Summary

Data have been aquired from flipart for pure learning and educational purposes Selenium has been used to fetch first 25 pages of flipkart when searched with 'ear buds' and data have been segregated in tabular format for data analysis

In [3]:

```
import time
from selenium import webdriver
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
```

In [2]:

```
# scraping the ecommerce website for educational and learning purposes
driver = webdriver.Chrome('chromedriver.exe')

earbud_dict = {'name': [],
              'prop': [],
              'rating': [],
              'num_ratings': [],
              'discounted_price' : [],
              'original_price': [],
              'num_page': []}
```

In [ ]:

```
#gathering data from webpage for top search results on first 25 pages for keyword: 'ear buds'
for num_page in range(1,1+25):
    driver.get(f'https://www.flipkart.com/search?q=ear+buds&otracker=search&otracker1=search&marketplace=FLIPKART&as-show=on&as=off&page={num_page}')
    time.sleep(10)
    #driver.implicitly_wait(10)

    earbuds = driver.find_elements_by_class_name('_3liAhj')
    for num_earbud, earbud in enumerate(earbuds):
        try:
            name = earbud.find_element_by_class_name('_2cLu-l').text
        except:
            name = np.nan
        try:
            prop = earbud.find_element_by_class_name('_1rcHFq').text
        except:
            prop = np.nan
        try:
            rating = earbud.find_element_by_class_name('hGSR34').text
        except:
            rating = np.nan
        try:
            num_ratings = earbud.find_element_by_class_name('_38sUEc').text
        except:
            num_ratings = np.nan
        try:
            discounted_price = earbud.find_element_by_class_name('_1vC4OE').text
        except:
            discounted_price = np.nan
        try:
            original_price = earbud.find_element_by_class_name('_3auQ3N').text
        except:
            original_price = np.nan
        earbud_dict['name'].append(name)
        earbud_dict['prop'].append(prop)
        earbud_dict['rating'].append(rating)
        earbud_dict['num_ratings'].append(num_ratings)
        earbud_dict['discounted_price'].append(discounted_price)
        earbud_dict['original_price'].append(original_price)
        earbud_dict['num_page'].append(num_page)
```

In [ ]:

```
df = pd.DataFrame(earbud_dict)
df.head()
```

In [ ]:

```
#saving the data for offline usage so that servers are not called multiple number of time
s
df.to_json('ear_buds.json')
```

In [4]:

```
#Reloading data from json file
df = pd.read_json('ear_buds.json')
df.head()
```

Out[4]:

	name	prop	rating	num_ratings	discounted_price	original_price	num_page
0	Infinity (JBL) Glide N120 Neckband with Metal ...	Black, Yellow, Wireless in the ear	4.1	(12,407)	₹1,499	₹3,999	1
1	boAt Airdopes 201 Earbuds Bluetooth Headset	Active Black, True Wireless	4.1	(15,791)	₹1,499	₹3,999	1
2	Infinity (JBL) Glide N120 Neckband with Metal ...	Black, Red, Wireless in the ear	4.1	(12,408)	₹1,499	₹3,999	1
3	Noise Shots Groove Truly Wireless Bluetooth He...	Matte Black, True Wireless	4.1	(5,370)	₹2,199	₹4,999	1
4	Redmi Earbuds S Bluetooth Headset	Black, True Wireless	3.9	(1,873)	₹1,599	₹2,399	1

In [5]:

```
#number of rows
print('num of rows:', len(df), '\n')
#na values
print(df.isna().sum())
```

```
num of rows: 1000

name                  0
prop                  0
rating              701
num_ratings         701
discounted_price      0
original_price        4
num_page              0
dtype: int64
```

In [6]:

```
#clean the data for further evaluation
def clean_ratings(x):
    if x is not None:
        x = int(str(x)[1:-1].replace(',',''))
    return x
def clean_price(x):
    if x is not None:
        x = float(str(x)[1:].replace(',',''))
    return x
```

```
df['num_ratings'] = df['num_ratings'].apply(clean_ratings).astype('Int64', errors='ignore')
df['discounted_price'] = df['discounted_price'].apply(clean_price)
df['original_price'] = df['original_price'].apply(clean_price)
df['discount_percentage'] = (df['original_price'] - df['discounted_price'])*100 / df['original_price']
df.head()
```

Out[6]:

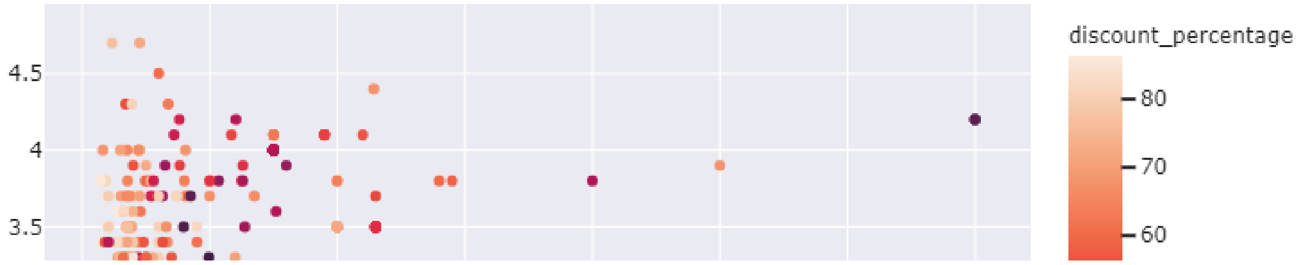
	name	prop	rating	num_ratings	discounted_price	original_price	num_page	discount_percentage
0	Infinity (JBL) Glide N120 Neckband with Metal ...	Black, Yellow, Wireless in the ear	4.1	12407	1499.0	3999.0	1	62.515629
1	boAt Airdopes 201 Earbuds Bluetooth Headset	Active Black, True Wireless	4.1	15791	1499.0	3999.0	1	62.515629
2	Infinity (JBL) Glide N120 Neckband with Metal ...	Black, Red, Wireless in the ear	4.1	12408	1499.0	3999.0	1	62.515629
3	Noise Shots Groove Truly Wireless Bluetooth He...	Matte Black, True Wireless	4.1	5370	2199.0	4999.0	1	56.011202
4	Redmi Earbuds S Bluetooth Headset	Black, True Wireless	3.9	1873	1599.0	2399.0	1	33.347228

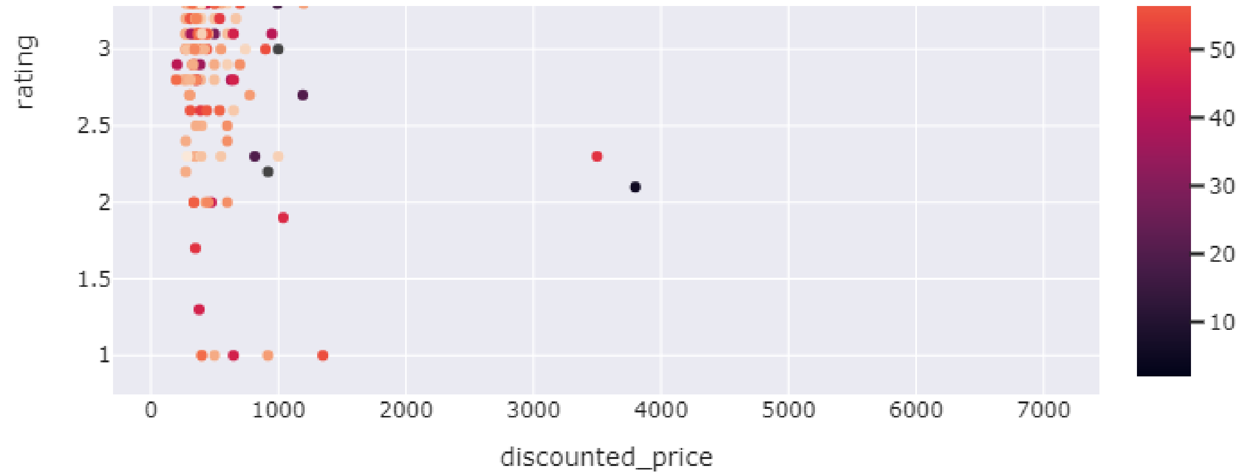
In [7]:

```
#importing plotting libraries
import seaborn as sns
import matplotlib.pyplot as plt
import plotly.express as px
import plotly.graph_objects as go
import re
from wordcloud import WordCloud
import spacy
from plotly.offline import plot
```

