In [1]:
```
from wordcloud import WordCloud
from textblob import TextBlob
from sklearn.metrics import confusion_matrix
from nltk.sentiment.vader import SentimentIntensityAnalyzer
from nltk.tokenize import word_tokenize
from nltk.corpus import stopwords
from nltk.stem import WordNetLemmatizer

import nltk
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
import plotly.express as px
import re
```

In [2]:
```
nltk.download('vader_lexicon')
nltk.download('punkt')
nltk.download('wordnet')
nltk.download('omw-1.4')
nltk.download('stopwords')
pd.set_option('display.max_colwidth', None)
```

```
[nltk_data] Downloading package vader_lexicon to
[nltk_data]     /Users/vinitkanani/nltk_data...
[nltk_data]   Package vader_lexicon is already up-to-date!
[nltk_data] Downloading package punkt to
[nltk_data]     /Users/vinitkanani/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package wordnet to
[nltk_data]     /Users/vinitkanani/nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
[nltk_data] Downloading package omw-1.4 to
[nltk_data]     /Users/vinitkanani/nltk_data...
[nltk_data]   Package omw-1.4 is already up-to-date!
[nltk_data] Downloading package stopwords to
[nltk_data]     /Users/vinitkanani/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
```

In [3]:
```
# import data
data = pd.read_csv('data/training.csv', encoding="ISO-8859-1", header=None)
data.columns = ['sentiment', 'id', 'date', 'query', 'user', 'tweet']
```

In [4]:
```
data.head()

print("Size of the dataset", data.shape)
```

```
Size of the dataset (1600000, 6)
```

In [5]:
```
# Missing Values
print("Missing Values \n\n", data.isnull().sum())
```

```
Missing Values

 sentiment    0
id            0
date          0
query         0
user          0
tweet         0
dtype: int64
```

1. Data Preprocessing

In [6]:
```
print("Number of http links", data['tweet'].str.count('http').sum())
data['tweet'] = data['tweet'].str.replace(r'http\S+|www.\S+', '', case=False, regex=True

print("Number of @ mentions", data['tweet'].str.count('@').sum())
data['tweet'] = data['tweet'].str.replace(r'@\S+', '', case=False, regex=True)

print("Number of # mentions", data['tweet'].str.count('#').sum())
data['tweet'] = data['tweet'].str.replace(r'#\S+', '', case=False, regex=True)

print("Number of RT", data['tweet'].str.count('RT').sum())
data['tweet'] = data['tweet'].str.replace(r'RT', '', case=False, regex=True)
```

```
Number of http links 71635
Number of @ mentions 798628
Number of # mentions 45133
Number of RT 0
```

In [7]:
```
stop_words = set(stopwords.words('english'))
stop_words.add('quot')
stop_words.add('amp')

lemma = WordNetLemmatizer()

def clean_text(text):
    text = str(text).lower()
    text = re.sub(r'http\S+', ' ', text)
    text = re.sub('[^a-zA-Z]', ' ', text)
    text = word_tokenize(text)
    text = [item for item in text if item not in stop_words]
    text = [lemma.lemmatize(w) for w in text]
    text = [i for i in text if len(i) > 2]
    text = ' '.join(text)
    return text
```

In [9]:
```
data['clean_tweet'] = data['tweet'].apply(clean_text)
print(data.head(2))
```

