

idegmjm7p

May 3, 2024

```
[63]: import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
```

```
[64]: DATA= pd.read_csv('app_reviews.csv')
```

```
[65]: DATA.head(5)
```

```
[65]:      name      userName \
0  WhiteHatJr  All in one Captions
1  WhiteHatJr      githin george
2  WhiteHatJr  Anita Choudhury
3  WhiteHatJr      Snehil gupta
4  WhiteHatJr  UTKALIKA PRUSTI

      content  score  thumbsUpCount \
0  I was very unhappy with this app because I can...      1      1234
1  Come on! Man it's not normal for kids to devel...      1      213
2  This app is good for coding but I think this o...      1      156
3  This app is good for coding but I think this o...      1       82
4  It is good app . But it's app use only who has...      1     150

      reviewCreatedVersion      at \
0      1.5.1  2020-09-18 09:21:07
1      1.5.2  2020-09-30 14:34:38
2      1.5.1  2020-09-17 17:50:57
3      1.5.2  2020-10-09 21:10:06
4      1.5.1  2020-09-21 05:27:50

      replyContent      repliedAt \
0  Hi! Thank you for reviewing. Kindly note that ...  2020-09-18 11:58:46
1  Hi, Thank you for reviewing and sharing your p...  2020-09-30 16:01:39
2  Hi! We apologize for the inconvenience. We wou...  2020-09-17 17:59:10
3  Hi, Thank you for reviewing. Please be apprise...  2020-10-10 10:35:40
```

4 Hi! Thank you for reviewing. Kindly note that ... 2020-09-21 10:46:15

	sortOrder	appId
0	most_relevant	com.whitehatjr
1	most_relevant	com.whitehatjr
2	most_relevant	com.whitehatjr
3	most_relevant	com.whitehatjr
4	most_relevant	com.whitehatjr

```
[66]: for col in DATA.columns:
      print(col)
```

```
name
userName
content
score
thumbsUpCount
reviewCreatedVersion
at
replyContent
repliedAt
sortOrder
appId
```

```
[67]: # Then, replace NaN values in thumbsUpCount with a default value (e.g., -1)
DATA['thumbsUpCount'].fillna(-1, inplace=True)

bins = [0, 10, 20, 30, 40, 50, 100, 500, 1000, 1234]
labels = ['0-10', '11-20', '21-30', '31-40', '41-50', '51-100', '101-500',
↪ '501-1000', '1001-1234']
DATA['thumbsUpCategory'] = pd.cut(DATA['thumbsUpCount'], bins=bins,
↪ labels=labels, right=False)

print(DATA)
```

	name	userName \
0	WhiteHatJr	All in one Captions
1	WhiteHatJr	githin george
2	WhiteHatJr	Anita Choudhury
3	WhiteHatJr	Snehil gupta
4	WhiteHatJr	UTKALIKA PRUSTI
...
13109	TestBook	vivek anand Mishra
13110	TestBook	Raushan singh Rathod
13111	TestBook	IPL 2020 live
13112	TestBook	Saurabh Rathod
13113	TestBook	Daanish King

	content	score \
0	I was very unhappy with this app because I can...	1
1	Come on! Man it's not normal for kids to devel...	1
2	This app is good for coding but I think this o...	1
3	This app is good for coding but I think this o...	1
4	It is good app . But it's app use only who has...	1
...
13109	Good app.	5
13110	Good	5
13111	This is awesome app for ssc all exams because ...	5
13112	It is very useful for practicing	5
13113	Best I love this	5

	thumbsUpCount	reviewCreatedVersion	at \
0	1234	1.5.1	2020-09-18 09:21:07
1	213	1.5.2	2020-09-30 14:34:38
2	156	1.5.1	2020-09-17 17:50:57
3	82	1.5.2	2020-10-09 21:10:06
4	150	1.5.1	2020-09-21 05:27:50
...
13109	0	5.21.3	2020-10-09 13:51:08
13110	0	NaN	2020-10-09 13:45:22
13111	0	5.21.3	2020-10-09 12:46:16
13112	0	5.21.3	2020-10-09 12:15:46
13113	0	NaN	2020-10-09 12:09:14

	replyContent	repliedAt \
0	Hi! Thank you for reviewing. Kindly note that ...	2020-09-18 11:58:46
1	Hi, Thank you for reviewing and sharing your p...	2020-09-30 16:01:39
2	Hi! We apologize for the inconvenience. We wou...	2020-09-17 17:59:10
3	Hi, Thank you for reviewing. Please be apprise...	2020-10-10 10:35:40
4	Hi! Thank you for reviewing. Kindly note that ...	2020-09-21 10:46:15
...
13109	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:53
13110	Hello, Thanks for your kind words and review. ...	2020-10-11 06:52:52
13111	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:47
13112	Hello, Thanks for your kind words and review. ...	2020-10-11 06:52:48
13113	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:42

	sortOrder	appId	thumbsUpCategory
0	most_relevant	com.whitehatjr	NaN
1	most_relevant	com.whitehatjr	101-500
2	most_relevant	com.whitehatjr	101-500
3	most_relevant	com.whitehatjr	51-100
4	most_relevant	com.whitehatjr	101-500
...
13109	newest	com.testbook.tbapp	0-10

13110	newest	com.testbook.tbapp	0-10
13111	newest	com.testbook.tbapp	0-10
13112	newest	com.testbook.tbapp	0-10
13113	newest	com.testbook.tbapp	0-10

[13114 rows x 12 columns]

[68]: `print(DATA)`

	name	userName	\
0	WhiteHatJr	All in one Captions	
1	WhiteHatJr	githin george	
2	WhiteHatJr	Anita Choudhury	
3	WhiteHatJr	Snehil gupta	
4	WhiteHatJr	UTKALIKA PRUSTI	
...	
13109	TestBook	vivek anand Mishra	
13110	TestBook	Raushan singh Rathod	
13111	TestBook	IPL 2020 live	
13112	TestBook	Saurabh Rathod	
13113	TestBook	Daanish King	

	content	score	\
0	I was very unhappy with this app because I can...	1	
1	Come on! Man it's not normal for kids to devel...	1	
2	This app is good for coding but I think this o...	1	
3	This app is good for coding but I think this o...	1	
4	It is good app . But it's app use only who has...	1	
...	
13109	Good app.	5	
13110	Good	5	
13111	This is awesome app for ssc all exams because ...	5	
13112	It is very useful for practicing	5	
13113	Best I love this	5	

	thumbsUpCount	reviewCreatedVersion	at	\
0	1234	1.5.1	2020-09-18 09:21:07	
1	213	1.5.2	2020-09-30 14:34:38	
2	156	1.5.1	2020-09-17 17:50:57	
3	82	1.5.2	2020-10-09 21:10:06	
4	150	1.5.1	2020-09-21 05:27:50	
...	
13109	0	5.21.3	2020-10-09 13:51:08	
13110	0	NaN	2020-10-09 13:45:22	
13111	0	5.21.3	2020-10-09 12:46:16	
13112	0	5.21.3	2020-10-09 12:15:46	
13113	0	NaN	2020-10-09 12:09:14	

		replyContent	repliedAt \
0	Hi! Thank you for reviewing. Kindly note that ...		2020-09-18 11:58:46
1	Hi, Thank you for reviewing and sharing your p...		2020-09-30 16:01:39
2	Hi! We apologize for the inconvenience. We wou...		2020-09-17 17:59:10
3	Hi, Thank you for reviewing. Please be apprise...		2020-10-10 10:35:40
4	Hi! Thank you for reviewing. Kindly note that ...		2020-09-21 10:46:15
...			
13109	Hello, Thanks for your review. We are glad tha...		2020-10-11 06:52:53
13110	Hello, Thanks for your kind words and review. ...		2020-10-11 06:52:52
13111	Hello, Thanks for your review. We are glad tha...		2020-10-11 06:52:47
13112	Hello, Thanks for your kind words and review. ...		2020-10-11 06:52:48
13113	Hello, Thanks for your review. We are glad tha...		2020-10-11 06:52:42

	sortOrder	appId	thumbsUpCategory
0	most_relevant	com.whitehatjr	NaN
1	most_relevant	com.whitehatjr	101-500
2	most_relevant	com.whitehatjr	101-500
3	most_relevant	com.whitehatjr	51-100
4	most_relevant	com.whitehatjr	101-500
...
13109	newest	com.testbook.tbapp	0-10
13110	newest	com.testbook.tbapp	0-10
13111	newest	com.testbook.tbapp	0-10
13112	newest	com.testbook.tbapp	0-10
13113	newest	com.testbook.tbapp	0-10