In [37]:

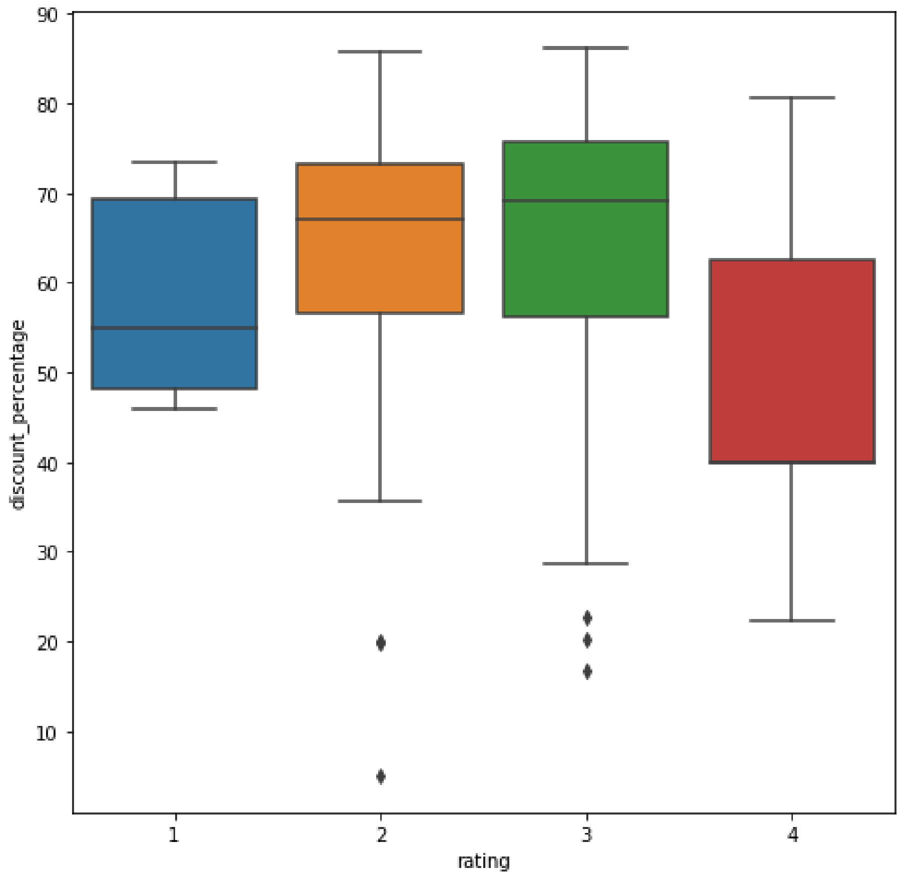
```
#evaluating if price has impact on ratings
fig = px.scatter(df, x='discounted_price', y='rating', color='discount_percentage', template='seaborn')
fig.show("png", width=800, height=500)

#Does high rating mean high discounts
df_copy = df.copy().dropna()
df_copy['rating'] = df_copy['rating'].dropna().apply(lambda x: int(x))
df_copy
plt.figure(figsize=(8, 8))
sns.boxplot(data=df_copy, x='rating', y='discount_percentage')

#conclusion: low priced earbuds (<1500) have large number of low ratings indicating poor quality
#conclusion: no impact of discount percentage seen in general
#High rating cannot confirm high discount
```





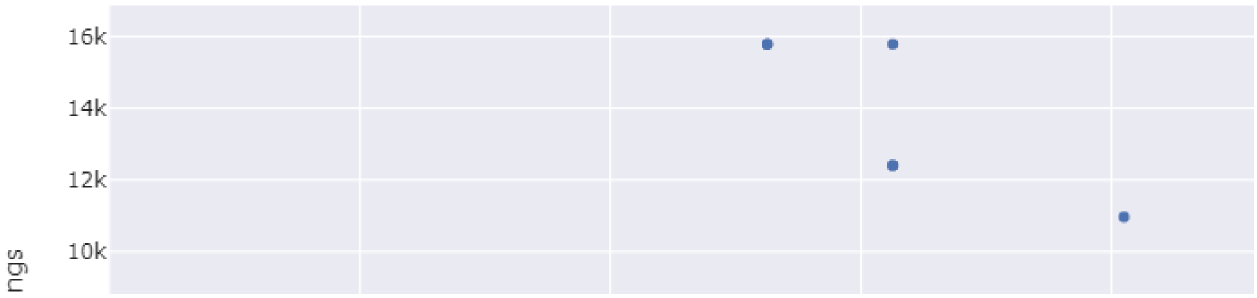
Out[37]:

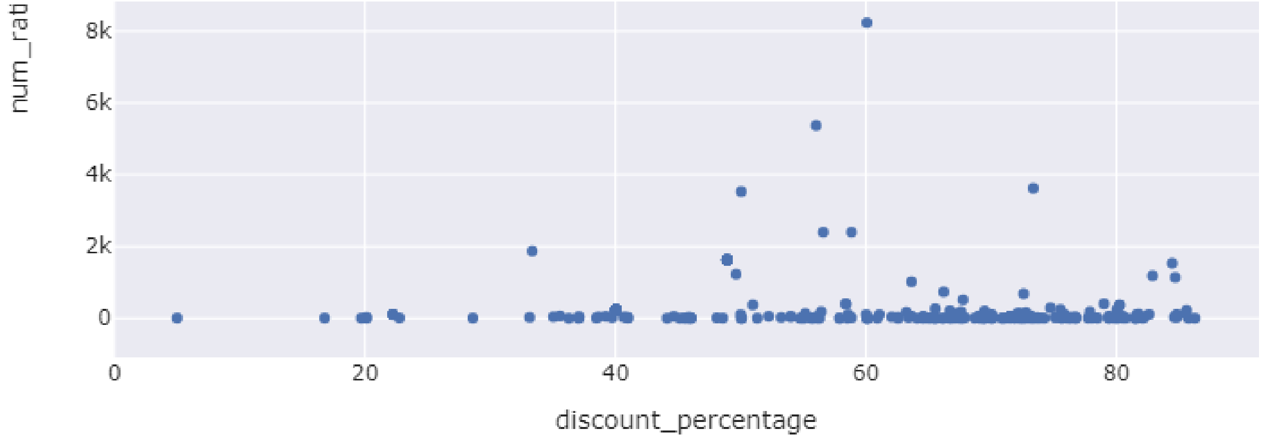
```
<matplotlib.axes._subplots.AxesSubplot at 0x236fedf3288>
```



