```
pip install wordcloud
```

```python
import re
import nltk
import seaborn as sns
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from wordcloud import WordCloud
from nltk.stem.porter import PorterStemmer
from nltk.corpus import stopwords
from sklearn.feature_extraction.text import CountVectorizer
```

```python
STOPWORDS = set(stopwords.words('english'))
nltk.download('stopwords')
```

```python
data = pd.read_csv(r"..\Data\amazon_alexa.tsv", delimiter = '\t',
quoting = 3)
```

```python
print(f"Dataset shape : {data.shape}")
```

```python
data.head()
```

```
   rating       date         variation  \
0       5  31-Jul-18  Charcoal Fabric
1       5  31-Jul-18  Charcoal Fabric
2       4  31-Jul-18    Walnut Finish
3       5  31-Jul-18  Charcoal Fabric
4       5  31-Jul-18  Charcoal Fabric

                                    verified_reviews  feedback
0                                      Love my Echo!         1
1                                          Loved it!         1
2  "Sometimes while playing a game, you can answe...         1
3  "I have had a lot of fun with this thing. My 4...         1
4                                              Music         1
```

```python
data.info()
```

```python
print("\nMissing values:\n", data.isnull().sum())
```

```

Missing values:
 rating              0
date                0
variation           0
verified_reviews    1
feedback            0
dtype: int64
```

```python
print(f"Feature names : {data.columns.values}")
```

```
data.dropna(inplace=True)

data['length'] = data['verified_reviews'].apply(len)

data.head()
```

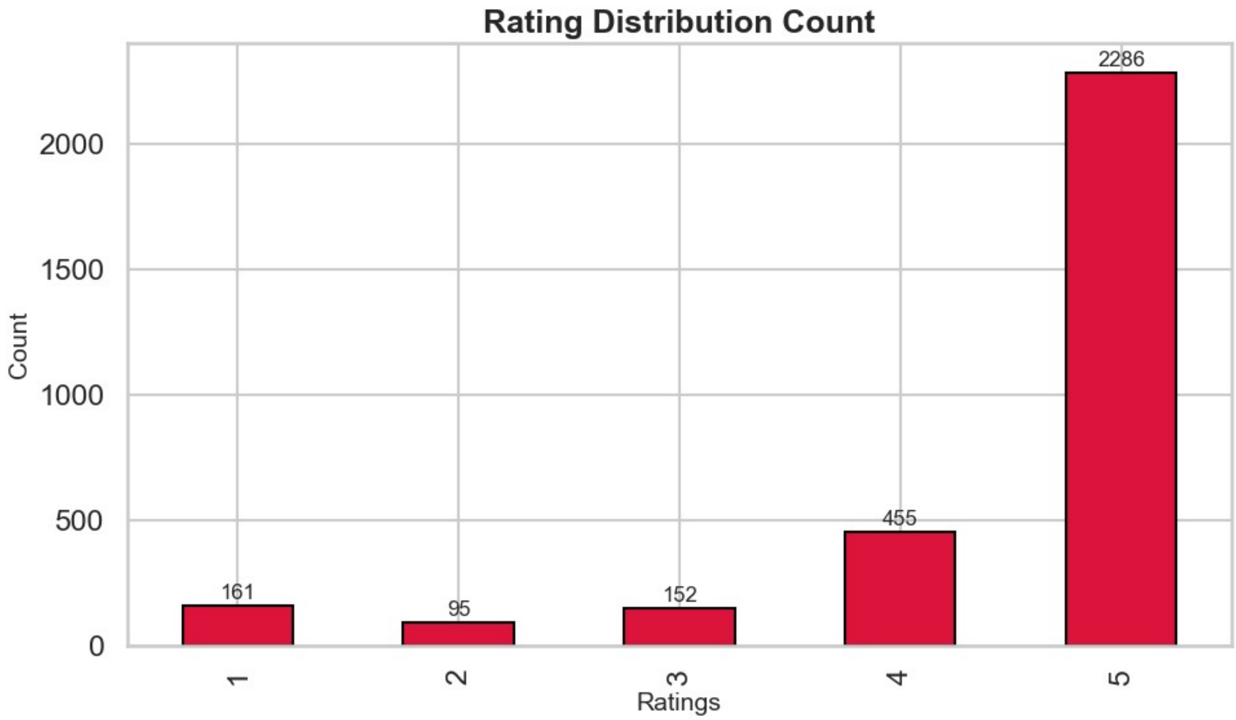
```
   rating       date         variation  \
0       5  31-Jul-18  Charcoal Fabric
1       5  31-Jul-18  Charcoal Fabric
2       4  31-Jul-18    Walnut Finish
3       5  31-Jul-18  Charcoal Fabric
4       5  31-Jul-18  Charcoal Fabric

                                    verified_reviews  feedback  length

0                                      Love my Echo!         1      13

1                                          Loved it!         1       9

2  "Sometimes while playing a game, you can answe...         1     197

3  "I have had a lot of fun with this thing. My 4...         1     174

4                                              Music         1       5
```

```
print(f"Rating value count: \n{data['rating'].value_counts()}")
```

```
Rating value count:
rating
5    2286
4     455
1     161
3     152
2      95
Name: count, dtype: int64
```

```
sns.set(style='whitegrid', context='talk')

# Set figure size
plt.figure(figsize=(10, 6))

# Bar plot with red color and edge styling
data['rating'].value_counts().sort_index().plot.bar(
    color='crimson',
    edgecolor='black'
)

# Set title and labels with font size
plt.title('Rating Distribution Count', fontsize=18, weight='bold')
plt.xlabel('Ratings', fontsize=14)
plt.ylabel('Count', fontsize=14)
```

```
# Show values on top of bars
for index, value in
enumerate(data['rating'].value_counts().sort_index()):
    plt.text(index, value + 10, str(value), ha='center', va='bottom',
fontsize=12)

# Improve layout
plt.tight_layout()
plt.show()
```



```
print(f"Rating value count - percentage distribution: \
n{round(data['rating'].value_counts()/data.shape[0]*100,2)}")
```

```
Rating value count - percentage distribution:
rating
5    72.59
4    14.45
1     5.11
3     4.83
2     3.02
Name: count, dtype: float64
```

```
print(f"Feedback value count: \n{data['feedback'].value_counts()}")
```

```
Feedback value count:
feedback
```

```
1    2893
0     256
Name: count, dtype: int64
```