[13114 rows x 12 columns]

```
[69]: DATA = DATA.drop(columns=['thumbsUpCount'])
DATA.tail(5)
```

```
[69]:
```

	name	userName \
13109	TestBook	vivek anand Mishra
13110	TestBook	Raushan singh Rathod
13111	TestBook	IPL 2020 live
13112	TestBook	Saurabh Rathod
13113	TestBook	Daanish King

	content	score \
13109	Good app.	5
13110	Good	5
13111	This is awesome app for ssc all exams because ...	5
13112	It is very useful for practicing	5
13113	Best I love this	5

	reviewCreatedVersion	at \
13109	5.21.3	2020-10-09 13:51:08

```

13110          NaN  2020-10-09 13:45:22
13111          5.21.3  2020-10-09 12:46:16
13112          5.21.3  2020-10-09 12:15:46
13113          NaN  2020-10-09 12:09:14

```

```

                                replyContent      repliedAt  \
13109  Hello, Thanks for your review. We are glad tha...  2020-10-11 06:52:53
13110  Hello, Thanks for your kind words and review. ...  2020-10-11 06:52:52
13111  Hello, Thanks for your review. We are glad tha...  2020-10-11 06:52:47
13112  Hello, Thanks for your kind words and review. ...  2020-10-11 06:52:48
13113  Hello, Thanks for your review. We are glad tha...  2020-10-11 06:52:42

```

```

            sortOrder      appId thumbsUpCategory
13109      newest  com.testbook.tbapp          0-10
13110      newest  com.testbook.tbapp          0-10
13111      newest  com.testbook.tbapp          0-10
13112      newest  com.testbook.tbapp          0-10
13113      newest  com.testbook.tbapp          0-10

```

```
[70]: DATA=DATA.reset_index()
```

```
[71]: DATA
```

```

[71]:      index      name      userName  \
0         0  WhiteHatJr  All in one Captions
1         1  WhiteHatJr      githin george
2         2  WhiteHatJr  Anita Choudhury
3         3  WhiteHatJr      Snehil gupta
4         4  WhiteHatJr  UTKALIKA PRUSTI
...      ...      ...      ...
13109  13109   TestBook  vivek anand Mishra
13110  13110   TestBook  Raushan singh Rathod
13111  13111   TestBook      IPL 2020 live
13112  13112   TestBook  Saurabh Rathod
13113  13113   TestBook  Daanish King

```

```

                                content  score  \
0      I was very unhappy with this app because I can...      1
1      Come on! Man it's not normal for kids to devel...      1
2      This app is good for coding but I think this o...      1
3      This app is good for coding but I think this o...      1
4      It is good app . But it's app use only who has...      1
...      ...      ...      ...
13109                                Good app.      5
13110                                Good      5
13111  This is awesome app for ssc all exams because ...      5
13112                                It is very useful for practicing      5

```

13113 Best I love this 5

	reviewCreatedVersion	at \
0	1.5.1	2020-09-18 09:21:07
1	1.5.2	2020-09-30 14:34:38
2	1.5.1	2020-09-17 17:50:57
3	1.5.2	2020-10-09 21:10:06
4	1.5.1	2020-09-21 05:27:50
...
13109	5.21.3	2020-10-09 13:51:08
13110	NaN	2020-10-09 13:45:22
13111	5.21.3	2020-10-09 12:46:16
13112	5.21.3	2020-10-09 12:15:46
13113	NaN	2020-10-09 12:09:14

	replyContent	repliedAt \
0	Hi! Thank you for reviewing. Kindly note that ...	2020-09-18 11:58:46
1	Hi, Thank you for reviewing and sharing your p...	2020-09-30 16:01:39
2	Hi! We apologize for the inconvenience. We wou...	2020-09-17 17:59:10
3	Hi, Thank you for reviewing. Please be apprise...	2020-10-10 10:35:40
4	Hi! Thank you for reviewing. Kindly note that ...	2020-09-21 10:46:15
...
13109	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:53
13110	Hello, Thanks for your kind words and review. ...	2020-10-11 06:52:52
13111	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:47
13112	Hello, Thanks for your kind words and review. ...	2020-10-11 06:52:48
13113	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:42

	sortOrder	appId	thumbsUpCategory
0	most_relevant	com.whitehatjr	NaN
1	most_relevant	com.whitehatjr	101-500
2	most_relevant	com.whitehatjr	101-500
3	most_relevant	com.whitehatjr	51-100
4	most_relevant	com.whitehatjr	101-500
...
13109	newest	com.testbook.tbapp	0-10
13110	newest	com.testbook.tbapp	0-10
13111	newest	com.testbook.tbapp	0-10
13112	newest	com.testbook.tbapp	0-10
13113	newest	com.testbook.tbapp	0-10

[13114 rows x 12 columns]

```
[72]: DATA['reviewCreatedVersion'].fillna("Unknown", inplace=True)

print(DATA)
```

	index	name	userName \
0	0	WhiteHatJr	All in one Captions
1	1	WhiteHatJr	githin george
2	2	WhiteHatJr	Anita Choudhury
3	3	WhiteHatJr	Snehil gupta
4	4	WhiteHatJr	UTKALIKA PRUSTI
...
13109	13109	TestBook	vivek anand Mishra
13110	13110	TestBook	Raushan singh Rathod
13111	13111	TestBook	IPL 2020 live
13112	13112	TestBook	Saurabh Rathod
13113	13113	TestBook	Daanish King

	content	score \
0	I was very unhappy with this app because I can...	1
1	Come on! Man it's not normal for kids to devel...	1
2	This app is good for coding but I think this o...	1
3	This app is good for coding but I think this o...	1
4	It is good app . But it's app use only who has...	1
...
13109	Good app.	5
13110	Good	5
13111	This is awesome app for ssc all exams because ...	5
13112	It is very useful for practicing	5
13113	Best I love this	5

	reviewCreatedVersion	at \
0	1.5.1	2020-09-18 09:21:07
1	1.5.2	2020-09-30 14:34:38
2	1.5.1	2020-09-17 17:50:57
3	1.5.2	2020-10-09 21:10:06
4	1.5.1	2020-09-21 05:27:50
...
13109	5.21.3	2020-10-09 13:51:08
13110	Unknown	2020-10-09 13:45:22
13111	5.21.3	2020-10-09 12:46:16
13112	5.21.3	2020-10-09 12:15:46
13113	Unknown	2020-10-09 12:09:14

	replyContent	repliedAt \
0	Hi! Thank you for reviewing. Kindly note that ...	2020-09-18 11:58:46
1	Hi, Thank you for reviewing and sharing your p...	2020-09-30 16:01:39
2	Hi! We apologize for the inconvenience. We wou...	2020-09-17 17:59:10
3	Hi, Thank you for reviewing. Please be apprise...	2020-10-10 10:35:40
4	Hi! Thank you for reviewing. Kindly note that ...	2020-09-21 10:46:15
...
13109	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:53
13110	Hello, Thanks for your kind words and review. ...	2020-10-11 06:52:52


```

13111 Hello, Thanks for your review. We are glad tha... 2020-10-11 06:52:47
13112 Hello, Thanks for your kind words and review. ... 2020-10-11 06:52:48
13113 Hello, Thanks for your review. We are glad tha... 2020-10-11 06:52:42