In [16]:

```
#evaluating if discount percentage has impact on sales
fig = px.scatter(df.dropna(), x='discount_percentage', y='num_ratings', template='seabor
n')
fig.show("png", width=800, height=500)
#discount is necessary but not sufficient for good sales figure
```



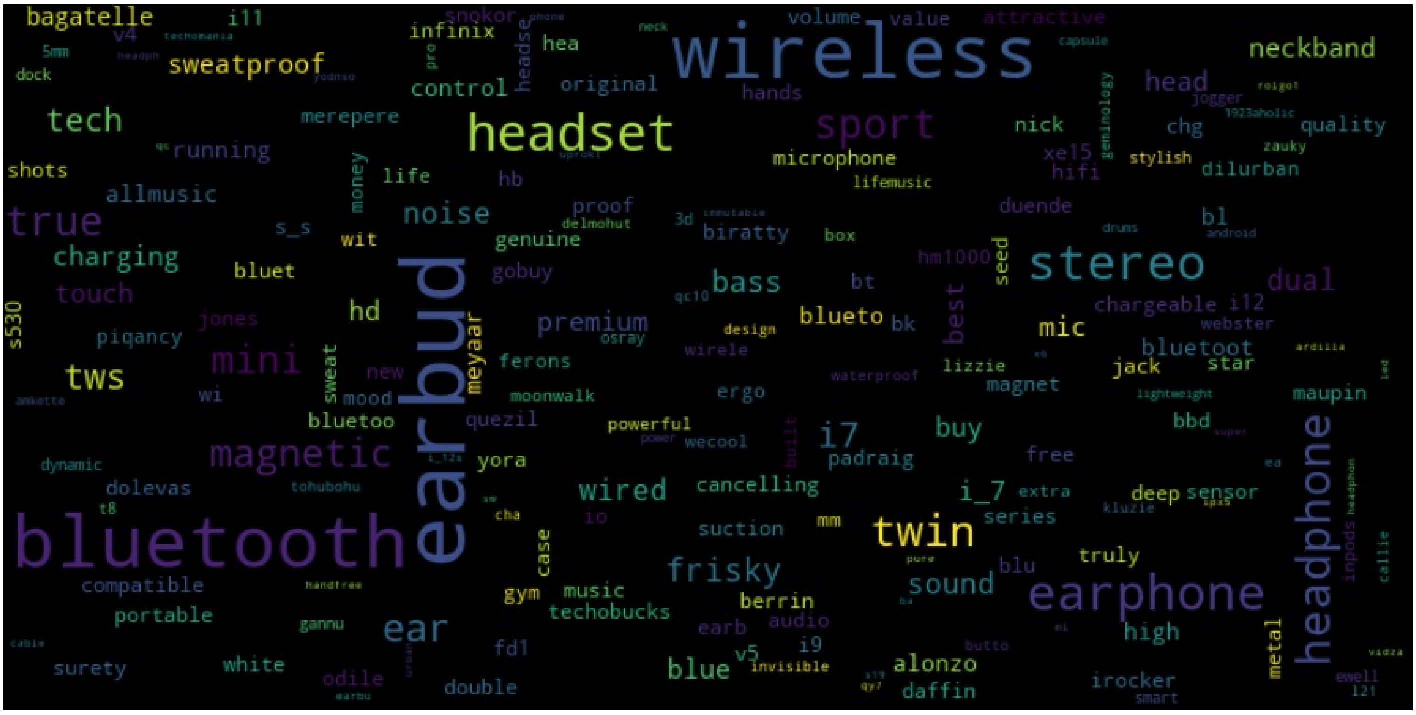


In [11]:

```
def wordcloud_gen(df, column_name):
    regex = r'\w+'
    names_combined = []
    for name in df[column_name]:
        words = re.findall(regex,name)
        words = [word.lower() for word in words]
        names_combined.extend(words)
    wordcloud = WordCloud(width=800, height=400,max_font_size=50,
                   background_color="black", collocations=False).generate((" ").join(names_combined))
    plt.figure(figsize=(16,9))
    plt.imshow(wordcloud, interpolation="bilinear")
    plt.axis("off")
    plt.show()
```

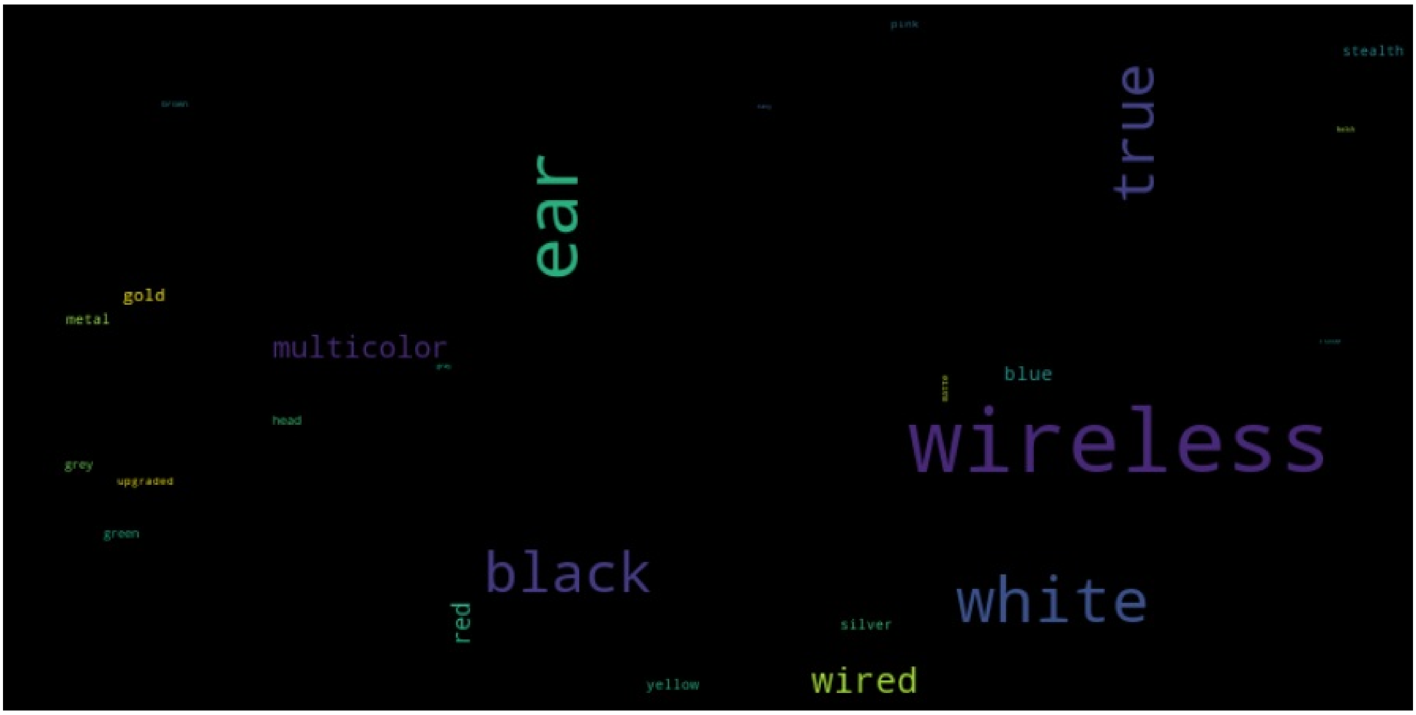
In [12]:

```
#generate most used words in the names of ear buds
wordcloud_gen(df, 'name')
# some of the famous words are earbud, bluetooth, wireless, earphone
```



