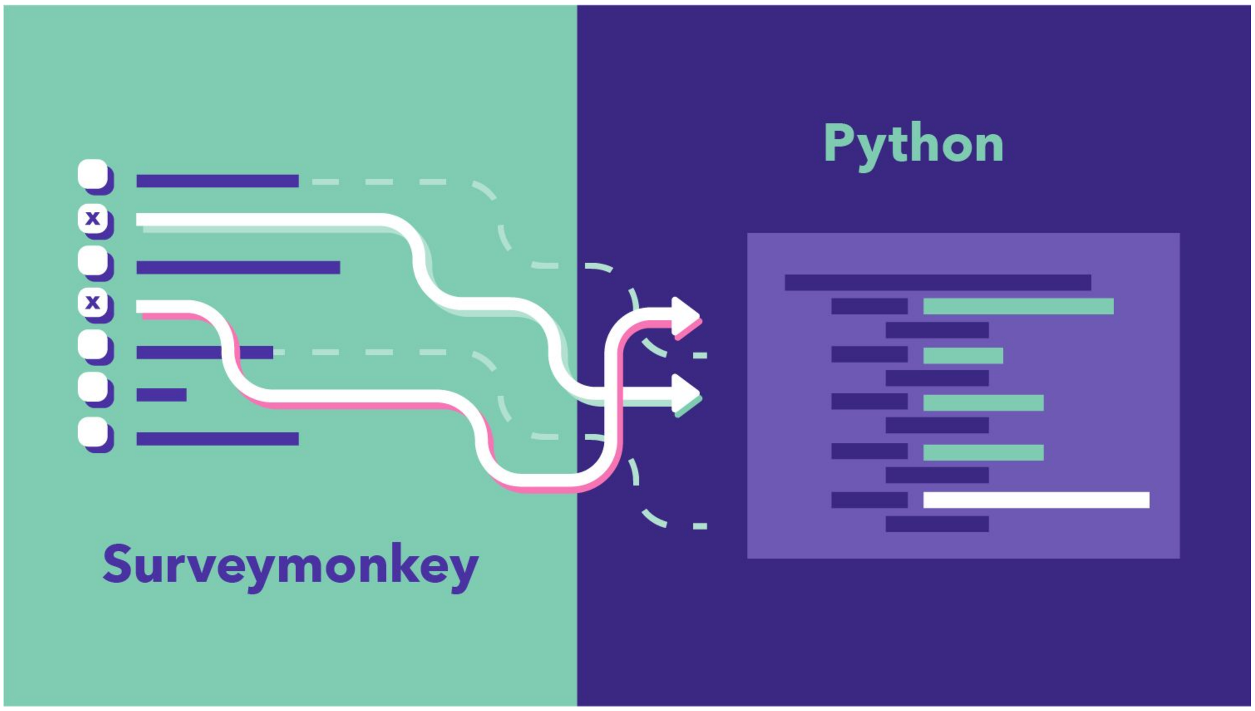
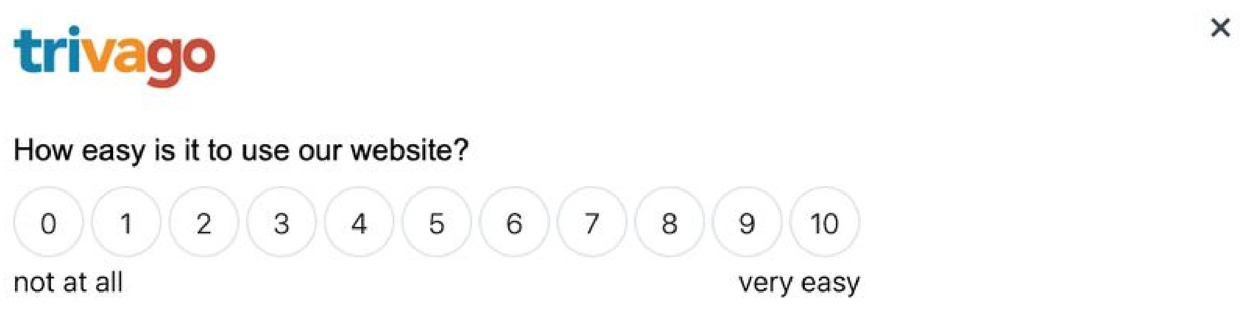