```

```

      sortOrder      appId thumbsUpCategory
0  most_relevant  com.whitehatjr      NaN
1  most_relevant  com.whitehatjr    101-500
2  most_relevant  com.whitehatjr    101-500
3  most_relevant  com.whitehatjr     51-100
4  most_relevant  com.whitehatjr    101-500
...
13109      newest  com.testbook.tbapp      0-10
13110      newest  com.testbook.tbapp      0-10
13111      newest  com.testbook.tbapp      0-10
13112      newest  com.testbook.tbapp      0-10
13113      newest  com.testbook.tbapp      0-10

```

[13114 rows x 12 columns]

[73]: DATA

```

[73]:      index      name      userName \
0         0  WhiteHatJr  All in one Captions
1         1  WhiteHatJr      githin george
2         2  WhiteHatJr  Anita Choudhury
3         3  WhiteHatJr      Snehil gupta
4         4  WhiteHatJr  UTKALIKA PRUSTI
...
13109  13109    TestBook  vivek anand Mishra
13110  13110    TestBook  Raushan singh Rathod
13111  13111    TestBook      IPL 2020 live
13112  13112    TestBook  Saurabh Rathod
13113  13113    TestBook  Daanish King

```

```

      content  score \
0  I was very unhappy with this app because I can...      1
1  Come on! Man it's not normal for kids to devel...      1
2  This app is good for coding but I think this o...      1
3  This app is good for coding but I think this o...      1
4  It is good app . But it's app use only who has...      1
...
13109      Good app.      5
13110      Good      5
13111  This is awesome app for ssc all exams because ...      5
13112      It is very useful for practicing      5
13113      Best I love this      5

```

	reviewCreatedVersion	at	\
0	1.5.1	2020-09-18 09:21:07	
1	1.5.2	2020-09-30 14:34:38	
2	1.5.1	2020-09-17 17:50:57	
3	1.5.2	2020-10-09 21:10:06	
4	1.5.1	2020-09-21 05:27:50	
...	
13109	5.21.3	2020-10-09 13:51:08	
13110	Unknown	2020-10-09 13:45:22	
13111	5.21.3	2020-10-09 12:46:16	
13112	5.21.3	2020-10-09 12:15:46	
13113	Unknown	2020-10-09 12:09:14	

	replyContent	repliedAt	\
0	Hi! Thank you for reviewing. Kindly note that ...	2020-09-18 11:58:46	
1	Hi, Thank you for reviewing and sharing your p...	2020-09-30 16:01:39	
2	Hi! We apologize for the inconvenience. We wou...	2020-09-17 17:59:10	
3	Hi, Thank you for reviewing. Please be apprise...	2020-10-10 10:35:40	
4	Hi! Thank you for reviewing. Kindly note that ...	2020-09-21 10:46:15	
...	
13109	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:53	
13110	Hello, Thanks for your kind words and review. ...	2020-10-11 06:52:52	
13111	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:47	
13112	Hello, Thanks for your kind words and review. ...	2020-10-11 06:52:48	
13113	Hello, Thanks for your review. We are glad tha...	2020-10-11 06:52:42	

	sortOrder	appId	thumbsUpCategory
0	most_relevant	com.whitehatjr	NaN
1	most_relevant	com.whitehatjr	101-500
2	most_relevant	com.whitehatjr	101-500
3	most_relevant	com.whitehatjr	51-100
4	most_relevant	com.whitehatjr	101-500
...
13109	newest	com.testbook.tbapp	0-10
13110	newest	com.testbook.tbapp	0-10
13111	newest	com.testbook.tbapp	0-10
13112	newest	com.testbook.tbapp	0-10
13113	newest	com.testbook.tbapp	0-10

[13114 rows x 12 columns]

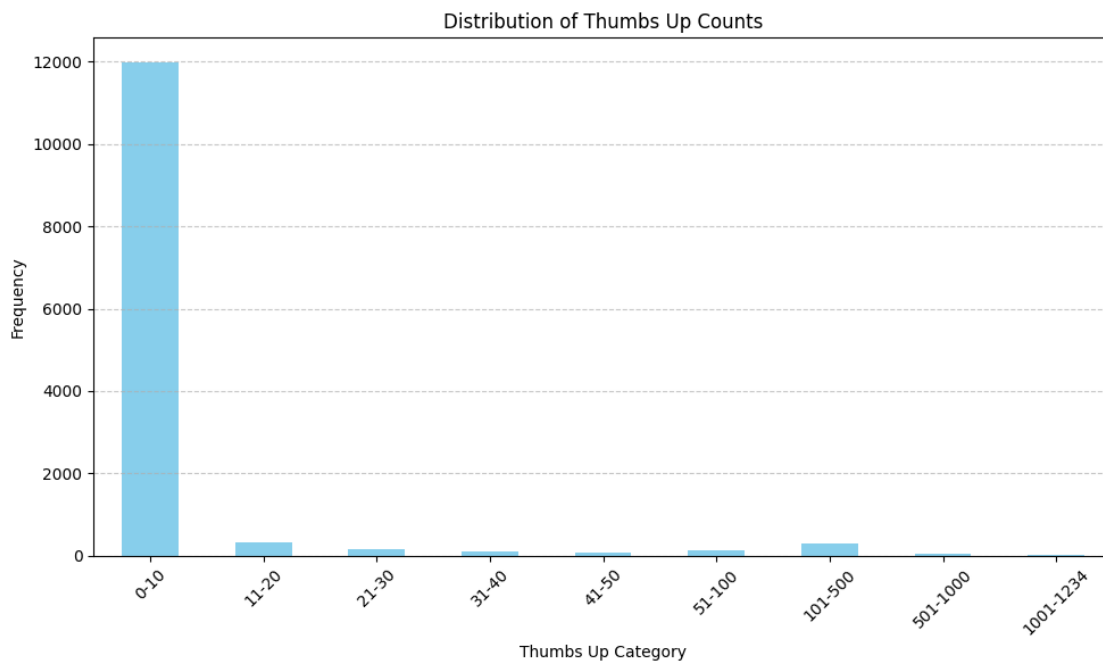
```
[74]: for col in DATA.columns:
      print(col)
```

```
index
name
userName
```