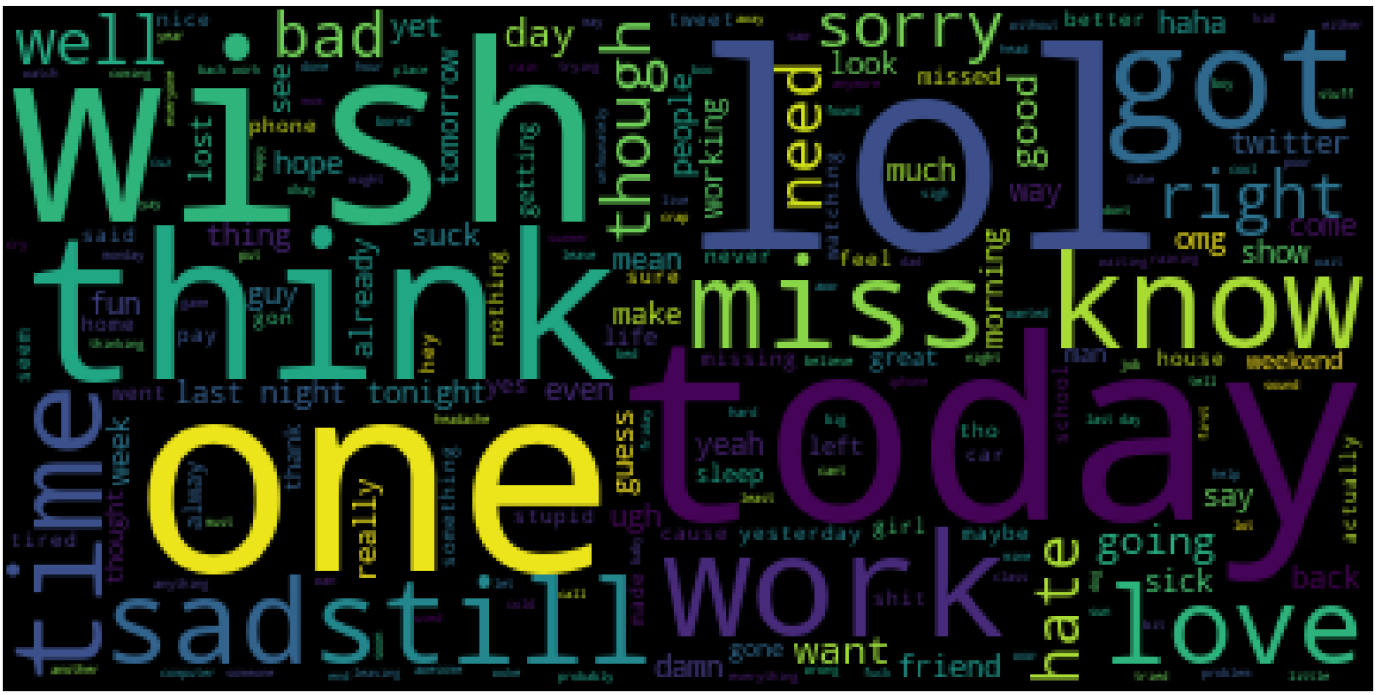
```
   sentiment          id                          date     query  \
0          0  1467810369  Mon Apr 06 22:19:45 PDT 2009  NO_QUERY
1          0  1467810672  Mon Apr 06 22:19:49 PDT 2009  NO_QUERY

              user  \
0  _TheSpecialOne_
1    scotthamilton

                     tweet  \
0                                  - Awww, that's a bummer.  You shoulda got David Carr
of Third Day to do it. ;D
1  is upset that he can't update his Facebook by texting it... and might cry as a result
  School today also. Blah!

                                                clean_tweet
0                           awww bummer shoulda got david carr third day
1  upset update facebook texting might cry result school today also blah
```

2. Wordclouds

In [10]:
```
def get_word_cloud(text):
    plt.figure(figsize=(20,20))
    word_cloud = WordCloud().generate(text)
    plt.imshow(word_cloud)
    plt.axis("off")
    plt.show()
```