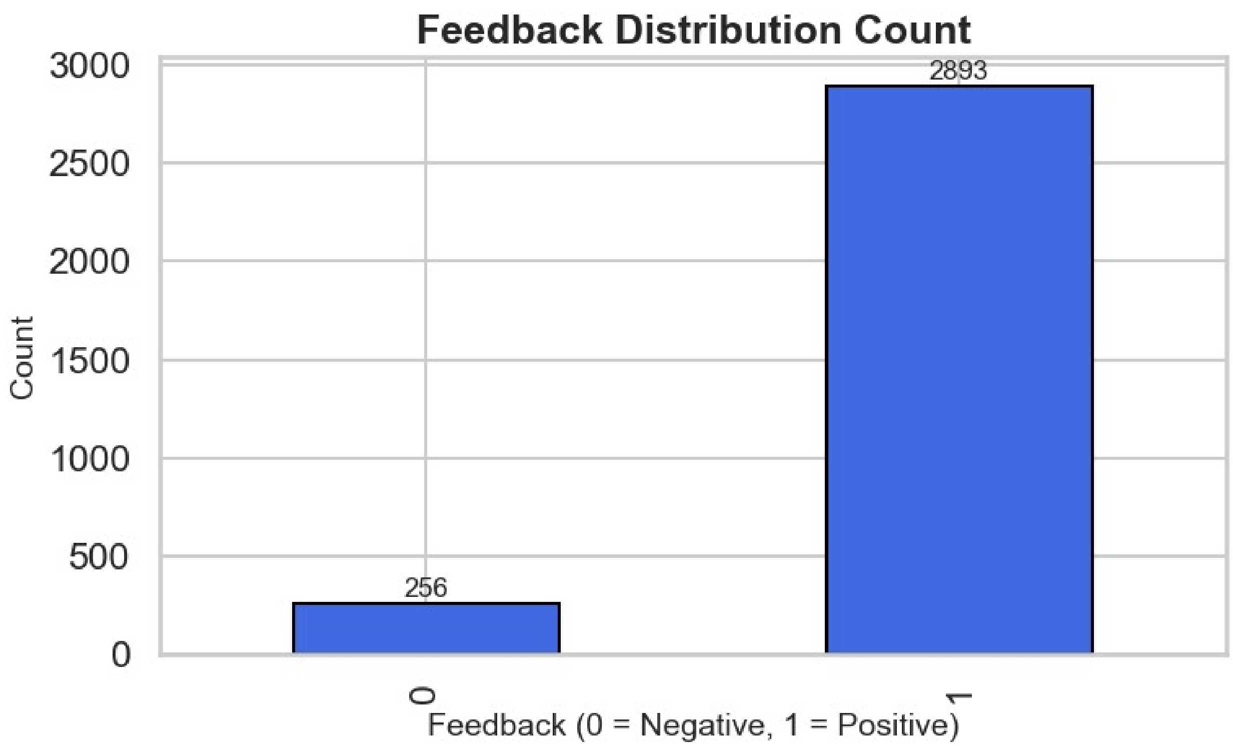
```
review_0 = data[data['feedback'] == 0].iloc[1]['verified_reviews']
print(review_0)
```

```
Sound is terrible if u want good music too get a bose
```

```
review_1 = data[data['feedback'] == 1].iloc[1]['verified_reviews']
print(review_1)
```

```
Loved it!
```