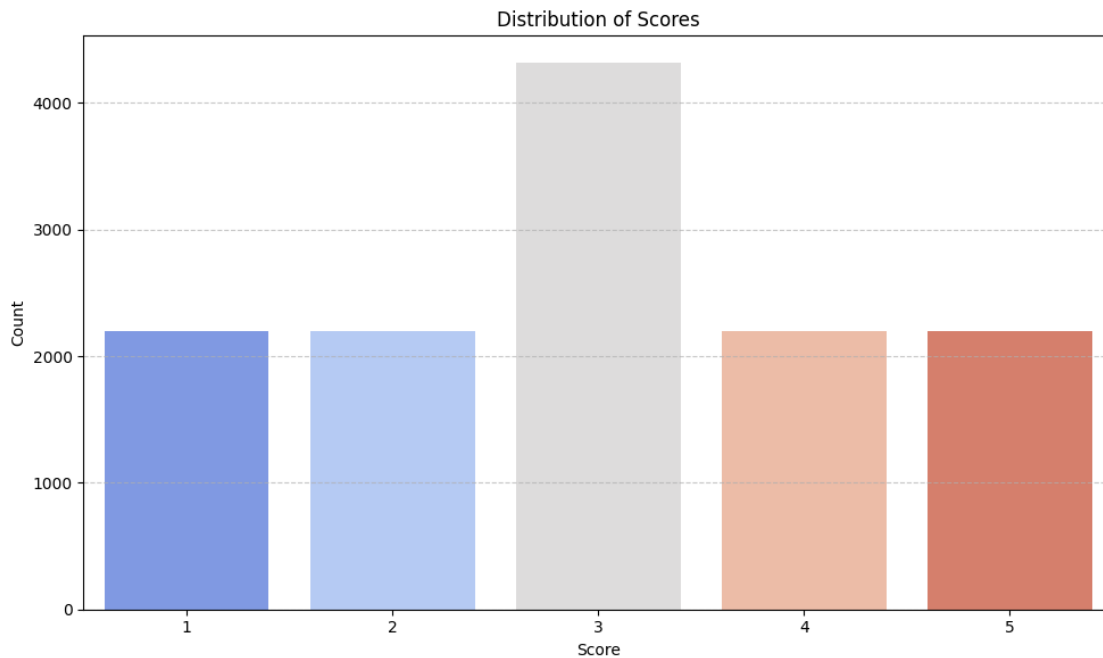
```
content
score
reviewCreatedVersion
at
replyContent
repliedAt
sortOrder
appId
thumbsUpCategory
```

```
[75]: # Assuming DATA is your DataFrame with 'thumbsUpCategory' column
# Count the frequency of each category
category_counts = DATA['thumbsUpCategory'].value_counts().sort_index()

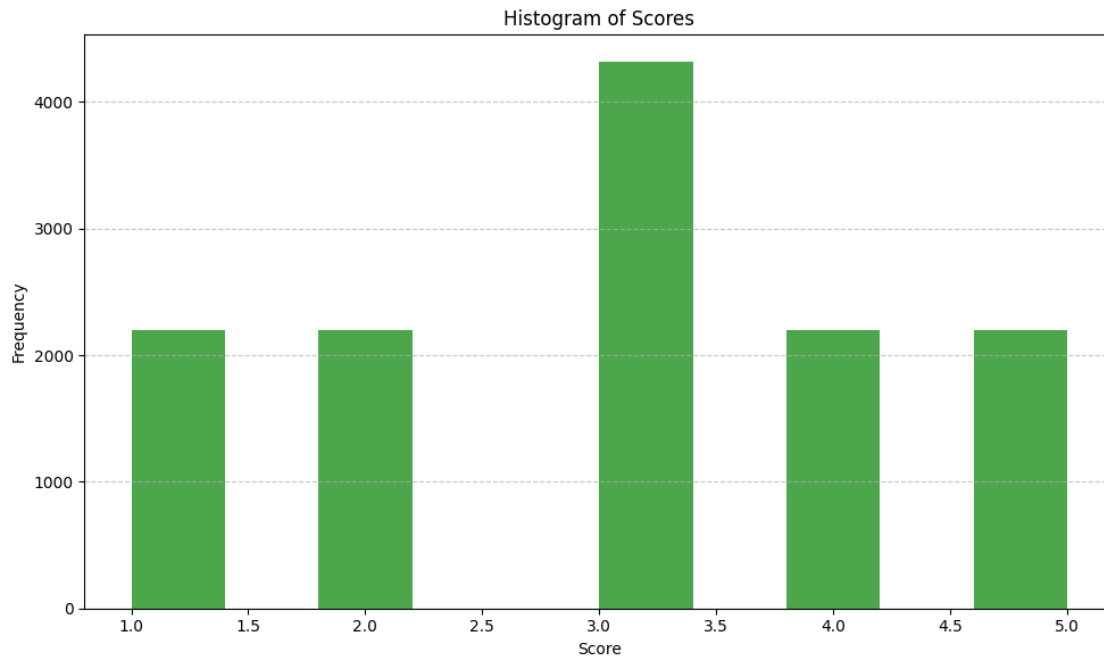
# Plotting
plt.figure(figsize=(10, 6))
category_counts.plot(kind='bar', color='skyblue')
plt.title('Distribution of Thumbs Up Counts')
plt.xlabel('Thumbs Up Category')
plt.ylabel('Frequency')
plt.xticks(rotation=45)
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.tight_layout()
plt.show()
```



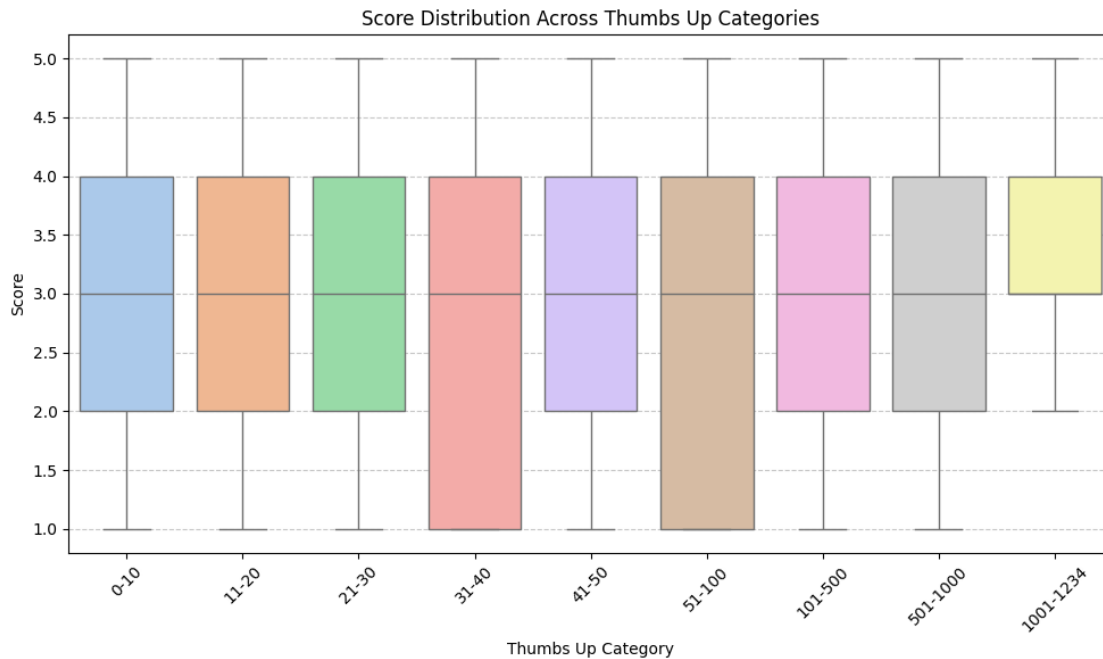
```
[78]: plt.figure(figsize=(10, 6))
sns.countplot(data=DATA, x='score', palette='coolwarm')
plt.title('Distribution of Scores')
plt.xlabel('Score')
plt.ylabel('Count')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.tight_layout()
plt.show()
```



```
[79]: plt.figure(figsize=(10, 6))
plt.hist(DATA['score'], bins=10, color='green', alpha=0.7)
plt.title('Histogram of Scores')
plt.xlabel('Score')
plt.ylabel('Frequency')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.tight_layout()
plt.show()
```



