

Name: Atharv Satish Nikam

Sentiment Analysis:

Dataset: Amazon Product Reviews [category: Software]

▼ Importing and Downloading required packages

```
import numpy as np
import pandas as pd
import json
import nltk
```

```
from google.colab import drive
drive.mount('/gdrive')
```

Mounted at /gdrive

```
nltk.download('sentiment')
from nltk.corpus import sentiment as sw
```

```
nltk.download('wordnet')
```

```
nltk.download('punkt')
```

```
[nltk_data] Downloading package sentiment to /root/nltk_data...
[nltk_data] Unzipping corpora/sentiment.zip.
[nltk_data] Downloading package wordnet to /root/nltk_data...
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data] Unzipping tokenizers/punkt.zip.
True
```

```
from nltk.corpus import stopwords
```

```
nltk.download('stopwords')
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data] Unzipping corpora/stopwords.zip.
True
```

```
nltk.download('vader_lexicon')
```

```
[nltk_data] Downloading package vader_lexicon to /root/nltk_data...
True
```

▼ Loading the JSON Data

```
data=[]
with open('/gdrive/My Drive/Software.json', 'r') as jsonFile:
    for line in jsonFile:
        data.append(json.loads(line))
```

```
print("Total number of reviews loaded: ", len(data))
```

```
Total number of reviews loaded: 459436
```

```
data[1:5]
```

```
[{'overall': 4.0,
  'verified': True,
  'reviewTime': '02 23, 2014',
  'reviewerID': 'A1YCCU0YRLS0FE',
  'asin': '0077613252',
  'style': {'Format': 'Loose Leaf'},
  'reviewerName': 'Rosalind White Ames',
  'reviewText': 'I am really enjoying this book with the worksheets that make you review your goals, what to do when you do not make
```

```

it, it reminds me of my human sexuality classwork.',
'summary': 'Health',
'unixReviewTime': 1393113600},
{'overall': 1.0,
'vote': '7',
'verified': True,
'reviewTime': '02 17, 2014',
'reviewerID': 'A1BJHRQDYVAY2J',
'asin': '0077613252',
'style': {'Format': ' Loose Leaf'}},
'reviewerName': 'Allan R. Baker',
'reviewText': 'IF YOU ARE TAKING THIS CLASS DON"T WASTE YOUR MONEY ON THIS SO CALLED BOOK! $140.00 FOR A "BOOK" THAT ISIN\T EVEN
BOUND LOOSE LEAFS, THAT I HAD TO PROVIDE MY OWN BINDER FOR. TURNS OUT YOU CAN BUY ACCESS TO THE BOOK AT MCGRAW HILL CONNECT CORE FOR
$70.00\n\nTHIS BOOK IS A COMPLETE WASTE OF MONEY!',
'summary': 'ARE YOU KIDING ME?',
'unixReviewTime': 1392595200},
{'overall': 3.0,
'vote': '3',
'verified': True,
'reviewTime': '02 17, 2014',
'reviewerID': 'APRDVZ6QBIQXT',
'asin': '0077613252',
'style': {'Format': ' Loose Leaf'}},
'reviewerName': 'Lucy',
'reviewText': "This book was missing pages!!! Important pages. I couldn't answer some test questions because of it!! I have never had
this happen before.",
'summary': 'missing pages!!',
'unixReviewTime': 1392595200},
{'overall': 5.0,
'verified': False,
'reviewTime': '10 14, 2013',
'reviewerID': 'A2JZTTBSLS1QXV',
'asin': '0077775473',
'reviewerName': 'Albert V.',
'reviewText': 'I have used LearnSmart and can officially say that this is an amazing study tool that quickly and simply adapts to
your style of learning. You can access it at anytime and it is on the go! Once you start using LearnSmart you will quickly realize that
this is the best way to learn and study.\n\nI am a business student and I did not use LearnSmart for my Accounting I class, however, I
did use it for my Accounting II class. The grade difference from Accounting I to Accounting II was a whole letter grade... thanks to
LearnSmart!\n\nEvery college student should definitely check it out!',
'summary': 'Best study product out there!',
'unixReviewTime': 1381708800}]