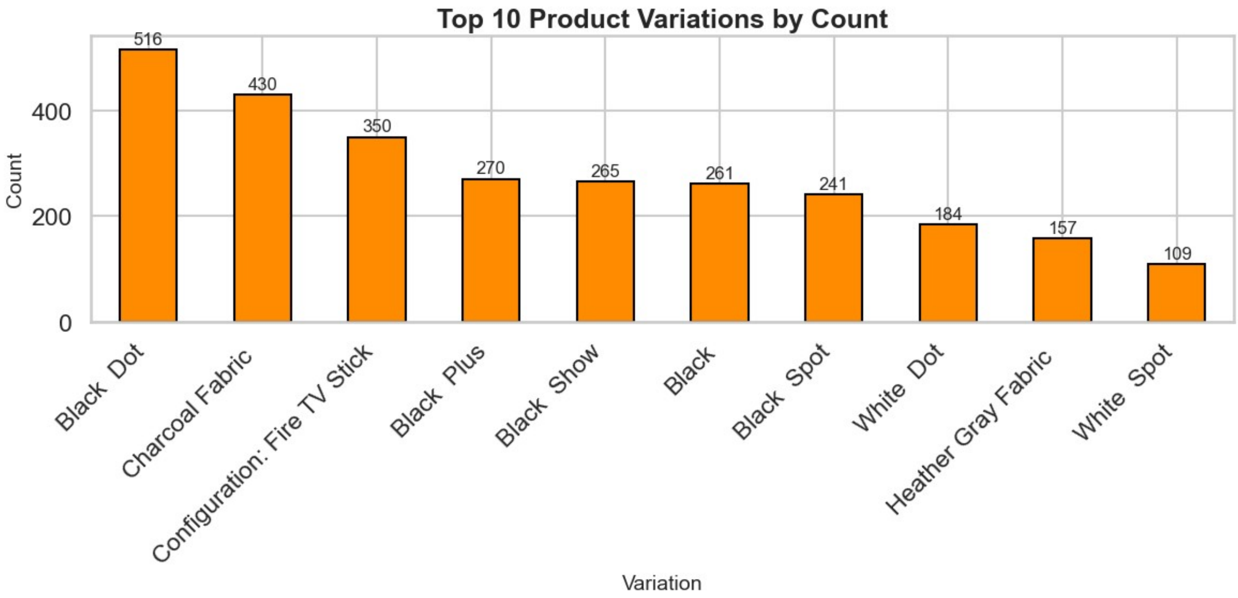
```
# Set the style
sns.set(style='whitegrid', context='talk')

# Set figure size
plt.figure(figsize=(8, 5))

# Plot feedback distribution
data['feedback'].value_counts().sort_index().plot.bar(
    color='royalblue',
    edgecolor='black'
)

# Set title and axis labels
plt.title('Feedback Distribution Count', fontsize=18, weight='bold')
plt.xlabel('Feedback (0 = Negative, 1 = Positive)', fontsize=14)
plt.ylabel('Count', fontsize=14)

# Add value labels on bars
for index, value in
enumerate(data['feedback'].value_counts().sort_index()):
    plt.text(index, value + 10, str(value), ha='center', va='bottom',
fontsize=12)

# Layout adjustment
plt.tight_layout()
plt.show()
```



```
print(f"Feedback value count - percentage distribution: \
n{round(data['feedback'].value_counts()/data.shape[0]*100,2)}")

Feedback value count - percentage distribution:
feedback
1    91.87
0     8.13
Name: count, dtype: float64

#Feedback = 0
data[data['feedback'] == 0]['rating'].value_counts()

#Feedback = 1
data[data['feedback'] == 1]['rating'].value_counts()

print(f"Variation value count: \n{data['variation'].value_counts()}")

Variation value count:
variation
Black  Dot                      516
Charcoal Fabric                 430
Configuration: Fire TV Stick    350