How to Analyze SurveyMonkey Data in Python

Posted on 23 September 2019 by Ruoyun Lin

Introduction

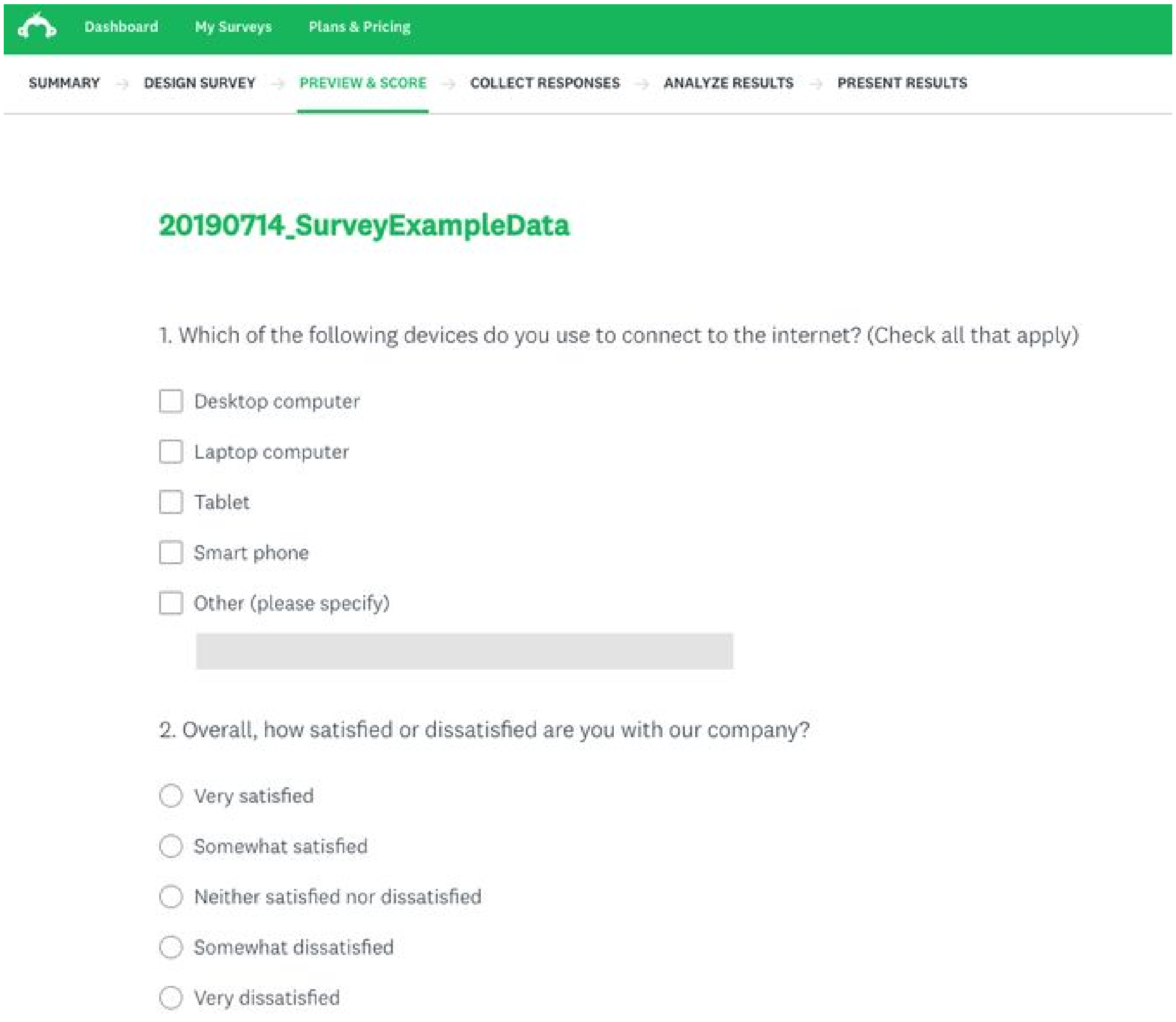
As a user researcher, it is important to know more about our users and their preferences concerning our product. One way to do that is by conducting surveys.



How easy is it to use our website?

A screenshot of a survey on trivago with a poll asking "How easy is it to use this website from 0 to 10?"

In order to gather user feedback from our global markets, we need to conduct a survey with a slightly different set of questions/translations for different countries, and then analyze the results and compare if there is any difference across countries concerning user needs.



20190714_SurveyExampleData

1. Which of the following devices do you use to connect to the internet? (Check all that apply)

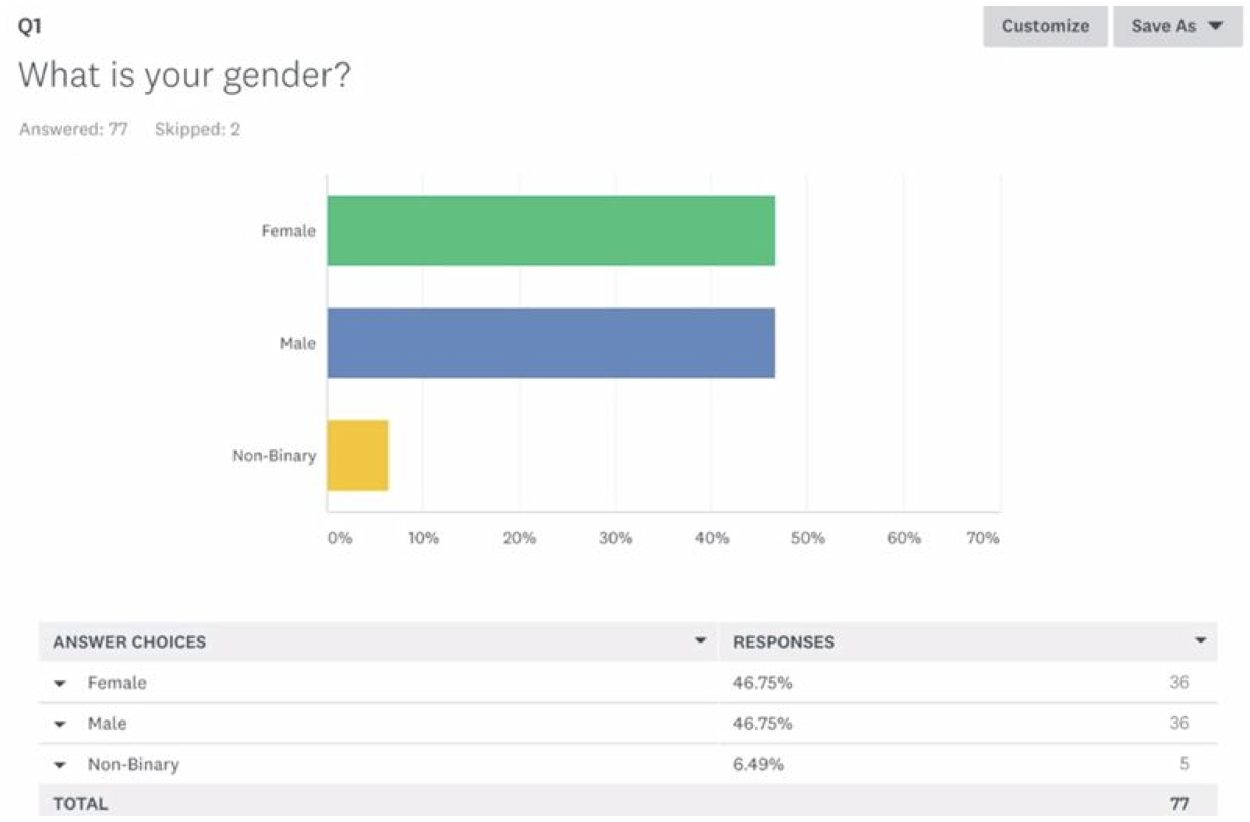
- ☐ Desktop computer
- ☐ Laptop computer
- ☐ Tablet
- ☐ Smart phone
- ☐ Other (please specify)

