Text Sentiment Analysis ¶

- identifies the subjective information from text by classifying it as positive, neutral or negative.
- an automated method to clasify opinions as negative, positive or neutral.
- Lexicon-based: count number of positive and negative words in given text and see which side is more.
- Machine learning based: train a classifier using the pre-labeled dataset with all the classes i.e. positive, negative, and neutral.
- Example:
  - "The rooms in the hotel were too smelly."
    - The sentence is expressing a negative opinion about the hotel.
    - Particularly, about the "rooms".
    - Since particular features (i.e. aspects) are emphasized -> aspect-based sentiment analysis.

Performing Sentiment Analysis using Text Classification

- We will use Multi-Nomial Naive Bayes Classification using scikit-learn.
- Problem: "Sentiment Analysis of Movie, Reviews" using the dataset from https://www.kaggle.com/c/sentiment-analysis-on-movie-reviews/data (https://www.kaggle.com/c/sentiment-analysis-on-movie-reviews/data) .

Pandas

- Popular Python library for data manipulation and analysis.

In [14]:

```
# Import pandas
import pandas as pd
import matplotlib.pyplot as plt
```

In [5]:

```
# Load data
data=pd.read_csv('data/movie_reviews/train.tsv', sep='\t')
```

In [7]:

```
# check related information
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 156060 entries, 0 to 156059
Data columns (total 4 columns):
PhraseId      156060 non-null int64
SentenceId    156060 non-null int64
Phrase        156060 non-null object
Sentiment     156060 non-null int64
dtypes: int64(3), object(1)
memory usage: 4.8+ MB
```

Lets do some Exploratory analysis

In [6]:

```
# Explore the data
data.head()
```

Out[6]:

In [11]:

```
data.Sentiment.value_counts()
```

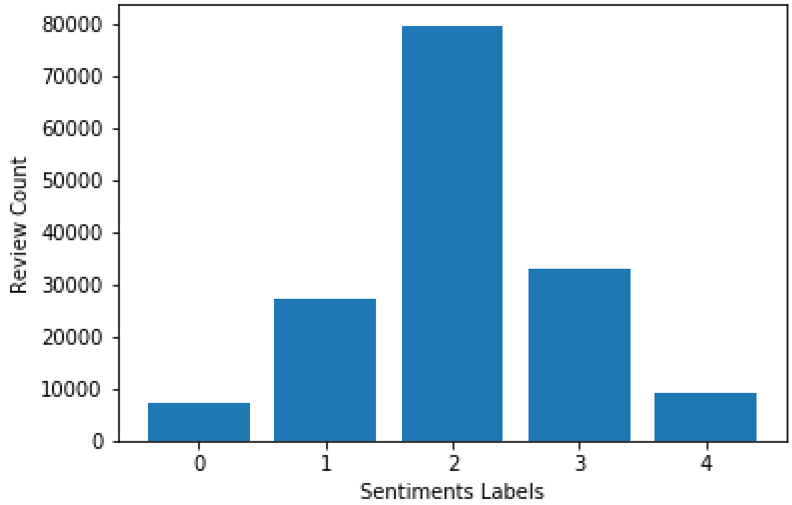
Out[11]:

There are 5 sentiment labels:

- 0 - negative
- 1 - somewhat negative
- 2 - neutral
- 3 - somewhat positive
- 4 - positive

In [16]:

```
Sentiment_count=data.groupby('Sentiment').count()
plt.bar(Sentiment_count.index.values, Sentiment_count['Phrase'])
plt.xlabel('Sentiments Labels')
plt.ylabel('Review Count')
plt.show()
```