```

```
#keys in the data
```

```
print(data[0].keys())
```

```
dict_keys(['overall', 'verified', 'reviewTime', 'reviewerID', 'asin', 'style', 'reviewerName', 'reviewText', 'summary', 'unixReviewTime'])
```

```
print(data[0]['reviewText'])
```

```
The materials arrived early and were in excellent condition. However for the money spent they really should've come with a binder and r
```

```
# to get only reviews from data
```

```
reviews = []
```

```
for item in data:
```

```
    if "reviewText" in item.keys():
```

```
        review = item["reviewText"]
```

```
        reviews.append(review)
```

```
print("total no of reviews extracted from json: ", len(reviews))
```

```
total no of reviews extracted from json: 459370
```

```
reviews[1:10]
```

```

['I am really enjoying this book with the worksheets that make you review your goals, what to do when you do not make it, it reminds me
of my human sexuality classwork.',
'IF YOU ARE TAKING THIS CLASS DON"T WASTE YOUR MONEY ON THIS SO CALLED BOOK! $140.00 FOR A "BOOK" THAT ISIN\T EVEN BOUND LOOSE LEAFS,
THAT I HAD TO PROVIDE MY OWN BINDER FOR. TURNS OUT YOU CAN BUY ACCESS TO THE BOOK AT MCGRAW HILL CONNECT CORE FOR $70.00\n\nTHIS BOOK
IS A COMPLETE WASTE OF MONEY!',
"This book was missing pages!!! Important pages. I couldn't answer some test questions because of it!! I have never had this happen
before.",
'I have used LearnSmart and can officially say that this is an amazing study tool that quickly and simply adapts to your style of
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'Strong background, good read, quite up to date. It takes a holistic approach to the subject. Lack of references is a bit

```

```
surprising.\nJorge',
'If you live on Mars and never heard of the internet, this is a good book to have.',
'i got this book on amazon and it ended up saving me a lot of money. It was in great condition and has been extremely useful to me.',
'I was very happy with this purchase because the shipment was super fast. Thanks',
'Recieved in a timely manner- book in great condition. Some markings- but ledgible. Will be ordering again from this site for my
school books- saved over $200.']
```

▼ HTML parsing

```
from html import unescape
```

```
#to save parsed reviews
parsedReviews = []
```

```
#used loop to process each review
for review in reviews:
    parsedReview = unescape(review)
    # print(parsedReview)
    parsedReviews.append(parsedReview)
```

```
parsedReviews[1:10]
```

```
['I am really enjoying this book with the worksheets that make you review your goals, what to do when you do not make it, it reminds me
of my human sexuality classwork.',
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```

▼ Removing Punctuations

```
# punctuations removal
import re
```

```
punc_pattern = r'^[\w\s]'
```

```
modifiedReviews = []
```

```
for review in parsedReviews:
    review2 = re.sub(punc_pattern, "", review)
    modifiedReviews.append(review2)
```

```
modifiedReviews[1:10]
```

```
['I am really enjoying this book with the worksheets that make you review your goals what to do when you do not make it it reminds me
of my human sexuality classwork',
'IF YOU ARE TAKING THIS CLASS DONT WASTE YOUR MONEY ON THIS SO CALLED BOOK 14000 FOR A BOOK THAT ISINT EVEN BOUND LOOSE LEAFS THAT I
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'i got this book on amazon and it ended up saving me a lot of money It was in great condition and has been extremely useful to me',
```

```
'I was very happy with this purchase because the shipment was super fast Thanks',
'Recieved in a timely manner book in great condition Some markings but ledgible Will be ordering again from this site for my school
books saved over 200']
```

▼ Removing "\n"

```
cleanedReviews = []

for review in modifiedReviews:
    # replacing "\n" with a space
    cleanedReview = review.replace("\n", " ")
    cleanedReviews.append(cleanedReview)

cleanedReviews[1:10]