Black  Plus                     270
Black  Show                     265
Black                           261
Black  Spot                     241
White  Dot                      184
```

```
Heather Gray Fabric             157
White  Spot                     109
Sandstone Fabric                 90
White                            90
White  Show                      85
White  Plus                      78
Oak Finish                       14
Walnut Finish                     9
Name: count, dtype: int64
```

```python
# Set seaborn style
sns.set(style='whitegrid', context='talk')

# Top 10 variations
top_variations = data['variation'].value_counts().head(10)

# Set figure size
plt.figure(figsize=(12, 6))

# Bar plot
top_variations.plot.bar(
    color='darkorange',
    edgecolor='black'
)

# Title and labels
plt.title('Top 10 Product Variations by Count', fontsize=18,
weight='bold')
plt.xlabel('Variation', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.xticks(rotation=45, ha='right')

# Add value labels
for index, value in enumerate(top_variations):
    plt.text(index, value + 5, str(value), ha='center', va='bottom',
fontsize=12)

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



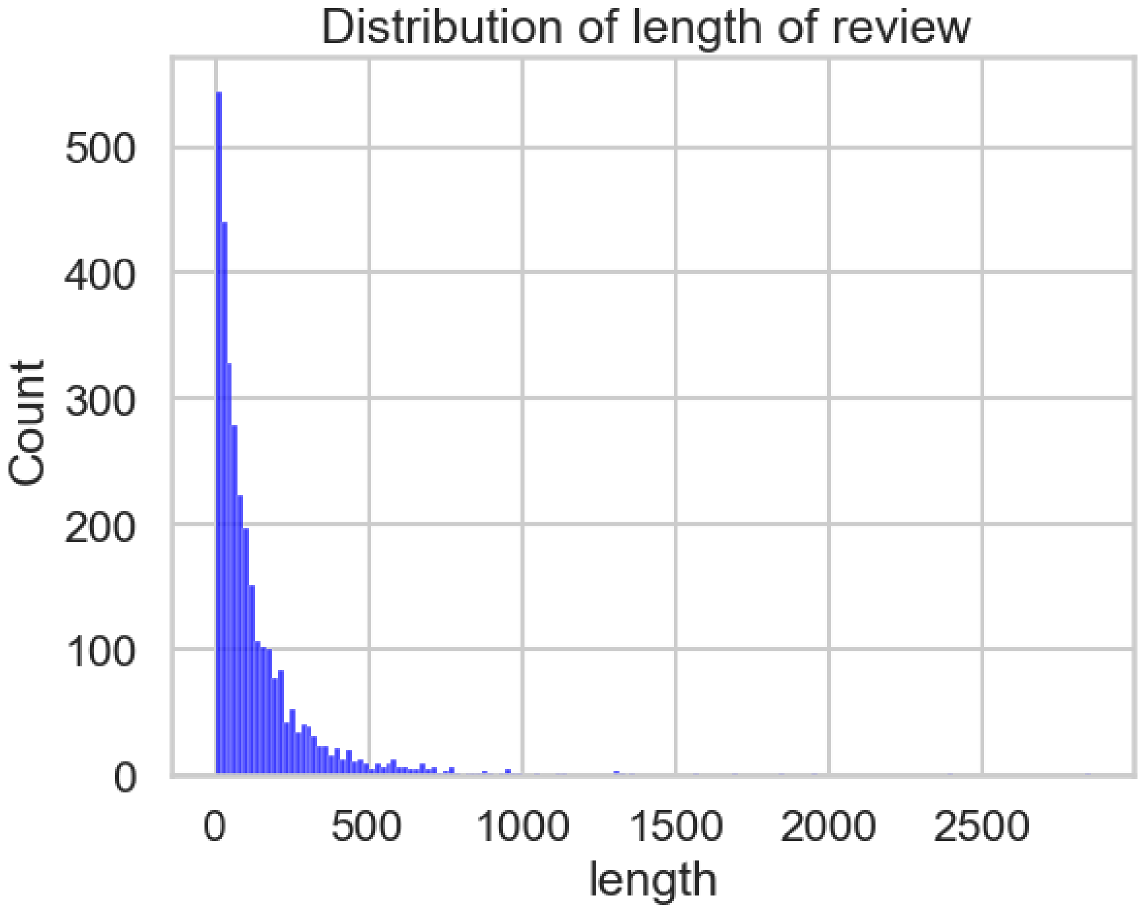
```
data.groupby('variation')['rating'].mean()
```