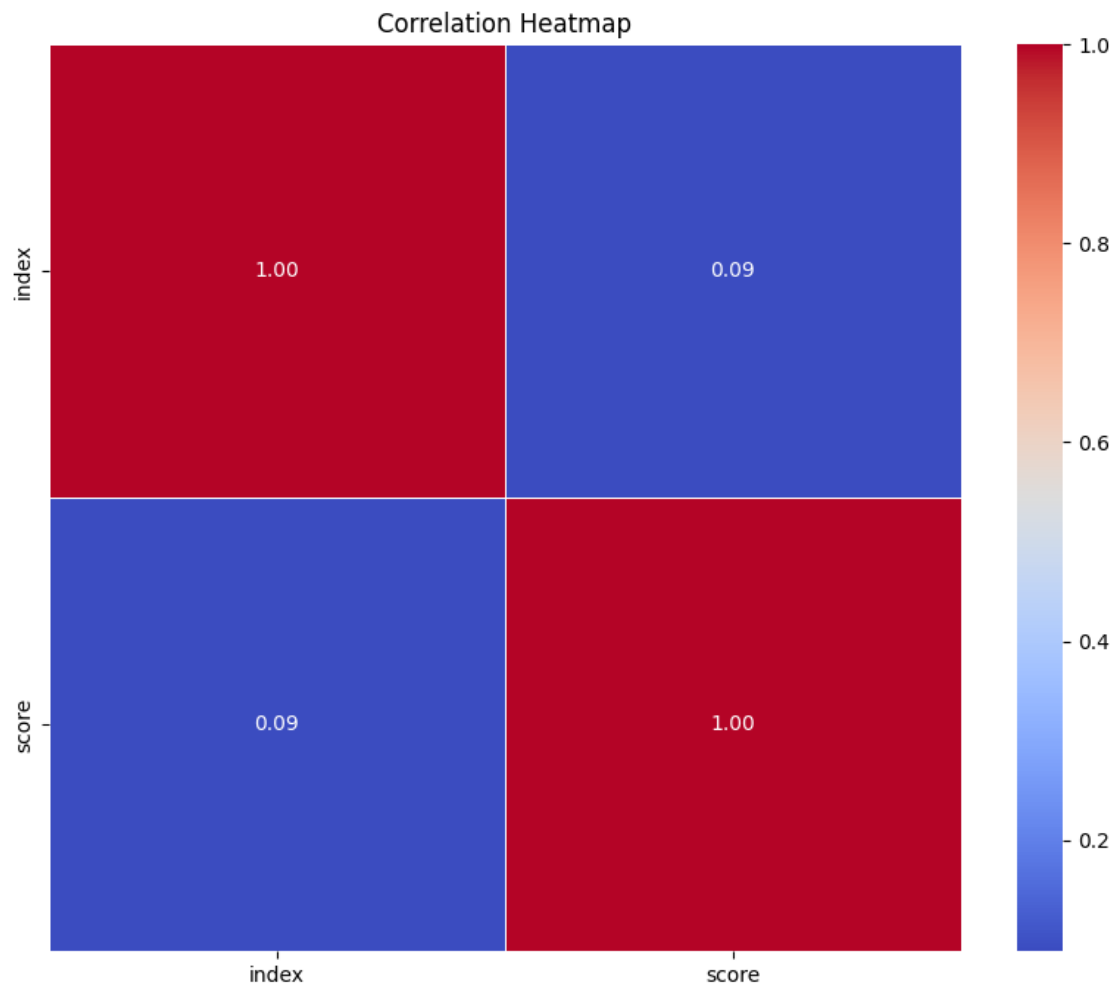
```
[80]: plt.figure(figsize=(10, 6))
sns.boxplot(data=DATA, x='thumbsUpCategory', y='score', palette='pastel')
plt.title('Score Distribution Across Thumbs Up Categories')
plt.xlabel('Thumbs Up Category')
plt.ylabel('Score')
plt.xticks(rotation=45)
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.tight_layout()
plt.show()
```



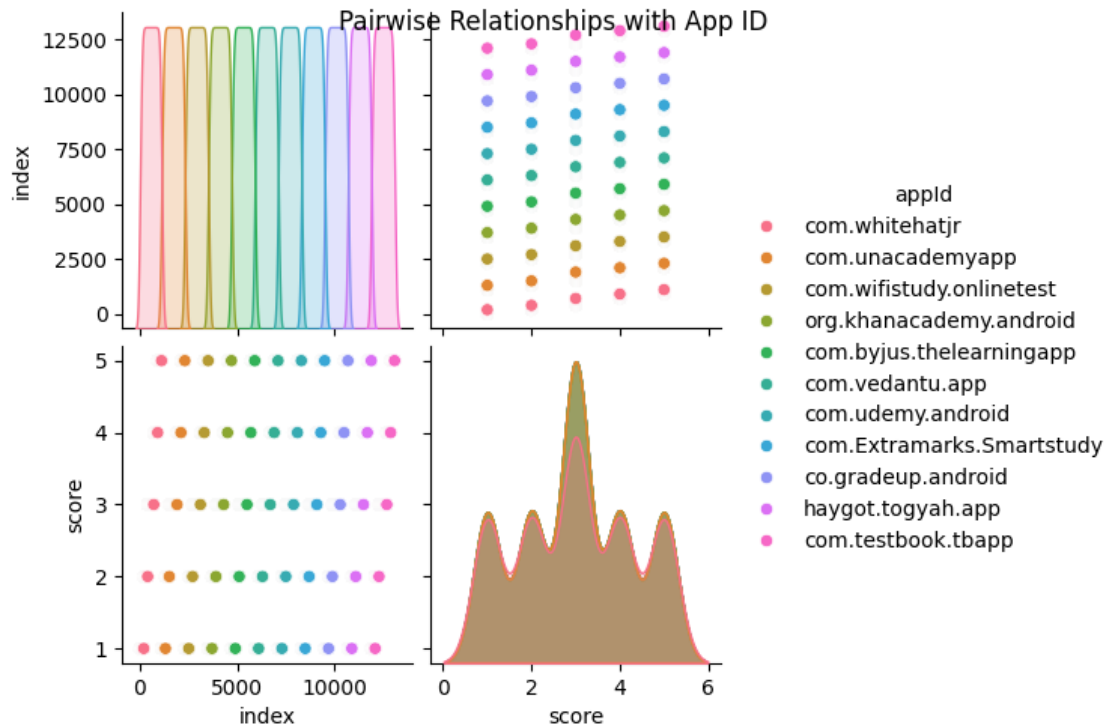
```
[82]: # Select only numeric columns
numeric_columns = DATA.select_dtypes(include=['number'])

# Compute the correlation matrix
correlation_matrix = numeric_columns.corr()

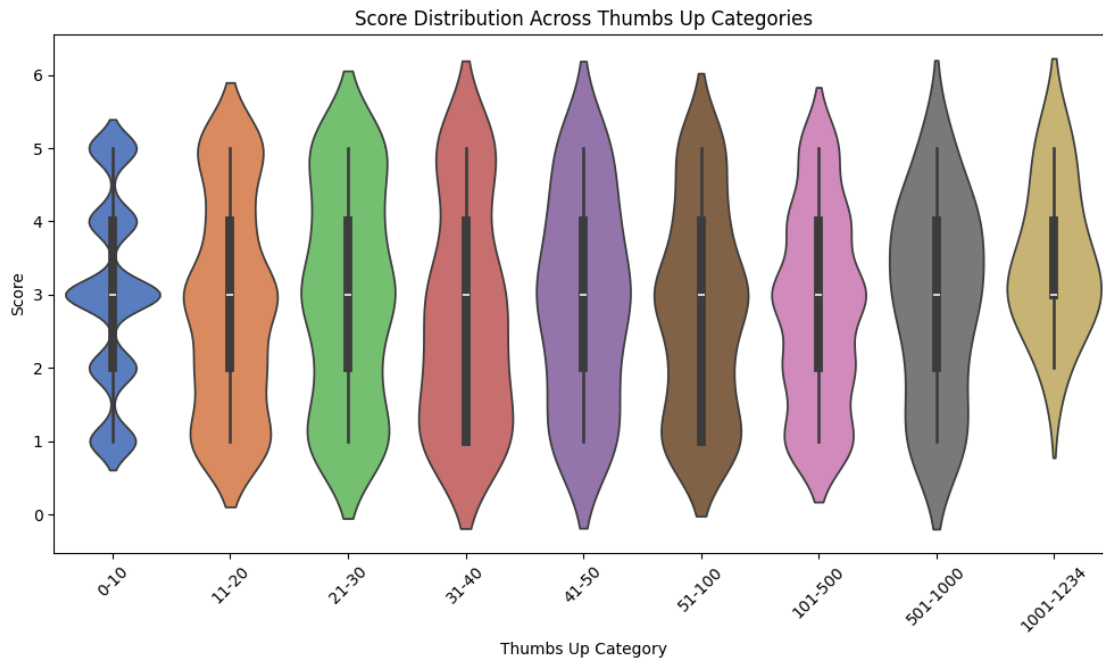
# Plot the correlation heatmap
plt.figure(figsize=(10, 8))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', fmt='.2f',
            linewidths=0.5)
plt.title('Correlation Heatmap')
plt.show()
```



```
[86]: sns.pairplot(DATA, hue='appId', diag_kind='kde', height=2.5)  
plt.suptitle('Pairwise Relationships with App ID')  
plt.show()
```



```
[88]: plt.figure(figsize=(10, 6))
sns.violinplot(data=DATA, x='thumbsUpCategory', y='score', palette='muted')
plt.title('Score Distribution Across Thumbs Up Categories')
plt.xlabel('Thumbs Up Category')
plt.ylabel('Score')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