In [13]:

```
#generate most used words in the property of ear buds
wordcloud_gen(df, 'prop')
# some of the famous words are wireless, white, black, wired, true
#seems like there are more white and black earbuds athan any other colors
#Going for any other color , rather people produce multicolor earbuds
```

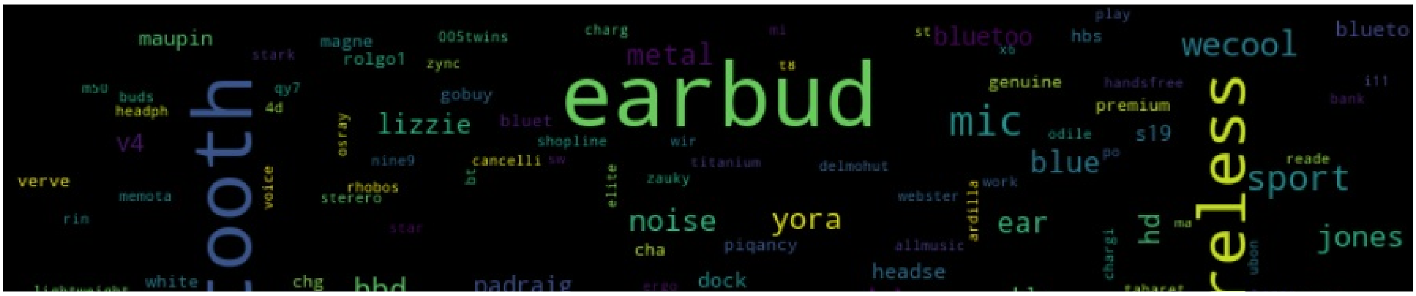


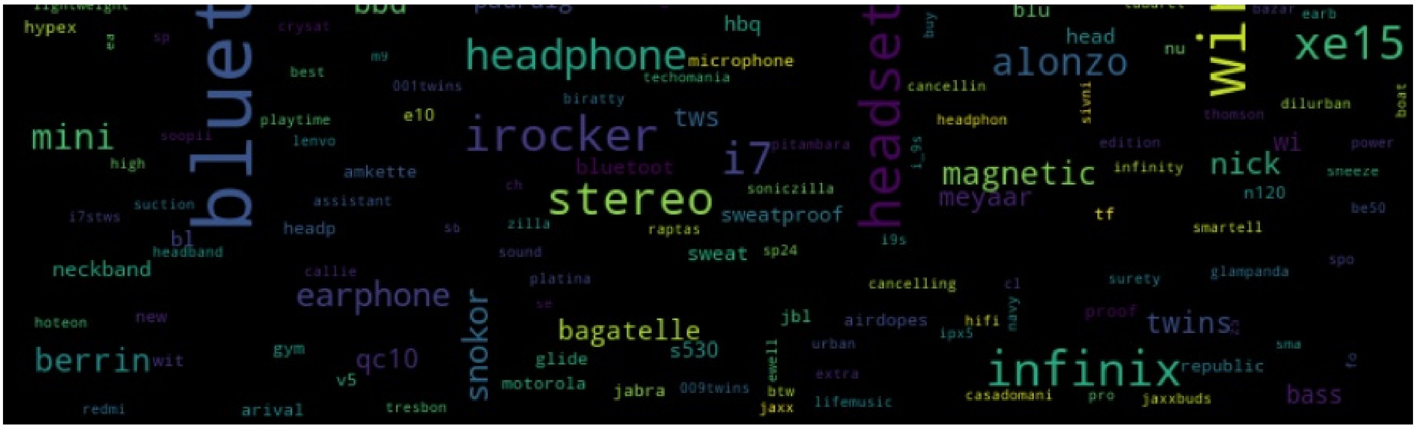
In [16]:

```
def wordcloud_gen_noun(df, column_name):
    '''only generate word cloud which are proper noun based on named entity recognition''
'
    names_combined = []
    regex = r'\w+'
    for name in df[column_name]:
        words = re.findall(regex,name)
        words = [word.lower() for word in words]
        names_combined.extend(words)
    text = (" ").join(names_combined)

    sp = spacy.load(r"C:\Users\Gaurav\anaconda3\Lib\site-packages\en_core_web_sm\en_core
_web_sm-2.3.1")
    sen = sp(text)
    #for word in sen[:20]:
    #    print(f'{word.text:{12}} {word.pos_:{10}} {word.tag_:{8}} {spacy.explain(word.ta
g_)}')
    noun = []
    for word in sen:
        if word.pos_ in ['PROPN']:
            noun.append(word.text)
    wordcloud = WordCloud(width=800, height=400,max_font_size=50,
                background_color="black", collocations=False).generate((" ").join(noun))
    plt.figure(figsize=(16,9))
    plt.imshow(wordcloud, interpolation="bilinear")
    plt.axis("off")
    plt.show()
```

In [17]:

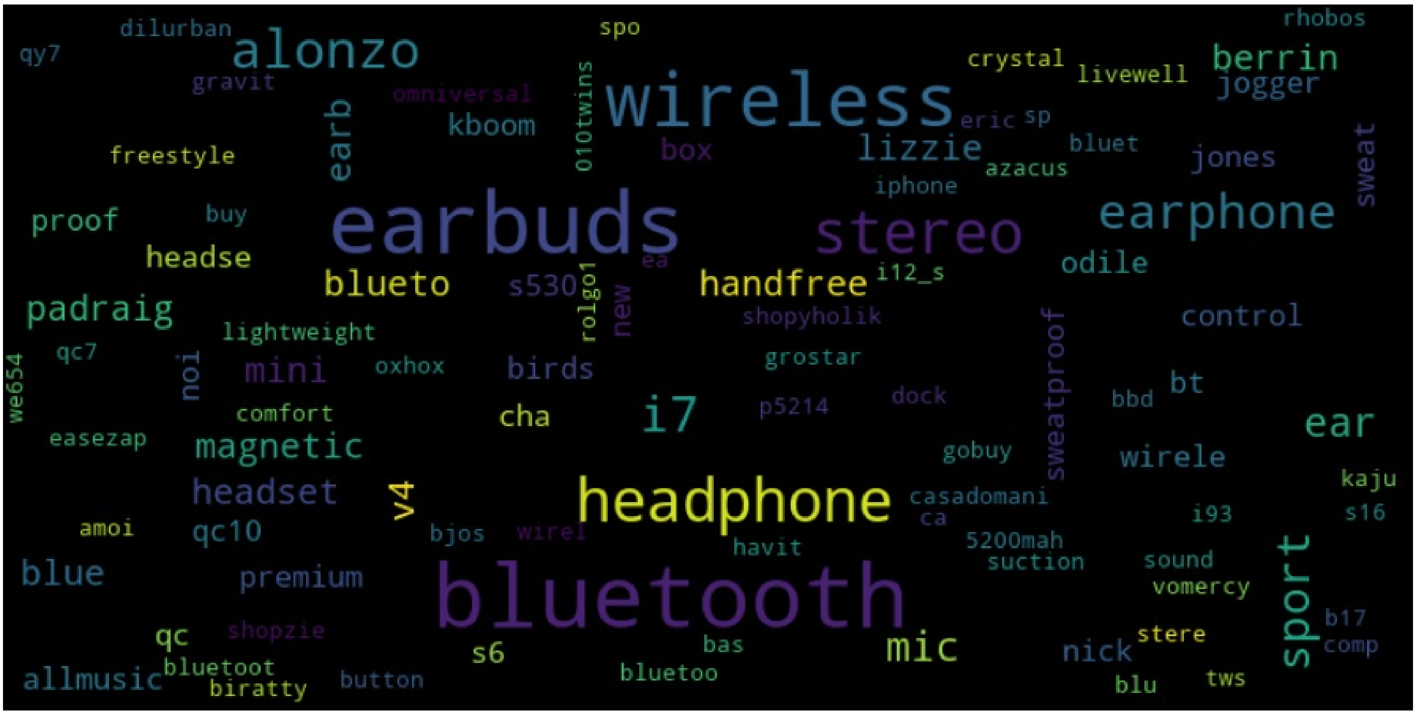
```
#what people like [only proper nouns]
filt = (df['rating']>=3)
wordcloud_gen_noun(df[filt], 'name')
#people like infinix, irocker, alonzo, etc
```