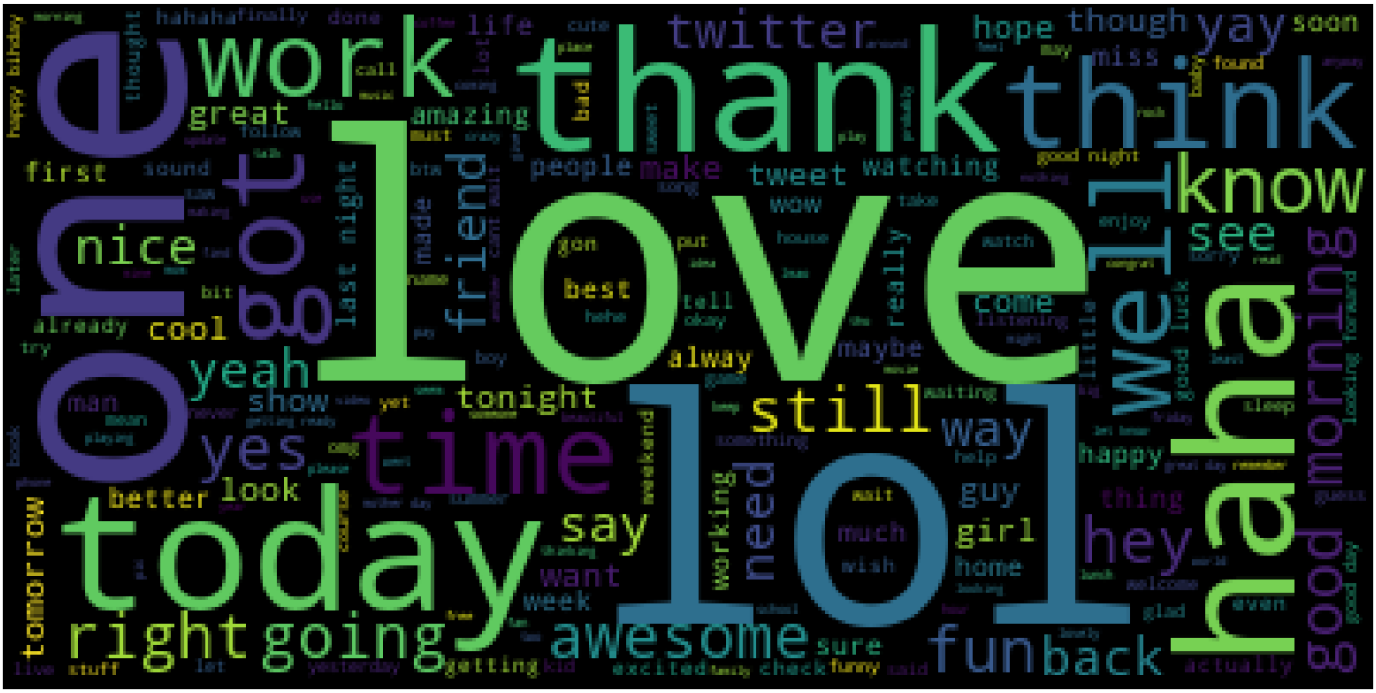
2.1 WordCloud of tweets with negative sentiment

In [11]:
```
get_word_cloud(data[data['sentiment'] == 0]['clean_tweet'].str.cat(sep=' '))
```