```
[90]: from wordcloud import WordCloud

# Generate word cloud
wordcloud = WordCloud(width=800, height=400, background_color='white').
    generate(DATA['content'].iloc[0])

# Display the word cloud
plt.figure(figsize=(10, 6))
plt.imshow(wordcloud, interpolation='bilinear')
plt.title('Word Cloud for Content')
plt.axis('off')
plt.show()
```

Word Cloud for Content



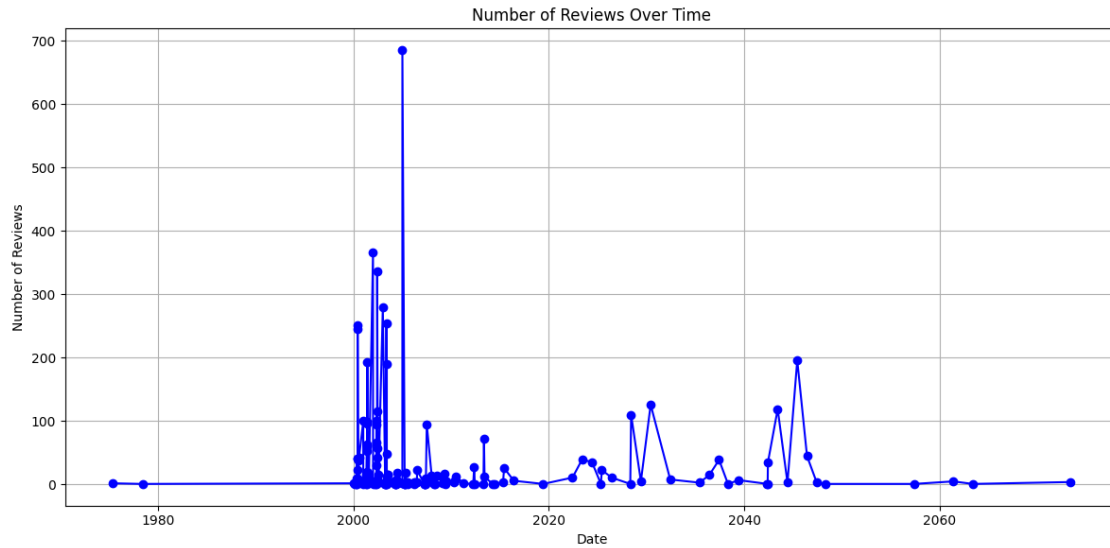
```
[95]: # Convert 'reviewCreatedVersion' to datetime format
DATA['reviewCreatedVersion'] = pd.to_datetime(DATA['reviewCreatedVersion'],
errors='coerce')

# Drop rows with NaT values (invalid dates)
DATA = DATA.dropna(subset=['reviewCreatedVersion'])

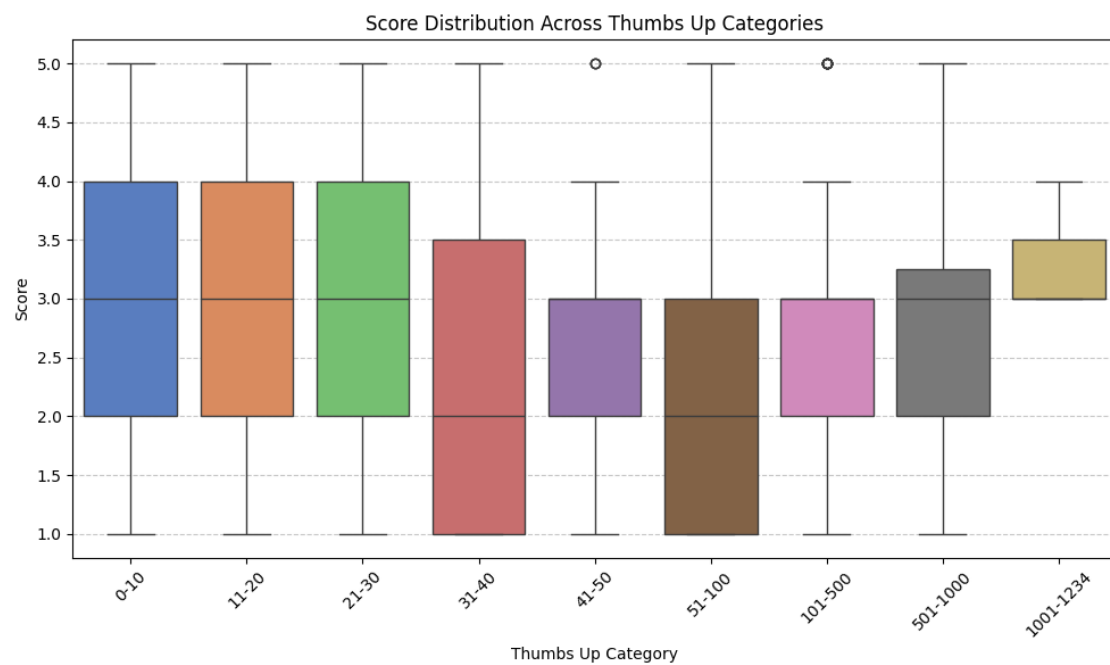
# Extract date from 'reviewCreatedVersion'
DATA['reviewDate'] = DATA['reviewCreatedVersion'].dt.date