```
data['length'].describe()
```

```
count    3149.000000
mean      132.714513
std       182.541531
min         1.000000
25%        30.000000
50%        74.000000
75%       166.000000
max      2853.000000
Name: length, dtype: float64
```

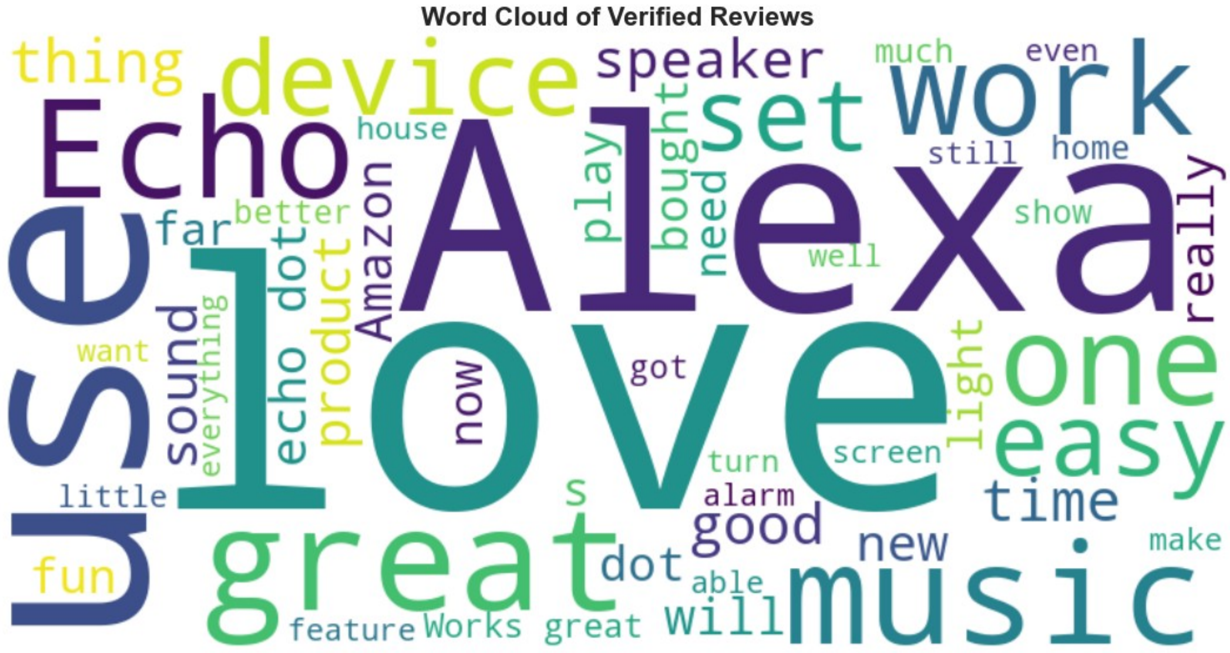
```
sns.histplot(data['length'],color='blue').set(title='Distribution of
length of review ')
```