['I am really enjoying this book with the worksheets that make you review your goals what to do when you do not make it it reminds me
of my human sexuality classwork',
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```

▼ Removing Apostrophe

```
noApoReviews = []

for review in cleanedReviews:
    #removing apostrophe
    # tweet = re.sub("'", "", tweet)

    #expanding
    review = re.sub(r"\b([T|t])here's\b", r"\1here is", review) #there's
    review = re.sub(r"\b([I|i])sn't\b", r"\1s not", review) #isn't
    review = re.sub(r"\b([I|i])t's\b", r"\1t is", review) #it's
    review = re.sub(r"\b([I|i])'m\b", r"\1 am", review) # i'm
    review = re.sub(r"\b([Y|y])ou're\b", r"\1ou are", review) # you're

    noApoReviews.append(review)

noApoReviews[1:10]

['I am really enjoying this book with the worksheets that make you review your goals what to do when you do not make it it reminds me
of my human sexuality classwork',
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books saved over 200']
```

▼ Converting texts to lowercase

```
lReviews = []

for review in noApoReviews:
    lReview = review.lower()
    lReviews.append(lReview)

lReviews[1:10]

['i am really enjoying this book with the worksheets that make you review your goals what to do when you do not make it it reminds me
of my human sexuality classwork',
 'if you are taking this class dont waste your money on this so called book 14000 for a book that isint even bound loose leafs that i
had to provide my own binder for turns out you can buy access to the book at mcgraw hill connect core for 7000 this book is a complete
waste of money',
 'this book was missing pages important pages i couldnt answer some test questions because of it i have never had this happen before',
 'i have used learnsmart and can officially say that this is an amazing study tool that quickly and simply adapts to your style of
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jorge',
 'if you live on mars and never heard of the internet this is a good book to have',
 'i got this book on amazon and it ended up saving me a lot of money it was in great condition and has been extremely useful to me',
 'i was very happy with this purchase because the shipment was super fast thanks',
 'recieved in a timely manner book in great condition some markings but ledgible will be ordering again from this site for my school
books saved over 200']
```

▼ Removing StopWords

```
noStopReviews = []

stop = stopwords.words('english')

for review in lReviews:
    # Tokenizing
    tokens = nltk.tokenize.word_tokenize(review)

    #new list to store the sentence without stopwords
    newReview = []
    for word in tokens:
        if word not in stop:
            newReview.append(word)

    # Converting list to a string
    noStopReview = " ".join(newReview)
    noStopReviews.append(noStopReview)

noStopReviews[1:10]

['really enjoying book worksheets make review goals make reminds human sexuality classwork',
 'taking class dont waste money called book 14000 book isint even bound loose leafs provide binder turns buy access book mcgraw hill
connect core 7000 book complete waste money',
 'book missing pages important pages couldnt answer test questions never happen',
 'used learnsmart officially say amazing study tool quickly simply adapts style learning access anytime go start using learnsmart
quickly realize best way learn study business student use learnsmart accounting class however use accounting ii class grade difference
accounting accounting ii whole letter grade thanks learnsmart every college student definitely check',
 'strong background good read quite date takes holistic approach subject lack references bit surprising jorge',
 'live mars never heard internet good book',
 'got book amazon ended saving lot money great condition extremely useful',
 'happy purchase shipment super fast thanks',
 'recieved timely manner book great condition markings ledgible ordering site school books saved 200']
```

▼ Calculating the polarity for Sentiment Analysis of the reviews

```
def polarity(review):
    tokens = nltk.tokenize.word_tokenize(review)
```

```

pos_score = 0
neg_score = 0
obj_score = 0

#score for each token
for token in tokens:
    synsets = list(swn.senti_synsets(token))

    if synsets:
        synset = synsets[0]
        pos_score += synset.pos_score()
        neg_score += synset.neg_score()
        obj_score += synset.obj_score()
    #if the word is not present in sentiwordnet
    #then assigning 0 scores
    else:
        pos_score += 0.0
        neg_score += 0.0

return pos_score, neg_score, obj_score

polarityList = []