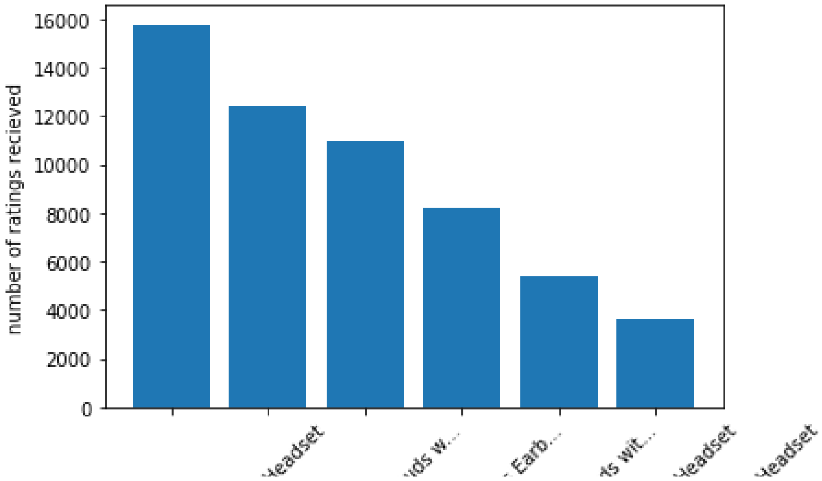
In [18]:

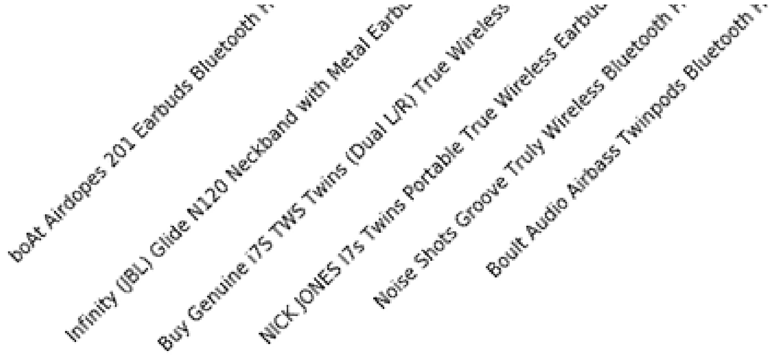
```
#what people don't like [only proper nouns]
filt = (df['rating']<3)
wordcloud_gen_noun(df[filt], 'name')
#people don't like blueto, jogger, lizzie, etc
```



In [19]:

```
#Maximum sold earbuds as per maximum number of ratings recieved
max_rated = df.sort_values('num_ratings', ascending=False)[:10]
plt.bar(x=max_rated['name'], height=max_rated['num_ratings'])
plt.xticks(rotation=45)
plt.ylabel('number of ratings recieved')
plt.show()
#boAt is the leader here
```

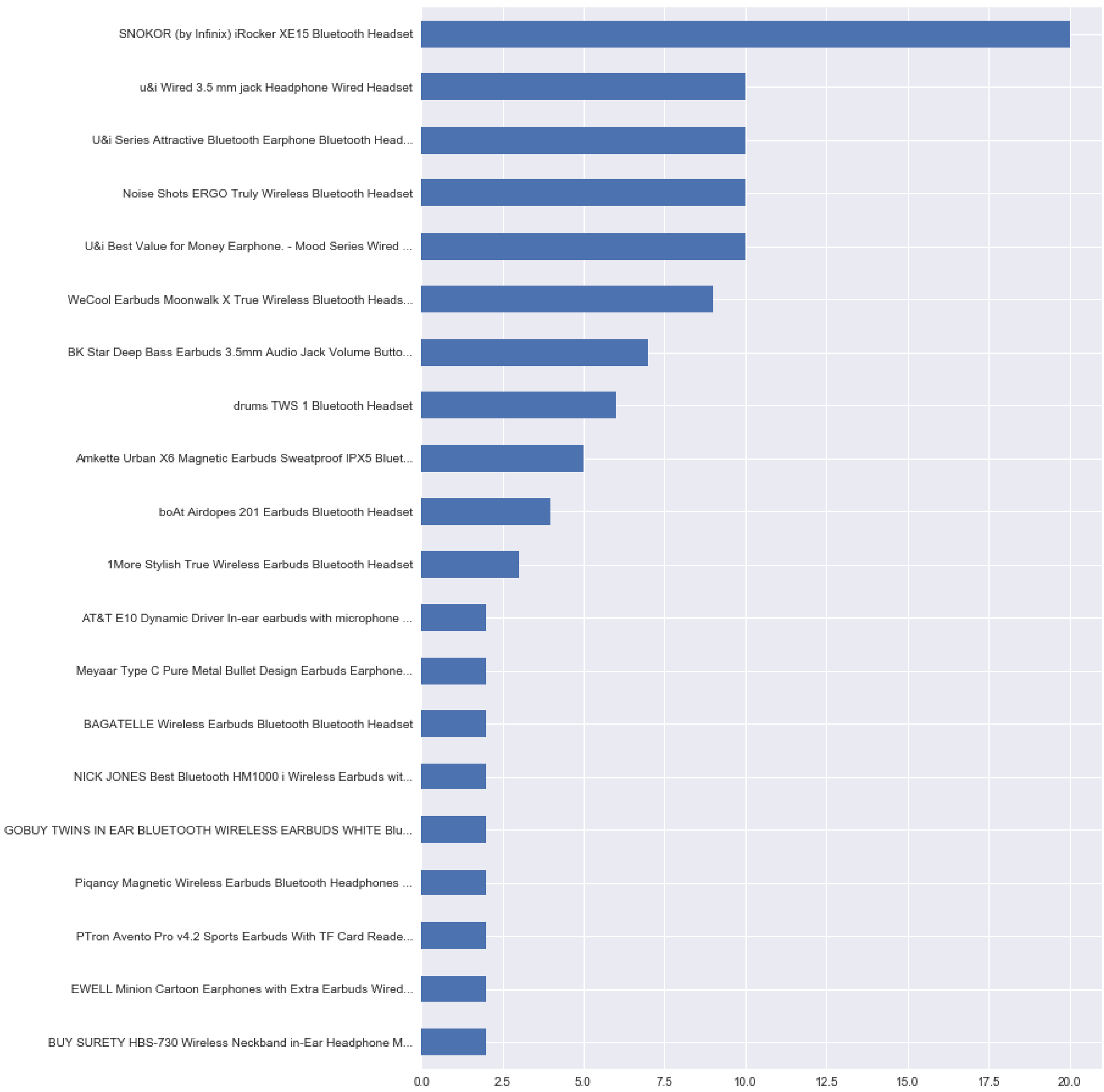




In [20]:

```
# Top 20 listed eabuds [Maximum variety over the website]
plt.figure(figsize=(16,4))
plt.style.use('seaborn')
plt.figure(figsize=(10,16))
df['name'].value_counts().sort_values()[-20:].plot.barh()
plt.show()
#SNOKER is the leader here
```