2. Overall, how satisfied or dissatisfied are you with our company?

- ○ Very satisfied
- ○ Somewhat satisfied
- ○ Neither satisfied nor dissatisfied
- ○ Somewhat dissatisfied
- ○ Very dissatisfied

A preview of a survey on SurveyMonkey showing some example data of a survey about device usage"

One tool we used to create a survey at trivago is SurveyMonkey. It is an online survey software that helps us to create and run online surveys. It is also possible to visualize the survey results in SurveyMonkey (for a single survey).



ANSWER CHOICES	RESPONSES	
Female	46.75%	36
Male	46.75%	36
Non-Binary	6.49%	5
TOTAL		77

A bar chart visualization of a survey about gender (male, female, non-binary)

However, if we want to compare the same question across several different surveys, it is difficult to do so directly in SurveyMonkey. Luckily, we can solve the problem by using programming languages like Python.

The reason why I wrote this blog post is to share knowledge. I am still at the stage of learning Python for data analysis. When I first encountered this problem at work, I tried to see if there is anyone else who has shared a solution for analyzing SurveyMonkey data in Python. I failed to find any direct answers. After trials and errors, I finally came up with a way to do it. Therefore, I want to share my knowledge and Python functions which might help others to save some time.

The following parts will show you how to analyze multiple-survey data exported from SurveyMonkey in Python. To be more specific, I will first explain how to import SurveyMonkey data into Python and automatically generate a codebook, and then share my code for visualizing the survey results for three types of survey questions: 1) checkboxes (multi-answer question), 2) multiple choice (single-answer question), and 3) matrix table.

For all the code below, I used Python 3.7 and the following packages:

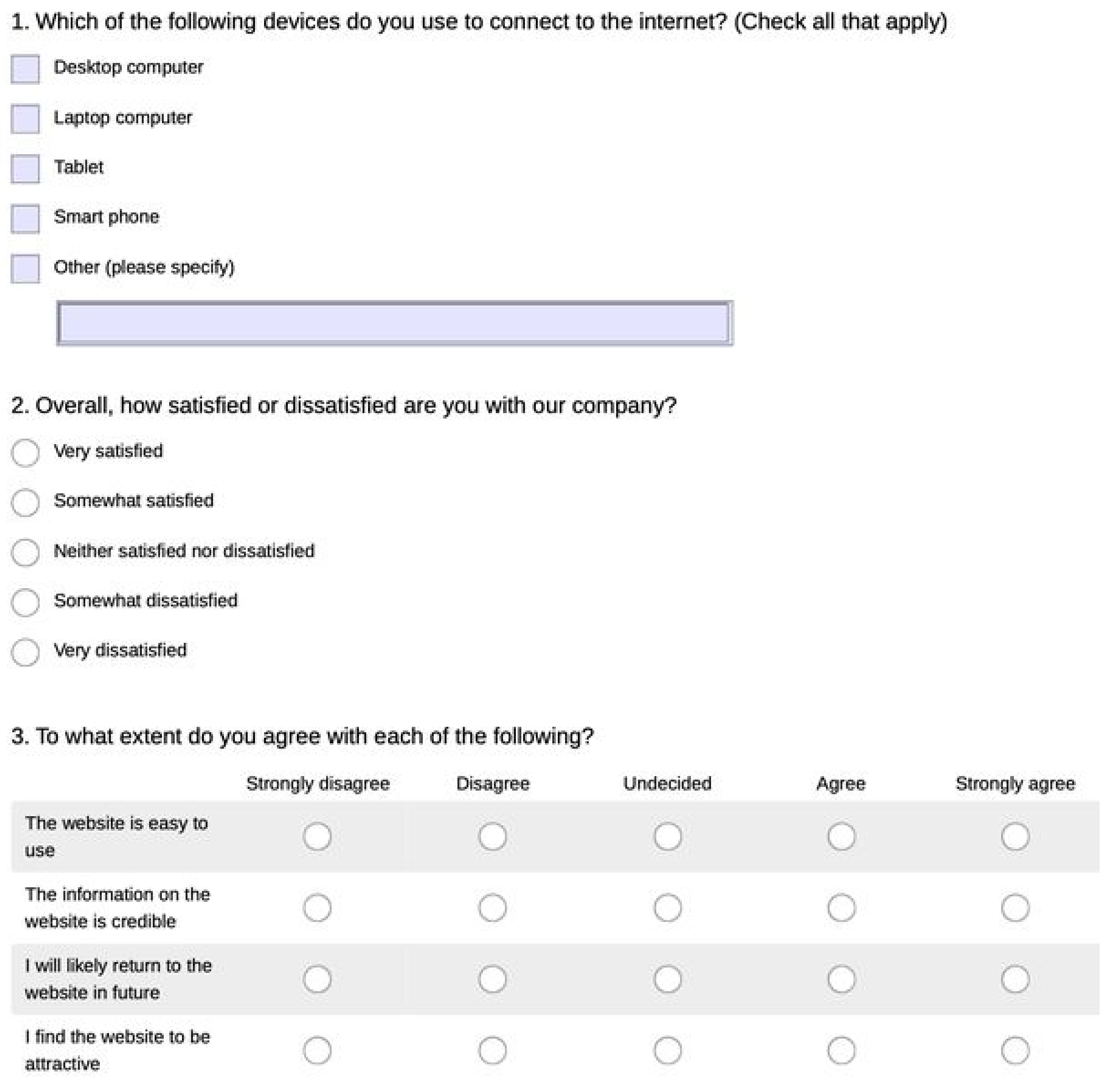
```
#pandas==0.24.2
import pandas as pd
#numpy==1.16.2
import numpy as np
#seaborn==0.9.0
import seaborn as sns
#matplotlib==3.0.3
import matplotlib.pyplot as plt
#set plot style
plt.style.use('bmh')
```