```

▼ Here, processing 100 reviews for faster processing; full data [490,000] took 7.5 hours to complete processing

```

for review in noStopReviews[:100]:
    pos_score, neg_score, obj_score = polarity(review)
    polarityList.append((pos_score, neg_score, obj_score))

for i, pol in enumerate(polarityList):
    review = reviews[i]
    print("Review:", review)
    print("Positive score:", pol[0])
    print("Negative score:", pol[1])
    print("Objective score:", pol[2])

    if(pol[0] > pol[1]):
        print("SENTIMENT OF A REVIEW IS POSITIVE.")
    elif(pol[0] == pol[1]):
        print("SENTIMENT OF A REVIEW IS NEUTRAL.")
    else:
        print("SENTIMENT OF A REVIEW IS NEGATIVE.")

print()

```

```
Objective score: 8.75
SENTIMENT OF A REVIEW IS POSITIVE.
```

Review: I've been using Dreamweaver (and it's predecessor Macromedia's UltraDev) for many years. For someone who is an experienced w

On the other hand, this is a great tool for someone who is a relative novice at web design. It starts off with a basic overview of H

It's important to note that there's a long gap from site design to actual implementation. This course teaches you how to implement a

As I said above, if you're a novice, a relative newcomer or just an experienced web designer who wants a refresher course, this is a

```
Positive score: 6.0
Negative score: 2.5
Objective score: 85.5
SENTIMENT OF A REVIEW IS POSITIVE.
```

Review: The demo is done with the PC version, with references to the Mac version when needed. The video is closed-captioned. You can

Starts off with "what is HTML" and some other basic stuff. Includes topics such as: Planning your Website; Defining a site in DW; Cre

She has a site that has some helpful resources, e.g. checklists for project management and site development, and helpful URLs. All in

She sounds weird, though, like a robot (or Stephen Hawking's voicebox) with her halting, clipped delivery. She tends to be slightly c

UI - at the top of the interface, there's a "Previous Video" button and "Next Video" button. The "Next Video" button is disabled for

There's a "Watch and Work" mode which shrinks the video display to let you work with your copy of DreamWeaver (not included). You can