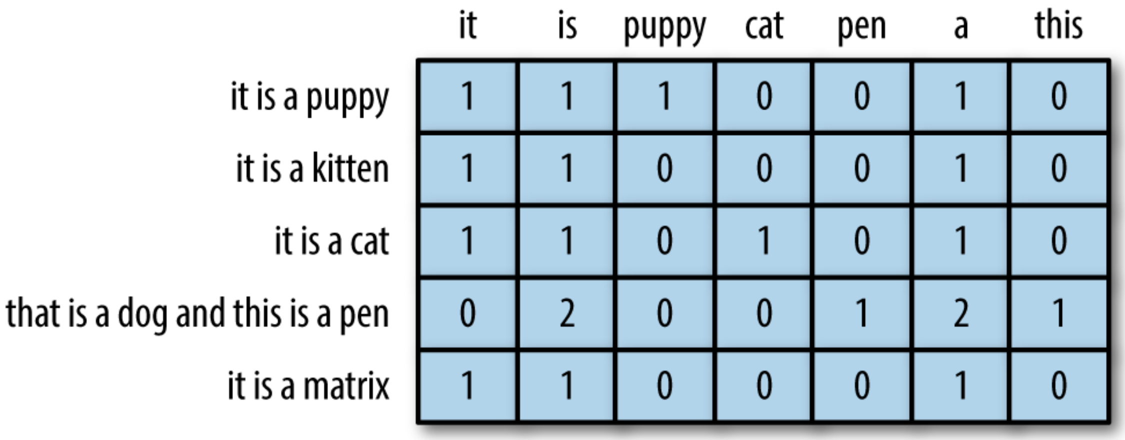


In [ ]:

```
```

Feature Generation with Bag of Words(BoW)

- Feature generation is done by transforming the text into a numerical representation, usually a vector.
- BoW is the process of extracting features from the text.
- It converts text into the matrix of occurrence of words within a document (document-term matrix), i.e. it shows if given words is present or not in a document.
- Document-term matrix example:



	it	is	puppy	cat	pen	a	this
it is a puppy	1	1	1	0	0	1	0
it is a kitten	1	1	0	0	0	1	0
it is a cat	1	1	0	1	0	1	0
that is a dog and this is a pen	0	2	0	0	1	2	1
it is a matrix	1	1	0	0	0	1	0

In [17]:

```
from sklearn.feature_extraction.text import CountVectorizer
from nltk.tokenize import RegexpTokenizer
#tokenizer to remove unwanted elements from out data like symbols and n
token = RegexpTokenizer(r'[a-zA-Z0-9]+')
cv = CountVectorizer(lowercase=True,stop_words='english',ngram_range =
text_counts= cv.fit_transform(data['Phrase'])
```

Split train and test set

- For unbiased examination of performance of the ML algorithm we need to divide the dataset into a training set and a test set.

In [18]:

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(text_counts, data['
```

Model Building

- ML algorithm: Multinomial Naive Bayes

In [19]:

```
from sklearn.naive_bayes import MultinomialNB
#Import scikit-learn metrics module for accuracy calculation
from sklearn import metrics
# Model Generation Using Multinomial Naive Bayes
clf = MultinomialNB().fit(X_train, y_train)
```

Lets do the prediction

In [20]:

```
predicted= clf.predict(X_test)
```

How about the accuracy?

In [21]:

```
print("MultinomialNB Accuracy:",metrics.accuracy_score(y_test, predicte
```

```
('MultinomialNB Accuracy:', 0.6049169122986885)
```

- The classifier performacne got is 60.49% using CountVector(or BoW), which is not considered as good accuracy.
- A limitations of Naive Bayes i.e. the assumption of independent predictors.
- How can we improve it?
    - Can we use features based on TFIDF?
    - any other better algorithms?
    - How about the input datasize?
    - or...?

References:

- https://monkeylearn.com/sentiment-analysis/ (https://monkeylearn.com/sentiment-analysis/)
- https://www.datacamp.com/community/tutorials/text-analytics-beginners-nltk (https://www.datacamp.com/community/tutorials/text-analytics-beginners-nltk)
- https://www.oreilly.com/library/view/feature-engineering-for/9781491953235/ch04.html (https://www.oreilly.com/library/view/feature-engineering-for/9781491953235/ch04.html)

```
In [ ]:
```