You can see the complete code for all my analysis in this notebook.

Import SurveyMonkey data into Python

Step 1: Export data from SurveyMonkey

I first created an example survey on SurveyMonkey including the aforementioned three types of questions. I also manually created some fake responses in order to demonstrate what the raw data looks like after exporting from SurveyMonkey.



1. Which of the following devices do you use to connect to the internet? (Check all that apply)

- ☐ Desktop computer
- ☐ Laptop computer
- ☐ Tablet
- ☐ Smart phone
- ☐ Other (please specify)

2. Overall, how satisfied or dissatisfied are you with our company?

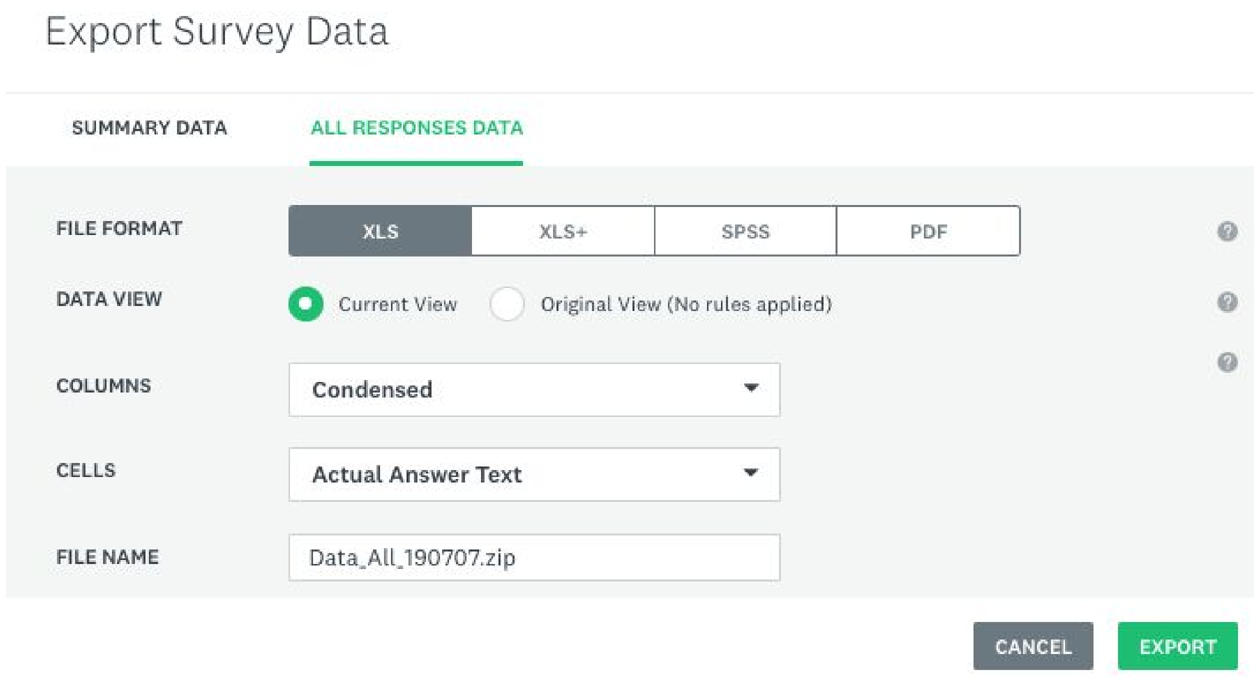
- ○ Very satisfied
- ○ Somewhat satisfied
- ○ Neither satisfied nor dissatisfied
- ○ Somewhat dissatisfied
- ○ Very dissatisfied

3. To what extent do you agree with each of the following?

	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
The website is easy to use	○	○	○	○	○
The information on the website is credible	○	○	○	○	○
I will likely return to the website in future	○	○	○	○	○
I find the website to be attractive	○	○	○	○	○

Creating the above visualization about device usage on SurveyMonkey

You can export data from SurveyMonkey easily by going to the “Analyze results” tab in a survey and then click “Save as”…“All response data”. It is recommended to export the “Actual answer text” so that you do not need to prepare the codebook manually.