▼ Sentiment Analysis using SpaCy

Reference: [from class modules] [https://github.com/Jcharis/Natural-Language-Processing-Tutorials/blob/master/NLP_with_SpaCy/NLP%20with%20SpaCy-%20Adding%20Extensions%20Attributes%20in%20SpaCy\(How%20to%20use%20sentiment%20analysis%20in%20SpaCy\).ipynb](https://github.com/Jcharis/Natural-Language-Processing-Tutorials/blob/master/NLP_with_SpaCy/NLP%20with%20SpaCy-%20Adding%20Extensions%20Attributes%20in%20SpaCy(How%20to%20use%20sentiment%20analysis%20in%20SpaCy).ipynb)

```
import spacy
from spacy.tokens import Doc
from nltk.sentiment.vader import SentimentIntensityAnalyzer

nlp = spacy.load("en_core_web_sm")

nlp.pipeline

[('tok2vec', <spacy.pipeline.tok2vec.Tok2Vec at 0x7cfaebe1ab00>),
 ('tagger', <spacy.pipeline.tagger.Tagger at 0x7cfaebe1af80>),
 ('parser', <spacy.pipeline.dep_parser.DependencyParser at 0x7cfaeaca4e40>),
 ('attribute_ruler',
  <spacy.pipeline.attributeruler.AttributeRuler at 0x7cfaeaa2a440>),
 ('lemmatizer',
  <spacy.lang.en.lemmatizer.EnglishLemmatizer at 0x7cfaebe45e80>),
 ('ner', <spacy.pipeline.ner.EntityRecognizer at 0x7cfaeaca4f90>)]
```

```
sent_analyzer = SentimentIntensityAnalyzer()
```

```
def sentimentScores(docx):
    return sent_analyzer.polarity_scores(docx.text)
```

```
Doc.set_extension("sentimenter", getter=sentimentScores)
```

```
for review in noStopReviews[:100]:
    print(review)
    rev = nlp(review)
    sent = (rev._.sentimenter)
    print(sent)
```

```
#getting the maximum score for sentiments
maxScore = max(sent, key=sent.get)
```

```
#sentiment based on the maximum score
if maxScore == 'neg':
    sentiment = "Negative"
elif maxScore == 'neu':
    sentiment = "Neutral"
```

```

else:
    sentiment = "Positive"
print("SENTIMENT OF A REVIEW: ",sentiment)

print()

title dvd introduction adobe premiere elements 11 exactly short introduction maybe nare already experienced operator older version pr
{'neg': 0.041, 'neu': 0.959, 'pos': 0.0, 'compound': -0.1027}
SENTIMENT OF A REVIEW: Neutral

purchased premier elements 11 difficult well impossible use proficient adobe photoshop user way back photoshop 7 new video dvdrom nic
{'neg': 0.052, 'neu': 0.79, 'pos': 0.158, 'compound': 0.6249}
SENTIMENT OF A REVIEW: Neutral

experience adobe premiere elements learn video answered lot questions got good start using video editing program would definitely rec
{'neg': 0.0, 'neu': 0.684, 'pos': 0.316, 'compound': 0.7506}
SENTIMENT OF A REVIEW: Positive

adobe premiere elements 11 difficult firsttime user reading manual give push needed start editing footage chad perkins voice learn vi
{'neg': 0.079, 'neu': 0.776, 'pos': 0.145, 'compound': 0.8173}
SENTIMENT OF A REVIEW: Positive

bought adobe premier elements 11 wanted learn edit footage able get new canon rebel t3i figured whiz microsoft office excel word powe
{'neg': 0.045, 'neu': 0.779, 'pos': 0.176, 'compound': 0.9792}
SENTIMENT OF A REVIEW: Positive

gets mechanics software succinctly augmented well book 100 actually moreanother 5 star tips elements
{'neg': 0.0, 'neu': 0.851, 'pos': 0.149, 'compound': 0.2732}
SENTIMENT OF A REVIEW: Neutral

using teach use premiere elements 11 made realized easy use recommend anyone wont sorry
{'neg': 0.0, 'neu': 0.624, 'pos': 0.376, 'compound': 0.683}
SENTIMENT OF A REVIEW: Positive

human japanese truly superb introduction outside seems daunting tasklearning asian language instruction grammar usage cd language pro
{'neg': 0.0, 'neu': 0.591, 'pos': 0.409, 'compound': 0.9758}
SENTIMENT OF A REVIEW: Positive

got human japanese demo website within week knew purchase one best programs entire computer hj eases japanese language beginning hira
{'neg': 0.0, 'neu': 0.698, 'pos': 0.302, 'compound': 0.9854}
SENTIMENT OF A REVIEW: Positive

first experience human japanese first version released simple program attractive look presented japanese simple way anyone could real
{'neg': 0.028, 'neu': 0.798, 'pos': 0.174, 'compound': 0.9871}
SENTIMENT OF A REVIEW: Positive

first language software purchased love way information organized makes easy learn even gotten far chapters feel confident learned alr
{'neg': 0.0, 'neu': 0.62, 'pos': 0.38, 'compound': 0.9545}
SENTIMENT OF A REVIEW: Positive

human japanese best pc program learning japanese easy juse good quises help remember 1010
{'neg': 0.0, 'neu': 0.441, 'pos': 0.559, 'compound': 0.9136}
SENTIMENT OF A REVIEW: Positive

want learn teach japanese would highly recommend human japanese hooked first chapter made great progress nice user interface includes
{'neg': 0.0, 'neu': 0.528, 'pos': 0.472, 'compound': 0.9617}
SENTIMENT OF A REVIEW: Positive

human japanese elegant yet simple user interface walks users storybook learning japanese lessons simple yet effective contain lots cu
{'neg': 0.019, 'neu': 0.796, 'pos': 0.185, 'compound': 0.977}
SENTIMENT OF A REVIEW: Positive

```


✓ 2s completed at 1:02 PM

● ✕