# Count number of reviews per date
review_counts = DATA.groupby('reviewDate').size()

# Plot time series
plt.figure(figsize=(12, 6))
review_counts.plot(kind='line', marker='o', color='b')
plt.title('Number of Reviews Over Time')
plt.xlabel('Date')
plt.ylabel('Number of Reviews')
plt.grid(True)
plt.tight_layout()
plt.show()
```



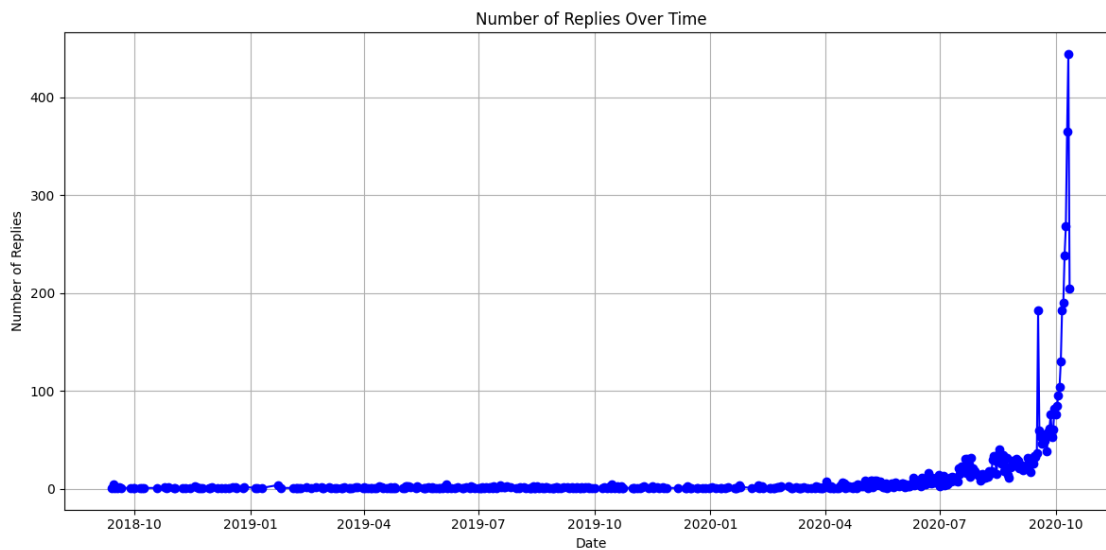
```
[97]: plt.figure(figsize=(10, 6))
sns.boxplot(data=DATA, x='thumbsUpCategory', y='score', palette='muted')
plt.title('Score Distribution Across Thumbs Up Categories')
plt.xlabel('Thumbs Up Category')
plt.ylabel('Score')
plt.xticks(rotation=45)
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.tight_layout()
plt.show()
```



```
[101]: # Extract date from 'at' and 'repliedAt' columns
DATA['reviewDate'] = DATA['at'].dt.date
DATA['replyDate'] = DATA['repliedAt'].dt.date

# Count number of replies per review date
reply_counts = DATA.groupby('reviewDate').size()

# Plot time series of reply counts
plt.figure(figsize=(12, 6))
reply_counts.plot(kind='line', marker='o', color='b')
plt.title('Number of Replies Over Time')
plt.xlabel('Date')
plt.ylabel('Number of Replies')
plt.grid(True)
plt.tight_layout()
plt.show()
```



```
[104]: # Calculate quartiles of response time
response_time_quartiles = DATA['responseTime'].quantile([0.25, 0.5, 0.75])

# Create function to categorize response time
def categorize_response_time(response_time):
    if response_time <= response_time_quartiles[0.25]:
        return 'fast'
    elif response_time <= response_time_quartiles[0.5]:
        return 'medium'
```

```

    else:
        return 'slow'

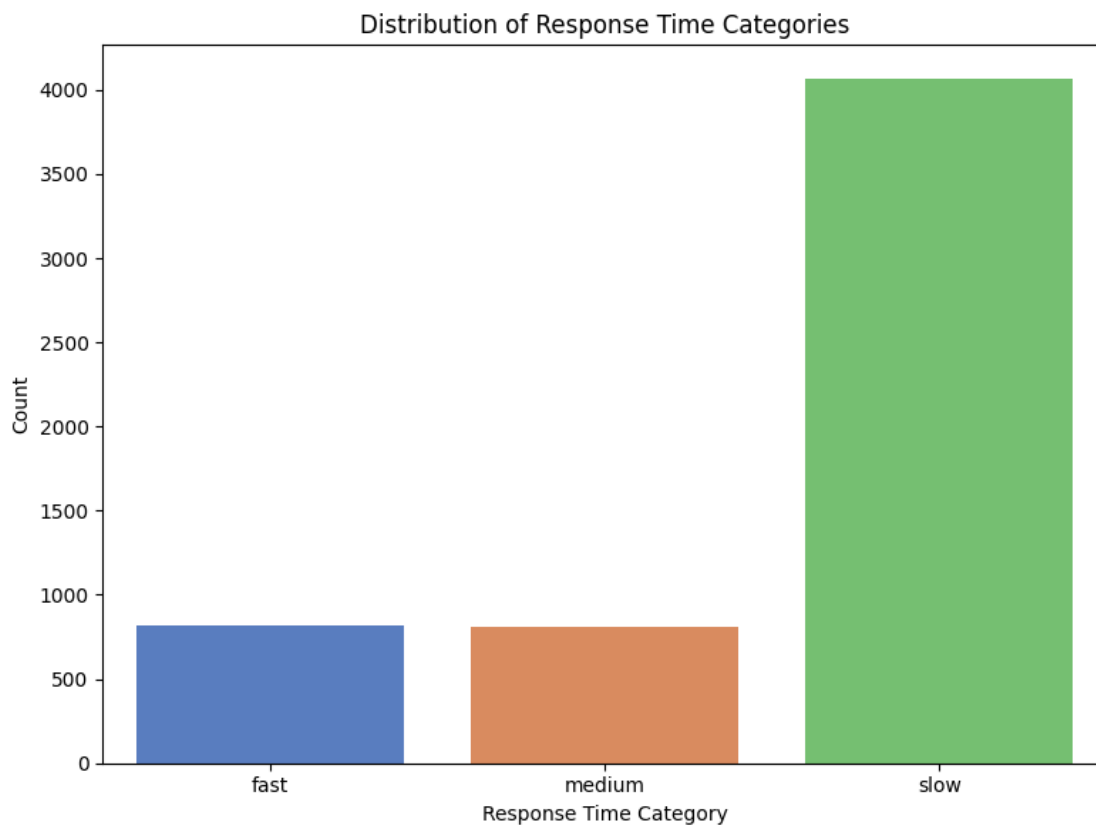
# Apply function to create response time category column
DATA['responseTimeCategory'] = DATA['responseTime'].
    ↪ apply(categorize_response_time)

```

```

[105]: # Plot count of response time categories
plt.figure(figsize=(8, 6))
sns.countplot(data=DATA, x='responseTimeCategory', palette='muted')
plt.title('Distribution of Response Time Categories')
plt.xlabel('Response Time Category')
plt.ylabel('Count')
plt.tight_layout()
plt.show()

```