Export Survey Data

SUMMARY DATA | ALL RESPONSES DATA

FILE FORMAT: [✓ XLS] XLS+ SPSS PDF

DATA VIEW: [✓ Current View] Original View (No rules applied)

COLUMNS: Condensed

CELLS: Actual Answer Text

FILE NAME: Data_All_190707.zip

The export data dialog on SurveyMonkey

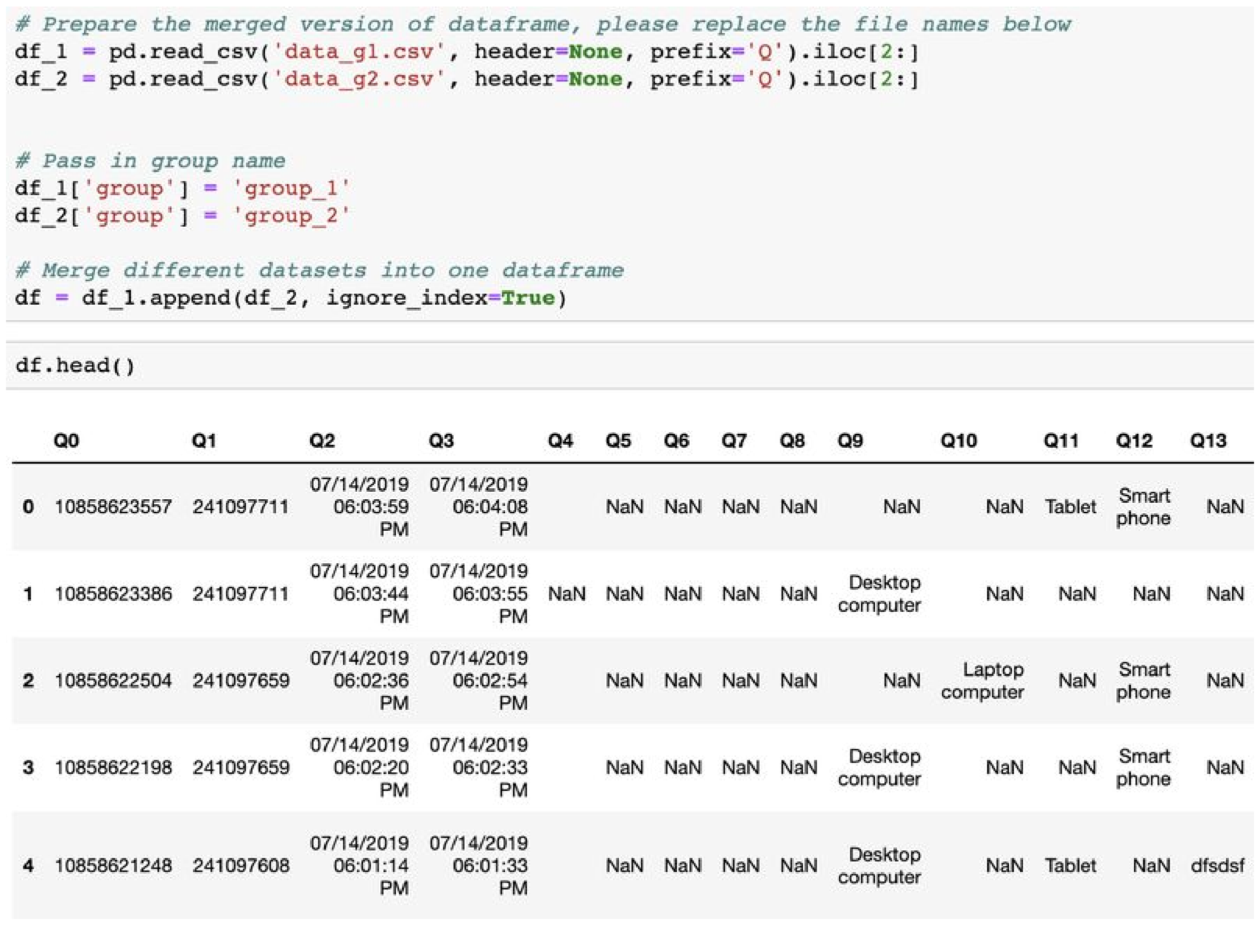
Please export all the survey data that you want to merge later in Python from SurveyMonkey, rename the CSV files inside the zip file, and move them into the working directory.

Step 2: Import SurveyMonkey data into Python

We can use the pandas package to import the data as a dataframe. Please note the data exported from SurveyMonkey actually includes two rows of headers. They can be used as a codebook to better understand the meaning of each column.