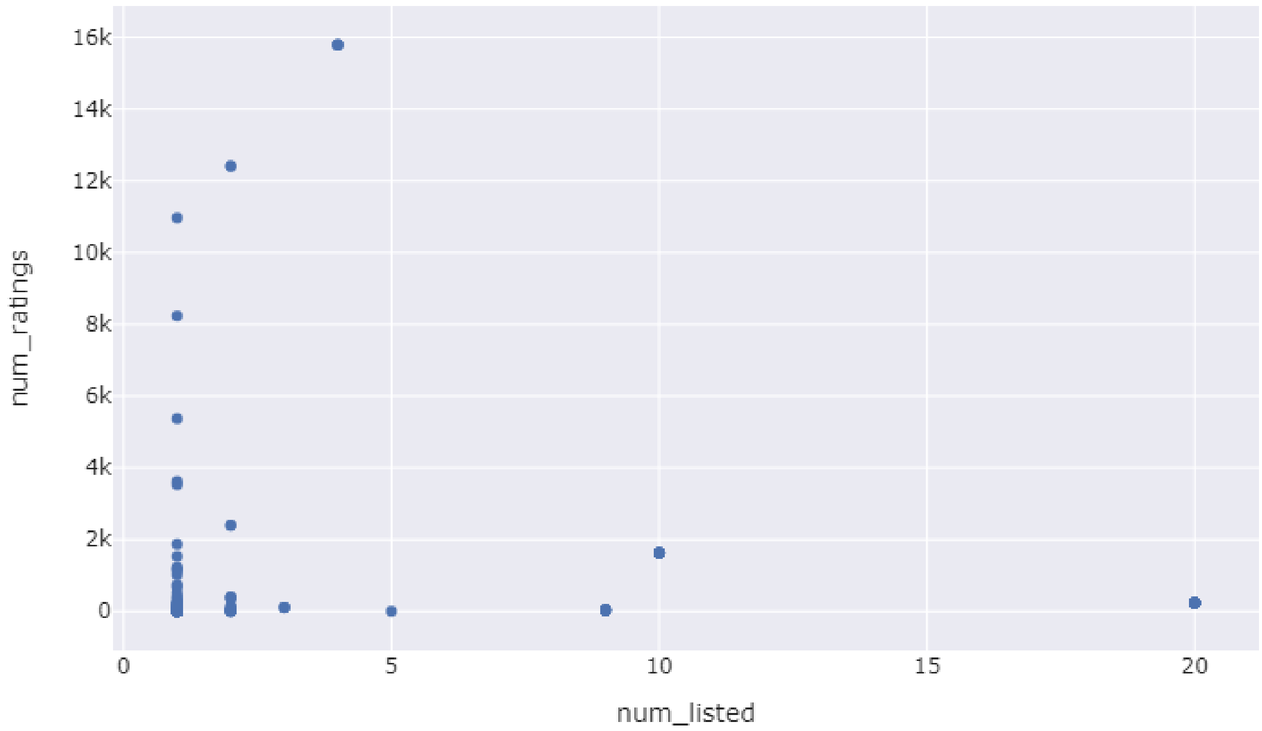
```
<Figure size 1152x288 with 0 Axes>
```



In [17]:

In [17]:

```
#Does most listed gets more buyers [by evaluating number of ratings]
num_listed = df['name'].value_counts().sort_values()
df_copy = df.copy()
df_copy['num_listed'] = df.apply(lambda x: num_listed[x['name']], axis=1)
fig = px.scatter(df_copy.dropna(), x='num_listed', y='num_ratings', template='seaborn')
fig.show("png", width=800, height=500)
#No correlation, Maximum number of times the listed doesnot gurantee maximum sales
```

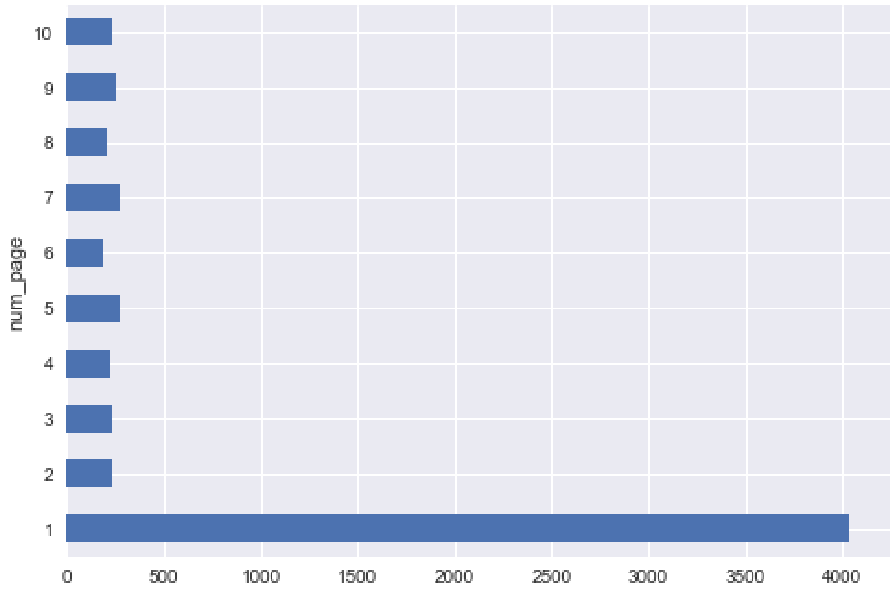


In [22]:

```
#Does items listed on the initial pages acquire more customers [by evaluating more number
of ratings]
df.groupby('num_page').apply(lambda x: x['num_ratings'].mean())[:10].plot.barh()
#Yes it does look like page 1 has maximum rated products rather than other pages
```