2.2 WordCloud of tweets with positive sentiment

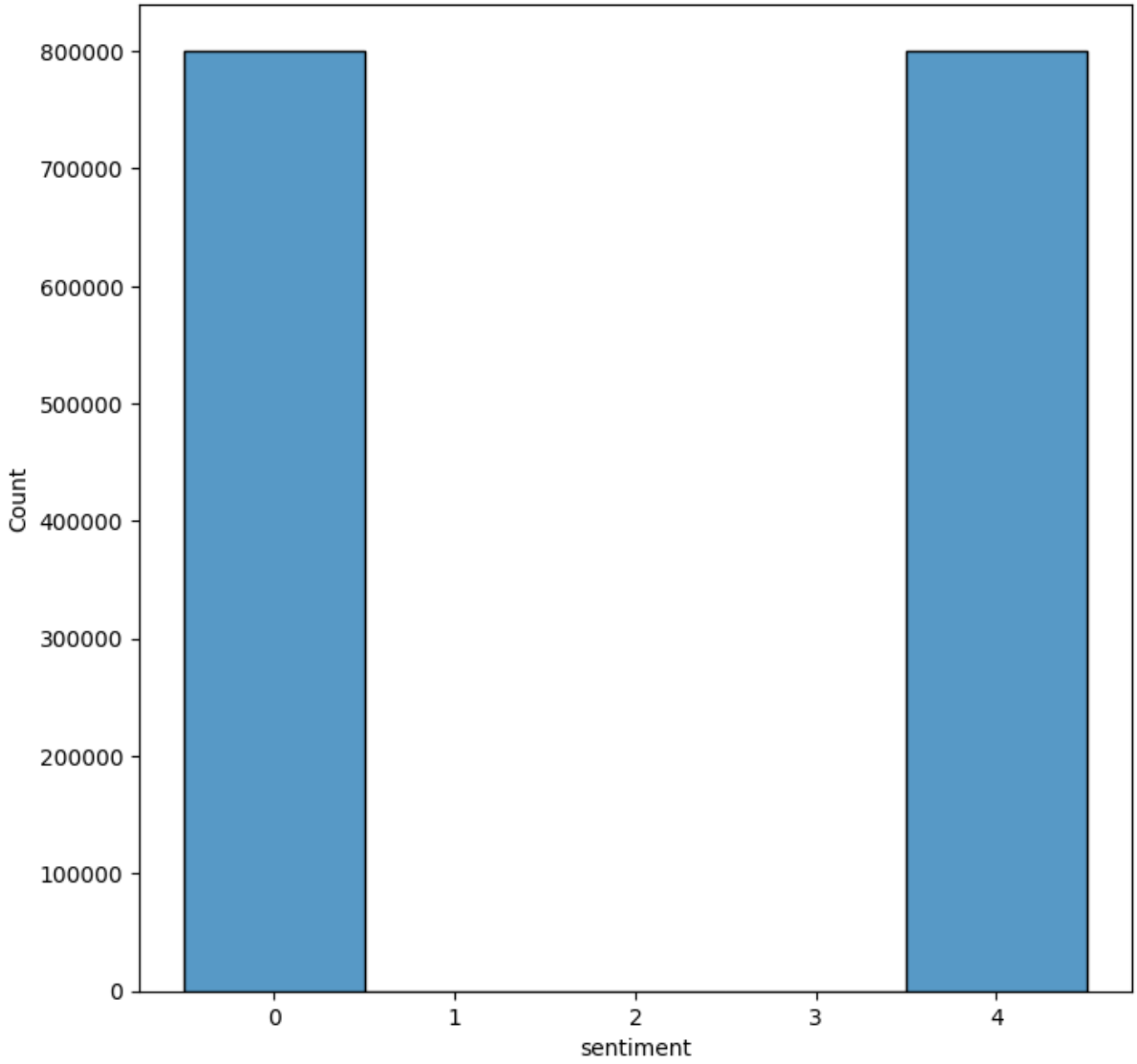
In [12]:
```
get_word_cloud(data[data['sentiment'] == 4]['clean_tweet'].str.cat(sep=' '))
```