As we can see from the screenshot above, the original column names are very complicated. In order to easily refer to each column later in the data analysis process, I decided to replace the header in a dataframe using numerical values with a prefix of "Q".

In the following screenshot, you can see that I imported two datasets from two surveys that share the same question and merged them into one dataframe.



```python
# Prepare the merged version of dataframe, please replace the file names below
df_1 = pd.read_csv('data_g1.csv', header=None, prefix='Q').iloc[2:]
df_2 = pd.read_csv('data_g2.csv', header=None, prefix='Q').iloc[2:]


# Pass in group name
df_1['group'] = 'group_1'
df_2['group'] = 'group_2'

# Merge different datasets into one dataframe
df = df_1.append(df_2, ignore_index=True)
```

```python
df.head()
```

	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
0	10858623557	241097711	07/14/2019 06:03:59 PM	07/14/2019 06:04:08 PM		NaN	NaN	NaN	NaN	NaN	NaN	Tablet	Smart phone	NaN
1	10858623386	241097711	07/14/2019 06:03:44 PM	07/14/2019 06:03:55 PM	NaN	NaN	NaN	NaN	NaN	Desktop computer	NaN	NaN	NaN	NaN
2	10858622504	241097659	07/14/2019 06:02:36 PM	07/14/2019 06:02:54 PM		NaN	NaN	NaN	NaN	NaN	Laptop computer	NaN	Smart phone	NaN
3	10858622198	241097659	07/14/2019 06:02:20 PM	07/14/2019 06:02:33 PM		NaN	NaN	NaN	NaN	Desktop computer	NaN	NaN	Smart phone	NaN
4	10858621248	241097608	07/14/2019 06:01:14 PM	07/14/2019 06:01:33 PM		NaN	NaN	NaN	NaN	Desktop computer	NaN	Tablet	NaN	dfsdsf

The merged data from the two surveys in an iPython notebook

Data visualization by group

In order to demonstrate the use of the following functions, I created more fake data with the Python library Faker.

How to visualize the multi-answer question by group?

Example code:

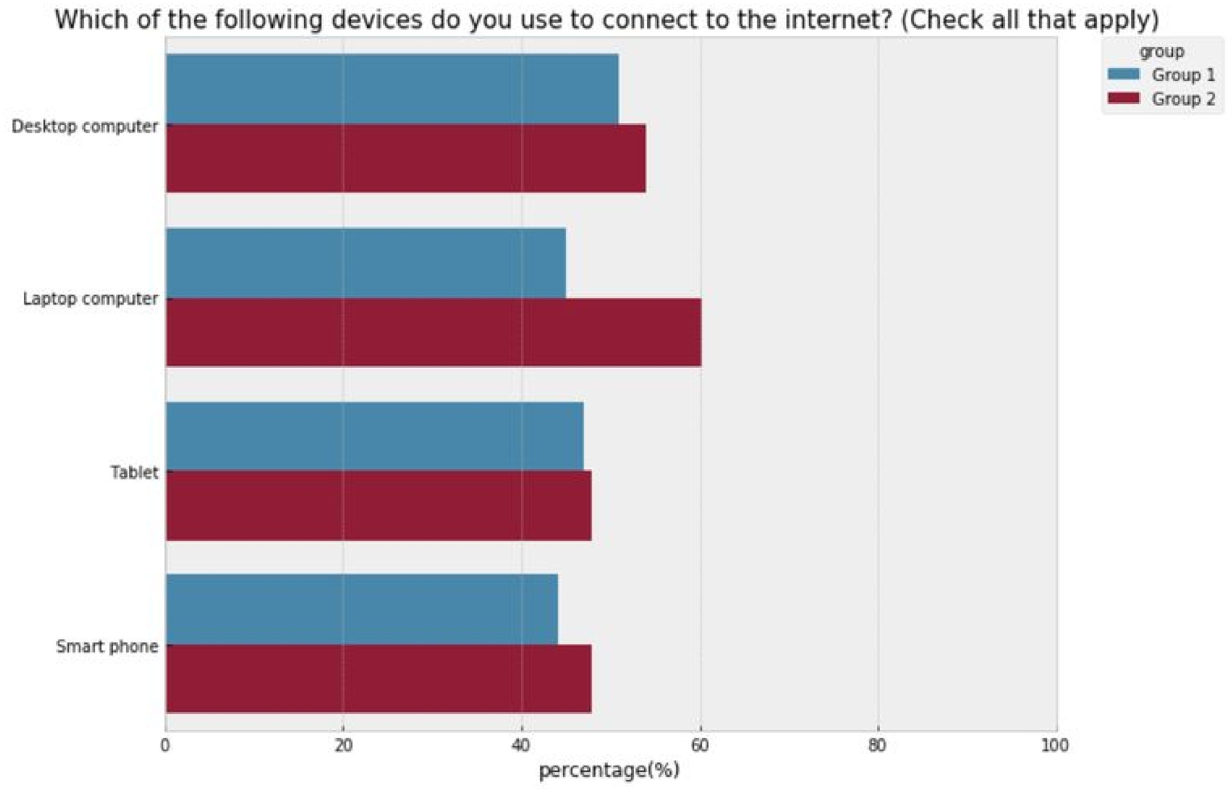
```python
# Prepare the summary table (please clean the data beforehand)
def prepare_table(data, column_range, group_column_name='group'):
    res = []
    col_range_index = list(column_range)
    group_index = data.columns.to_list().index(group_column_name)
    col_range_index.append(group_index)
    series = data.iloc[:, col_range_index].groupby(
      [group_column_name]).count().unstack()

    for group in series.index.levels[1]:
        for var in series.index.levels[0]:
            res.append(
                [
                    (series[var][group] / data.loc[
                      :,group_column_name].value_counts()[group] * 100).round(2),
                    codebook.iloc[int(var[1:]), 1],
                    group,
                ]
            )

    return pd.DataFrame(columns=["percentage(%)", "options",
                                 group_column_name], data=res)

# Generate the checkbox chart based on the summary table
def gen_chart_checkbox(data, column_range, group_column_name='group'):
    listOfGroup = list(data.loc[:,group_column_name].unique())
    listOfGroup.sort()
    table_sum = prepare_table(data, column_range, group_column_name)
    print("Number of answers in each group: ")
    print(data.loc[:,group_column_name].value_counts())

    fig, ax = plt.subplots(figsize=(10, 8))
    ax = sns.barplot(
        x="percentage(%)",
        y="options",
        hue=group_column_name,
        hue_order=listOfGroup,
        data=table_sum,
    )

    ax.set(xlim=(0, 100))
    ax.set_ylabel("")
    plt.title(codebook.iloc[column_range[0], 0], fontsize=15)
    plt.legend(bbox_to_anchor=(1.05, 1), loc=2,
               borderaxespad=0.0, title="group")
    return plt.show()
```