```
[Text(0.5, 1.0, 'Distribution of length of review ')]
```



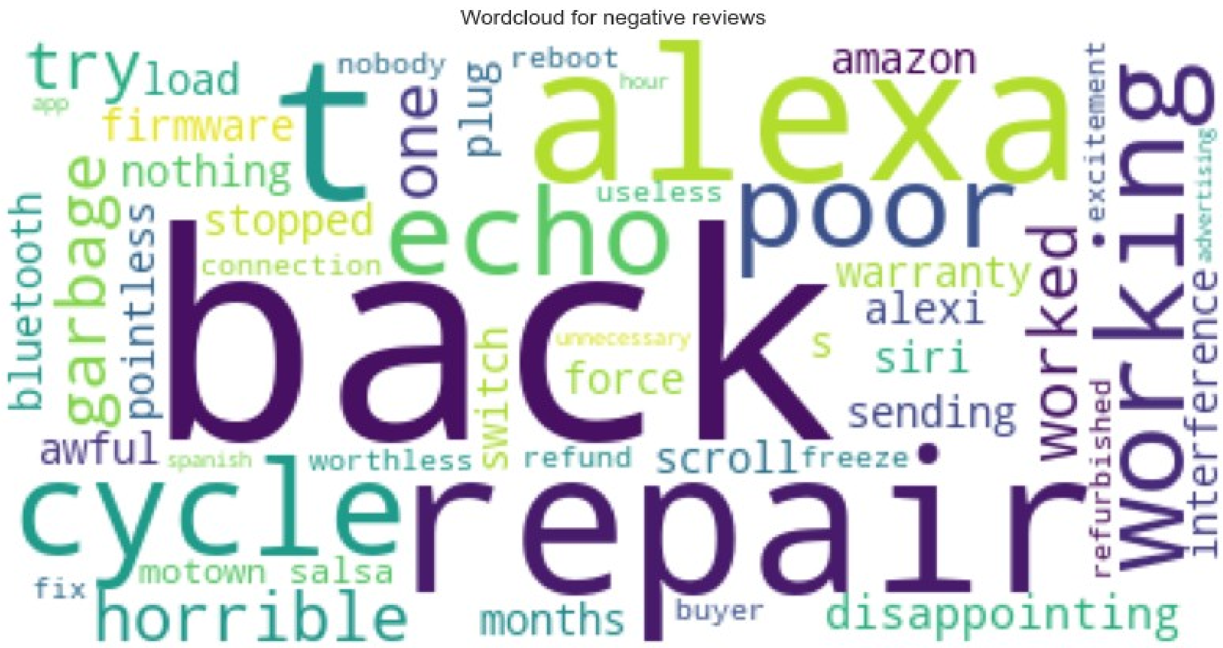
```
sns.histplot(data[data['feedback']==0]
['length'],color='red').set(title='Distribution of length of review if
feedback = 0')

cv = CountVectorizer(stop_words='english')
words = cv.fit_transform(data.verified_reviews)

# Combine all non-null reviews into one string
reviews = " ".join(str(review) for review in
data['verified_reviews'].dropna())

# Initialize WordCloud object with better customization
wc = WordCloud(
    background_color='white',
    max_words=50,
    width=800,
    height=400,
    colormap='viridis',  # Optional: try 'inferno', 'plasma', etc.
    contour_color='steelblue',
    contour_width=1
)
```

```
# Generate word cloud
wordcloud_image = wc.generate(reviews)