3. Count of tweets for each sentiment

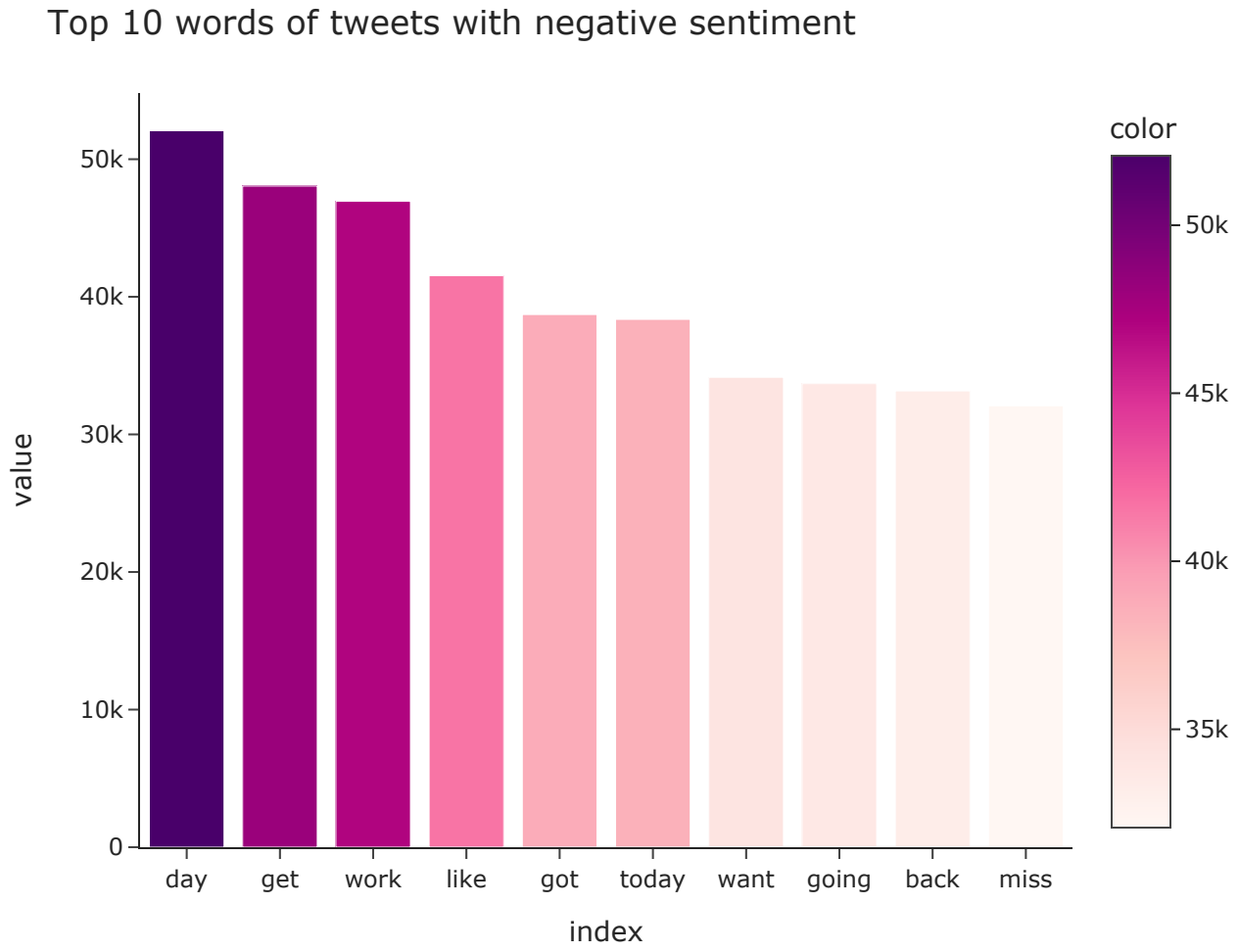
In [13]:
```
plt.figure(figsize=(8,8))
sns.histplot(data=data['tweet'], x=data['sentiment'], discrete="True")
```