Input:

data: Name of the dataframe column_range: A list of columns for the multi-answer questions group_column_name: The name of the column to identify group in the string format Output:

```
gen_chart_checkbox(df, range(9,13))
```

```
Number of answers in each group:
Group 1    102
Group 2     98
Name: group, dtype: int64
```



The output of the above script: visualizing the grouped result

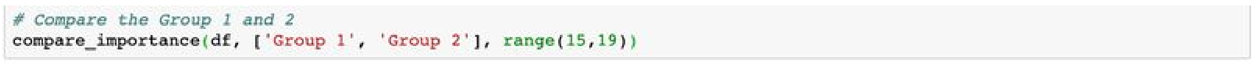
How to visualize the single-answer question by group?

Example code:

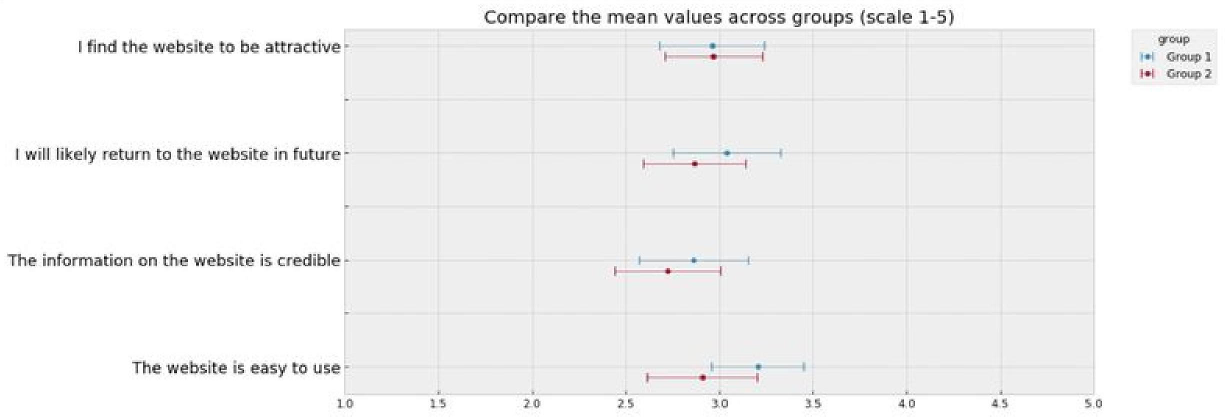
```
# Generate a chart to visualize single-answer questions
def gen_chart_radiobutton(data, question_name, index, group_column_name='group'):
    print("Number of answers in each group: ")
    print(data[[question_name, group_column_name]].
           groupby(group_column_name).count())
    i_counts = (
        data.groupby([group_column_name])[question_name]
        .value_counts(normalize=True)
        .rename("percentage(%)")
        .mul(100)
        .reset_index()
        .round(2)
    )

    listOfGroup = list(data.loc[:,group_column_name].unique())
    listOfGroup.sort()

    fig, ax = plt.subplots(figsize=(10, 8))
    fig = sns.barplot(
        x="percentage(%)",
        y=question_name,
        order=index,
        hue=group_column_name,
        hue_order=listOfGroup,
        data=i_counts,
    )

    plt.title(codebook.iloc[int(question_name[1:]), 0])
    plt.legend(bbox_to_anchor=(1.05, 1), loc=2,
               borderaxespad=0.0, title="group")
    ax.set(xlim=(0, 100))
    ax.set_ylabel("")
    return plt.show()
```

Input:

data: Name of the dataframe question_name: Column name of the question index: a list of the categorical labels in an order that makes the most sense for understanding the chat group_column_name: The name of the column to identify group in the string format Output:



```
# Compare the Group 1 and 2
compare_importance(df, ['Group 1', 'Group 2'], range(15,19))
```



The output of the above script: a bar chart with of the survey results

How to visualize the matrix table by group?