```

[106]: from textblob import TextBlob

# Function to classify sentiment
def get_sentiment(text):
    analysis = TextBlob(text)

```

```

if analysis.sentiment.polarity > 0:
    return 'positive'
elif analysis.sentiment.polarity < 0:
    return 'negative'
else:
    return 'neutral'

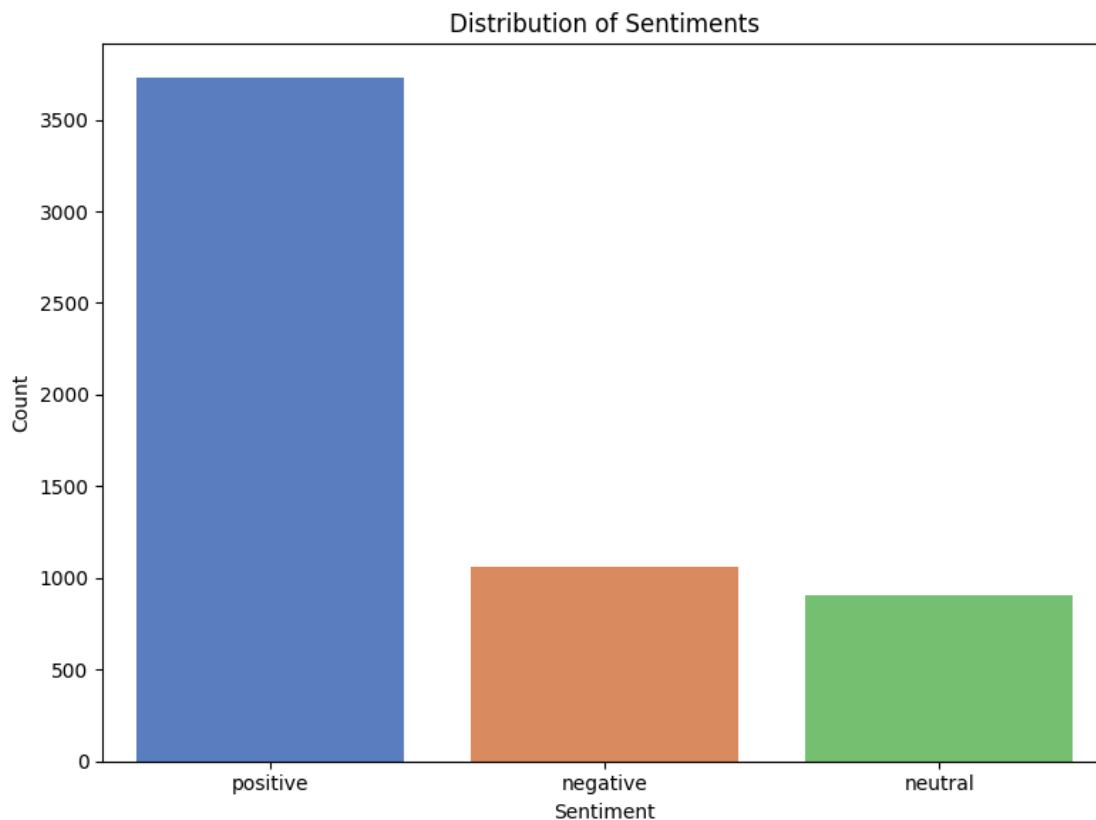
# Apply sentiment analysis to 'content' column
DATA['sentiment'] = DATA['content'].apply(get_sentiment)

```

```

[107]: # Plot count of sentiment categories
plt.figure(figsize=(8, 6))
sns.countplot(data=DATA, x='sentiment', palette='muted')
plt.title('Distribution of Sentiments')
plt.xlabel('Sentiment')
plt.ylabel('Count')
plt.tight_layout()
plt.show()

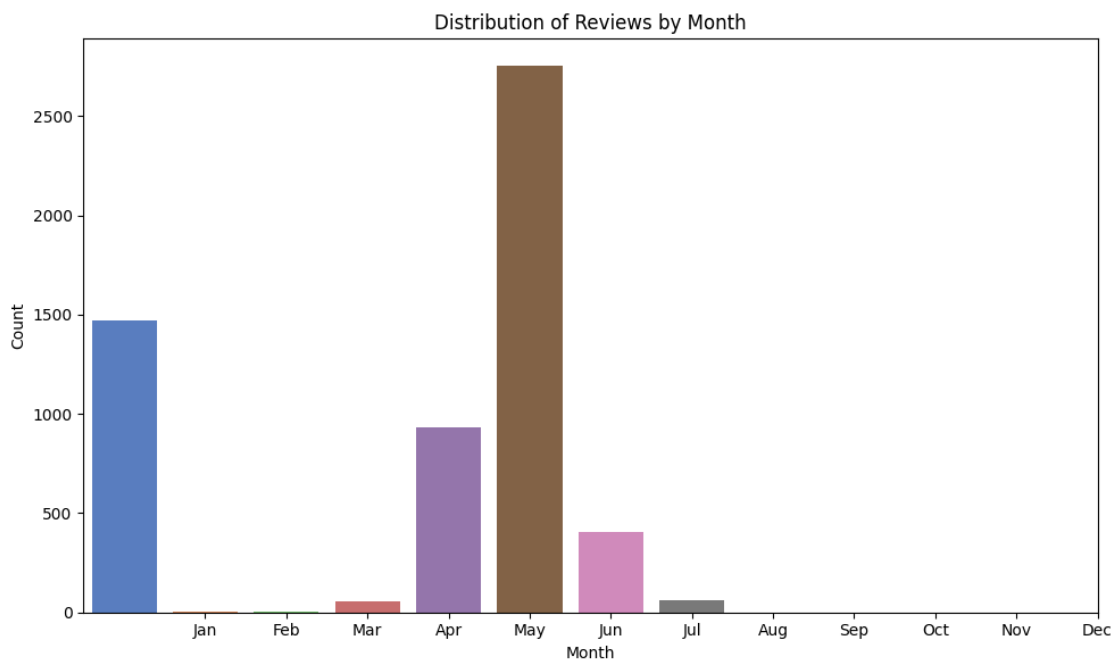
```



```
[108]: # Convert 'reviewCreatedVersion' to datetime format
DATA['reviewCreatedVersion'] = pd.to_datetime(DATA['reviewCreatedVersion'])

# Extract month and day of the week
DATA['month'] = DATA['reviewCreatedVersion'].dt.month
DATA['day_of_week'] = DATA['reviewCreatedVersion'].dt.day_name()
```

```
[109]: # Plot count of reviews by month
plt.figure(figsize=(10, 6))
sns.countplot(data=DATA, x='month', palette='muted')
plt.title('Distribution of Reviews by Month')
plt.xlabel('Month')
plt.ylabel('Count')
plt.xticks(ticks=range(1, 13), labels=['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug', 'Sep', 'Oct', 'Nov', 'Dec'])
plt.tight_layout()
plt.show()
```



```
[110]: # Plot count of reviews by day of the week
plt.figure(figsize=(10, 6))
sns.countplot(data=DATA, x='day_of_week', palette='muted', order=['Monday', 'Tuesday', 'Wednesday', 'Thursday', 'Friday', 'Saturday', 'Sunday'])
plt.title('Distribution of Reviews by Day of the Week')
plt.xlabel('Day of the Week')
plt.ylabel('Count')
```

```
plt.tight_layout()  
plt.show()
```