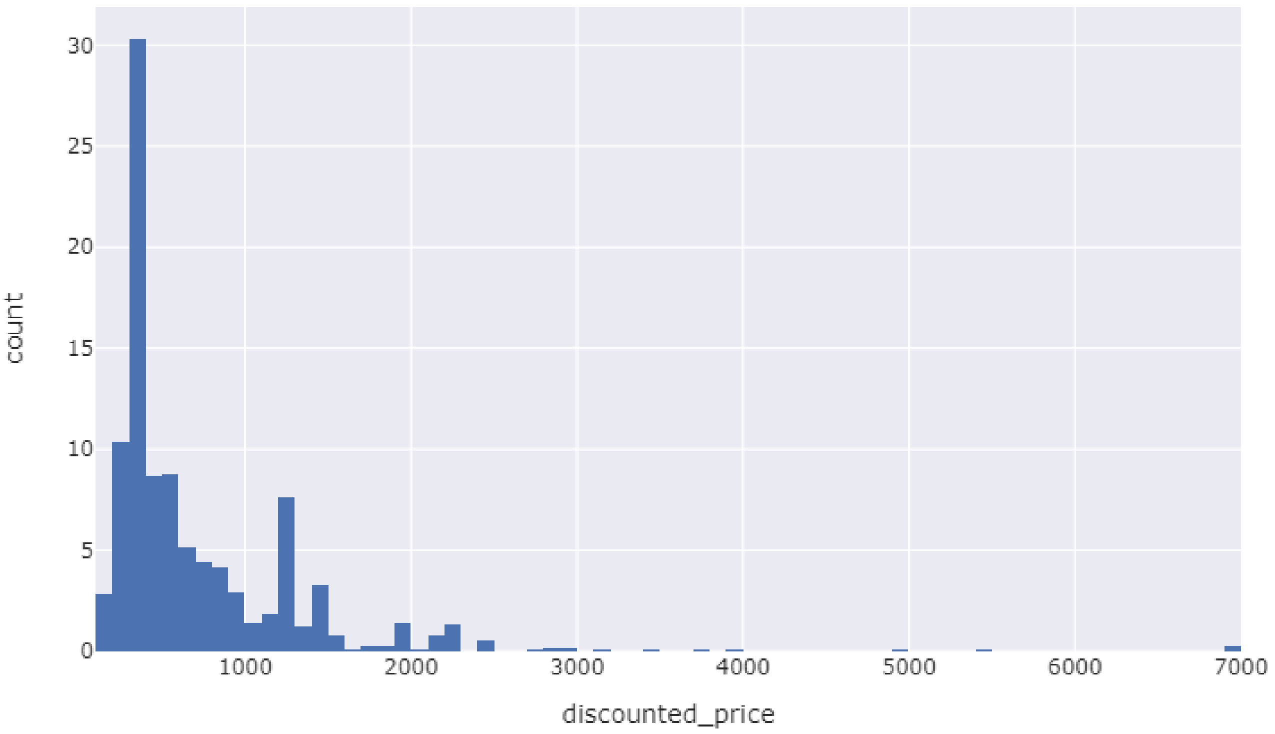
Out[22]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x25e96ab5e48>
```



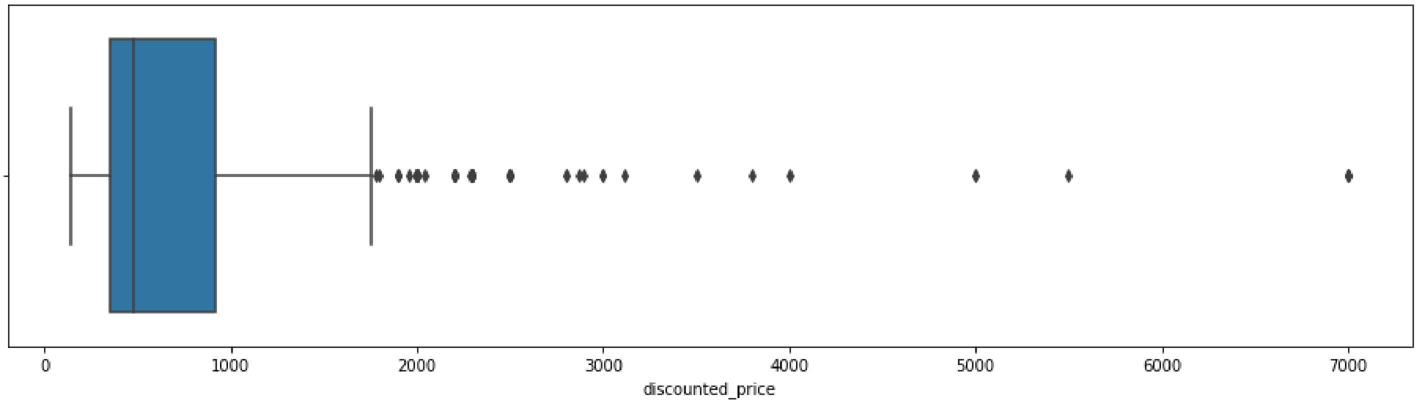
In [19]:

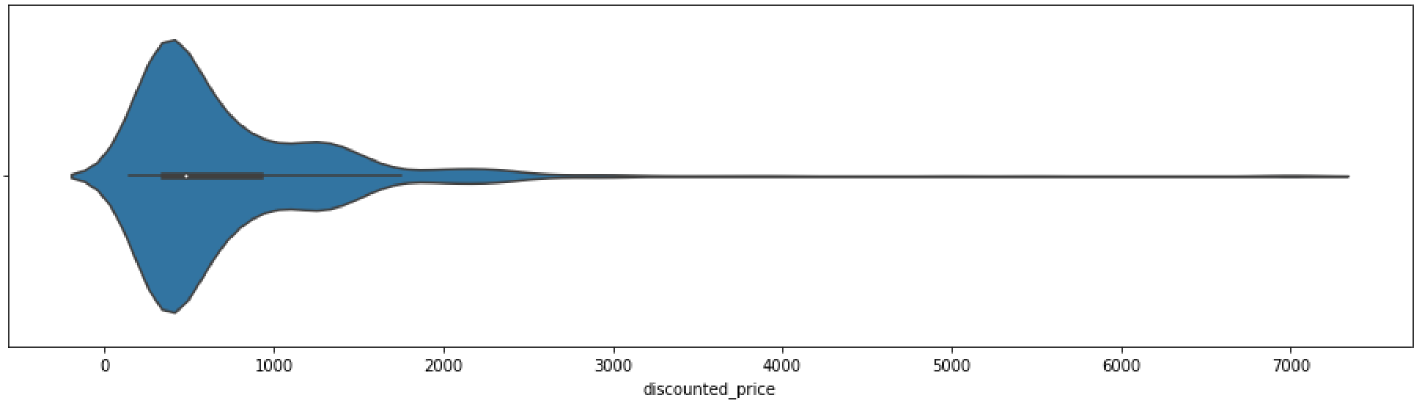
```
#usual prices of earbuds
fig = px.histogram(df, x='discounted_price', template='seaborn', histnorm='percent')
fig.show("png", width=800, height=500)
plt.figure(figsize=(16,4))
sns.boxplot(df['discounted_price'])
plt.figure(figsize=(16,4))
sns.violinplot(df['discounted_price'])
```



Out[19]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x236fac45648>
```