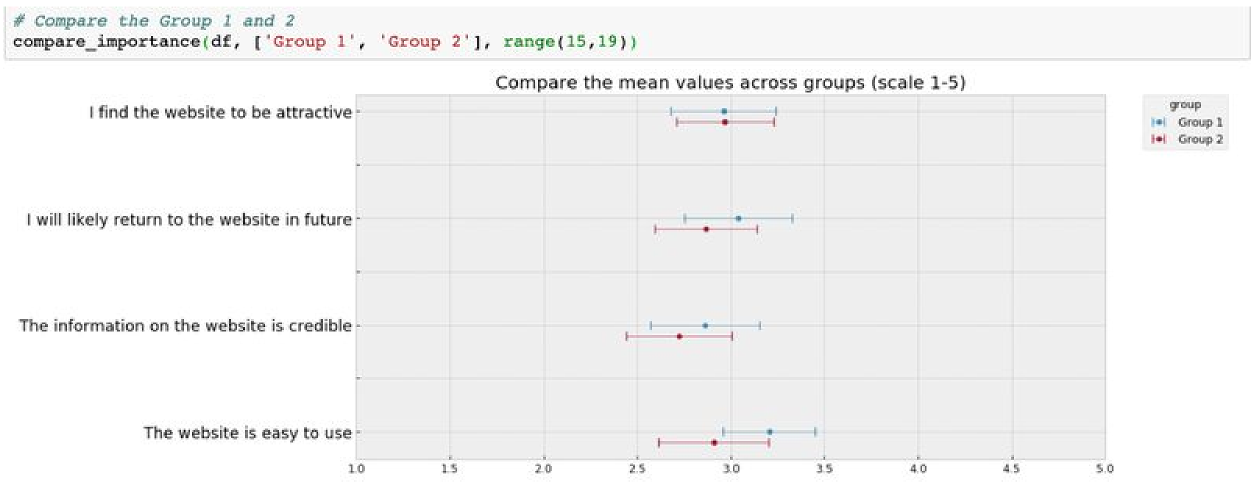
Example code:

```
# Generate summary data for each group
def gen_table(data, group_name, col_range, group_column_name='group'):
    data_sub = data[data[group_column_name] ==
                    group_name].iloc[:, col_range].dropna(how="all")
    for var in data_sub.columns:
        data_sub[var] = data_sub[var].map(
            {
                "Strongly agree": 5,
                "Agree": 4,
                "Undecided": 3,
                "Disagree": 2,
                "Strongly disagree": 1,
            }
        )

    table = data_sub.describe().loc[["mean", "std", "count"]].T
    index = []

    for var in table.index:
        i = int(var[1:])
        index.append(codebook.iloc[i, 1])

    table["item"] = index
    # table["item_n"] = range(len(index),0,-1)
    table["item_n"] = range(0, len(index))
    return table

# Generate a chart to compare the importance of missing features across two groups
def compare_importance(data, groups, col_range, group_column_name='group'):
    group_name_to_describe_data = {}
    #Create a dictionary to save the summary data for each group
    for i, group_name in enumerate(groups):
        group_name_to_describe_data[group_name] = "data_describe_%s" % i

    for group_name in groups:
        table = gen_table(data, group_name, col_range, group_column_name)
        group_name_to_describe_data[group_name] = table
    #Get the item list and index
    items = table.item.tolist()
    item_n = table.item_n.tolist()

    # Visualize the mean value with the 95% confidence interval
    # Change the figsize if you have more yticks
    plt.figure(num=None, figsize=(12, 6), dpi=90, facecolor="w", edgecolor="k")
    ax = plt.axes()

    for i, group_name in enumerate(groups):
        plt.errorbar(
            group_name_to_describe_data[group_name]["mean"].astype(float),
            group_name_to_describe_data[group_name]["item_n"] - 0.1 * i,
            xerr=1.96
            * (
                group_name_to_describe_data[group_name]["std"].astype(float)
                / (group_name_to_describe_data[group_name]["count"] ** 0.5)
            ),
            fmt="o",
            elinewidth=0.5,
            capsize=4,
            marker="o",
            ms=4,
            label=group_name,
        )

    ax.set_xlim(1, 5)
    ax.set_yticks(item_n)
    ax.set_yticklabels(labels=items, fontdict={'fontsize':16})
    plt.legend(bbox_to_anchor=(1.05, 1), loc=2, borderaxespad=0.0, title="group")
    plt.title("Compare the mean values across groups (scale 1-5)", fontsize=16)
    return plt.show()
```

Input:

data: Name of the dataframe groups: Group names of surveys that you are interested in comparing col_range: A list of columns for the matrix question group_column_name: The name of the column to identify group in the string format Note: Here please customize the function score_to_numeric above in order to convert the text labels in the raw data into meaningful numbers that you can interpret.

Output:



```
# Compare the Group 1 and 2
compare_importance(df, ['Group 1', 'Group 2'], range(15,19))
```

The final matrix table visualization

After all, it helps to have flexible tools at hand for cases where manual work is tedious or simply would take too much time. We have seen that working with survey data using Python is quite simple and powerful. That’s why it powers a big part of trivago’s data processing pipelines. If you’re interested in automating processes with code, you might want to have a look at our Python job offers here.

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Ruoyun Lin Ruoyun is a junior data scientist at trivago, who researched the psychological effects of social media usage during her PhD. She loves to deliver pragmatic suggestions to business and help people live a happier life.