# Plot word cloud
plt.figure(figsize=(12, 6))
plt.imshow(wordcloud_image, interpolation='bilinear')
plt.title('Word Cloud of Verified Reviews', fontsize=16,
weight='bold')
plt.axis('off')
plt.tight_layout()
plt.show()
```



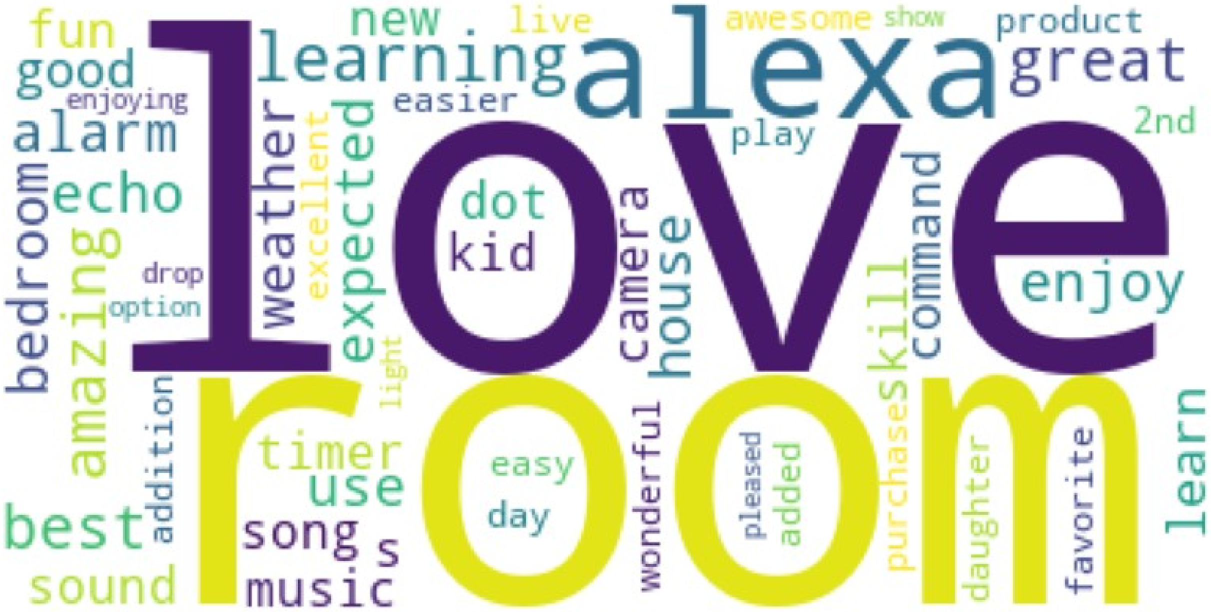
```
# Combine all reviews for each feedback category and splitting them
into individual words
neg_reviews = " ".join([review for review in data[data['feedback'] ==
0]['verified_reviews']])
neg_reviews = neg_reviews.lower().split()

pos_reviews = " ".join([review for review in data[data['feedback'] ==
1]['verified_reviews']])
pos_reviews = pos_reviews.lower().split()

#Finding words from reviews which are present in that feedback
category only
unique_negative = [x for x in neg_reviews if x not in pos_reviews]
unique_negative = " ".join(unique_negative)

unique_positive = [x for x in pos_reviews if x not in neg_reviews]
unique_positive = " ".join(unique_positive)
```

```
wc = WordCloud(background_color='white', max_words=50)

# Generate and plot wordcloud
plt.figure(figsize=(10,10))
plt.imshow(wc.generate(unique_negative))
plt.title('Wordcloud for negative reviews', fontsize=10)
plt.axis('off')
plt.show()
```



```
wc = WordCloud(background_color='white', max_words=50)

# Generate and plot wordcloud
plt.figure(figsize=(10,10))
plt.imshow(wc.generate(unique_positive))
plt.title('Wordcloud for positive reviews', fontsize=10)
plt.axis('off')
plt.show()
```

Wordcloud for positive reviews


love
room
alexa
learning
great
fun
new
live
awesome
show
product
good
enjoying
easier
alarm
play
2nd
echo
weather
expected
excellent
dot
kid
camera
house
command
bedroom
amazing
drop
option
enjoy
skill
light
addition
timer
easy
use
wonderful
pleased
added
purchase
daughter
favorite
learn
best
song
s
day
sound
music