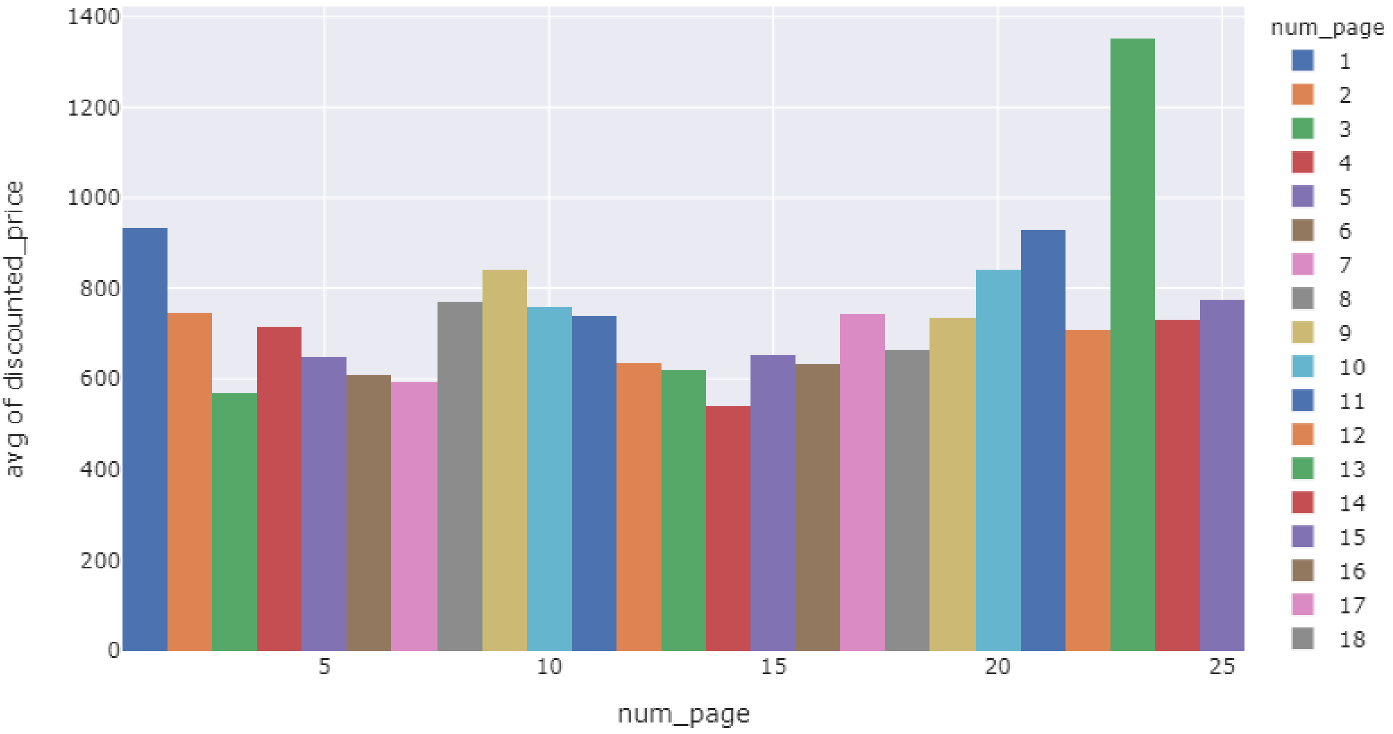




In [20]:

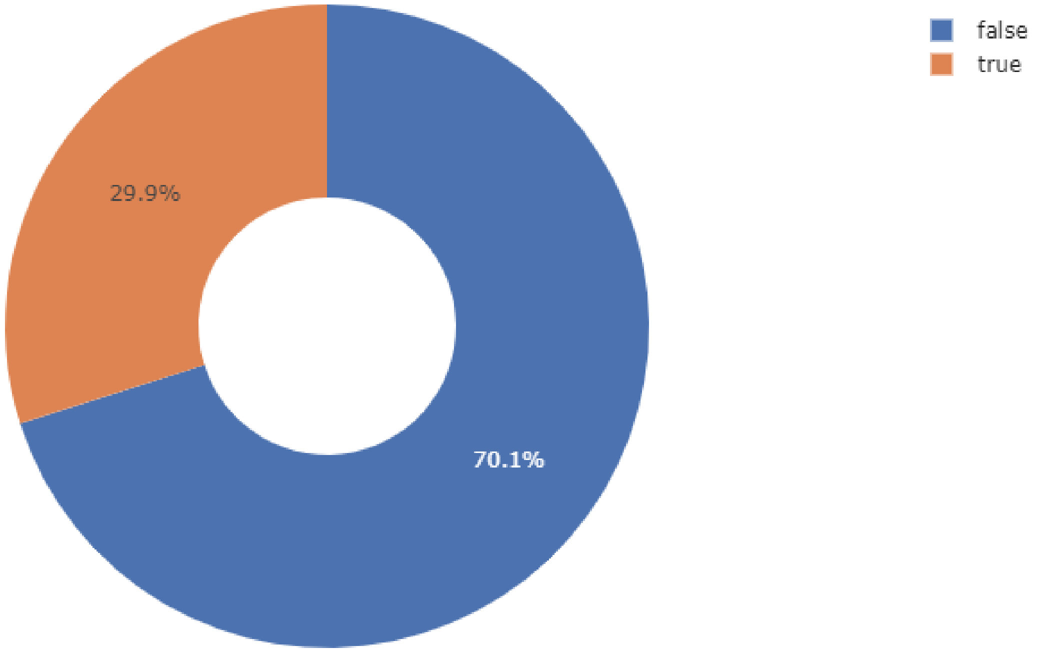
```
#average price of earbuds w.r.t. different pages of website
```

```
#average prive of earbuds w.r.t. different pages of website
fig = px.histogram(df, x='num_page', y='discounted_price', template='seaborn', histfunc=
'avg', color='num_page')
fig.show("png", width=800, height=500)
#No general trend, prices are evenly distributed across pages
```



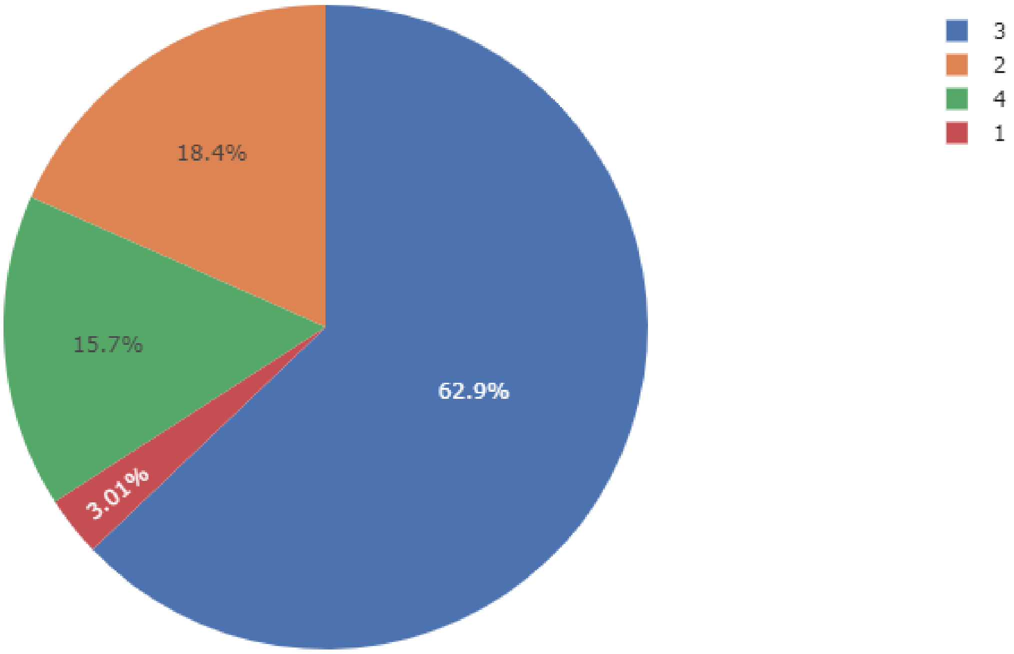
In [21]:

```
#percentage of products not getting rated
fig = px.pie(df['rating'].notna(), names='rating', template='seaborn')
fig.update_traces(hole=0.4)
fig.show("png", width=800, height=500)
#70% of products are not getting ratings
```



In [22]:

```
#Rating disctribution
fig = px.pie(df['rating'].dropna().apply(lambda x: int(x)), names='rating', template='se
aborn')
fig.show("png", width=800, height=500)
#In general people are diplomatic and gives 3 majorly ~60% of times
```


18.4%
15.7%
62.9%
3.01%
3
2
4
1