Out[13]:
```
<AxesSubplot: xlabel='sentiment', ylabel='Count'>
```



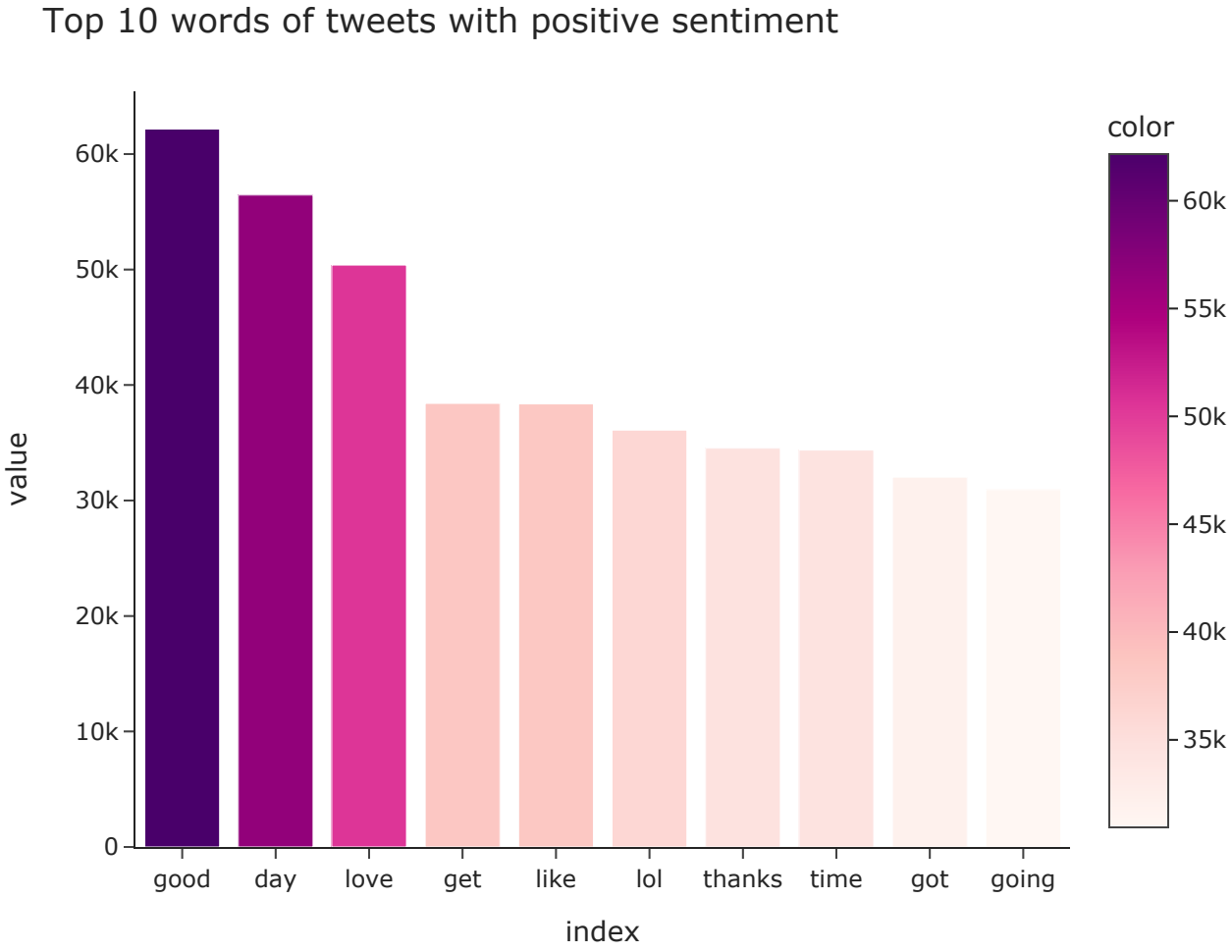
4. Top 10 frequent words of tweets with negative sentiment

In [14]:
```
top10_word = data.clean_tweet[data.sentiment == 0].str.split(expand=True).stack().value_

fig = px.bar(top10_word, color=top10_word.values, color_continuous_scale=px.colors.seque
    top10_word.values])
fig.update_traces(hovertemplate='Count: %{customdata[0]}')
fig.update_layout(title=f"Top 10 words of tweets with negative sentiment",
                  template='simple_white', hovermode='x unified')
fig.show()
```



5. Top 10 frequent words of tweets with positive sentiment

In [15]:
```
top10_word = data.clean_tweet[data.sentiment == 4].str.split(expand=True).stack().value_


fig = px.bar(top10_word, color=top10_word.values, color_continuous_scale=px.colors.seque
    top10_word.values])
fig.update_traces(hovertemplate='Count: %{customdata[0]}')
fig.update_layout(title=f"Top 10 words of tweets with positive sentiment",
                  template='simple_white', hovermode='x unified')
fig.show()
```


Top 10 words of tweets with positive sentiment
value
60k
50k
40k
30k
20k
10k
0
good
day
love
get
like
lol
thanks
time
got
going
index
color
60k
55k
50k
45k
40k
35k