Magnum Opus Task - 2 Cosine Similarity

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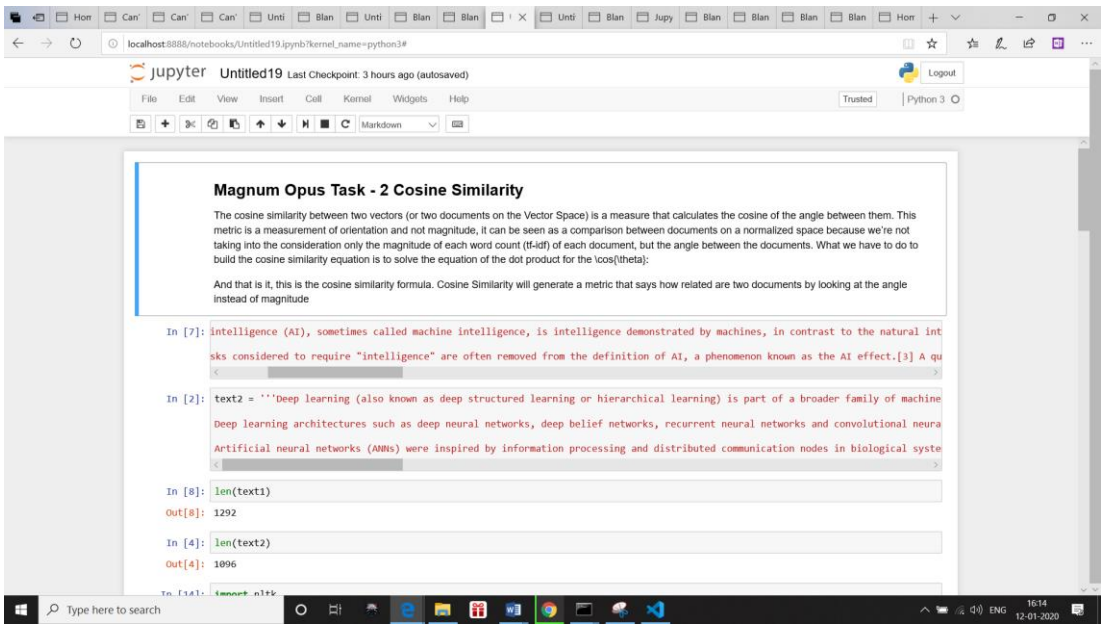
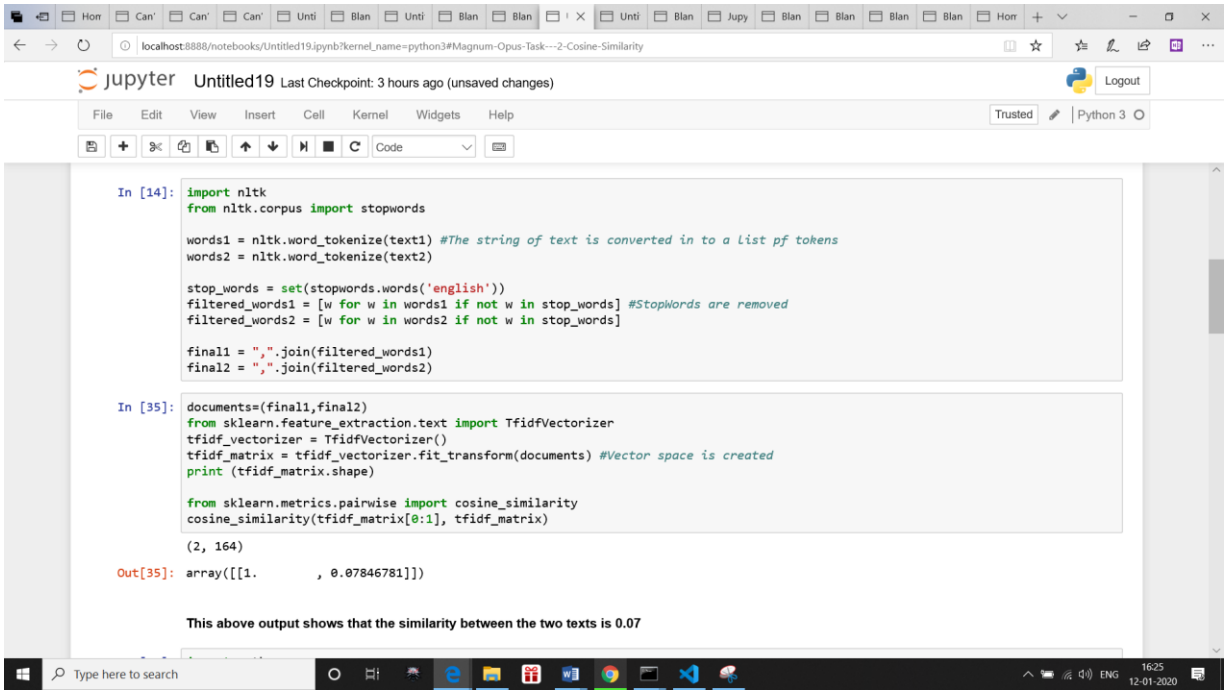
The cosine similarity between two vectors (or two documents on the Vector Space) is a measure that calculates the cosine of the angle between them. This metric is a measurement of orientation and not magnitude, it can be seen as a comparison between documents on a normalized space because we're not taking into the consideration only the magnitude of each word count (tf-idf) of each document, but the angle between the documents. What we have to do to build the cosine similarity equation is to solve the equation of the dot product for the $\cos\theta$:

$$\vec{a} \cdot \vec{b} = \|\vec{a}\| \|\vec{b}\| \cos\theta$$

$$\cos\theta = \frac{\vec{a} \cdot \vec{b}}{\|\vec{a}\| \|\vec{b}\|}$$

And that is it, this is the cosine similarity formula. Cosine Similarity will generate a metric that says how related are two documents by looking at the angle instead of magnitude




localhost:8888/notebooks/Untitled19.ipynb?kernel_name=python3#Magnum-Opus-Task---2-Cosine-Similarity
jupyter Untitled19 Last Checkpoint: 3 hours ago (unsaved changes)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted Python 3
Code
In [14]:
import nltk
from nltk.corpus import stopwords
words1 = nltk.word_tokenize(text1) #The string of text is converted in to a list pf tokens
words2 = nltk.word_tokenize(text2)
stop_words = set(stopwords.words('english'))
filtered_words1 = [w for w in words1 if not w in stop_words] #StopWords are removed
filtered_words2 = [w for w in words2 if not w in stop_words]
final1 = ",".join(filtered_words1)
final2 = ",".join(filtered_words2)
In [35]:
documents=(final1,final2)
from sklearn.feature_extraction.text import TfidfVectorizer
tfidf_vectorizer = TfidfVectorizer()
tfidf_matrix = tfidf_vectorizer.fit_transform(documents) #Vector space is created
print (tfidf_matrix.shape)
from sklearn.metrics.pairwise import cosine_similarity
cosine_similarity(tfidf_matrix[0:1], tfidf_matrix)
(2, 164)
Out[35]: array([[1.   , 0.07846781]])
This above output shows that the similarity between the two texts is 0.07
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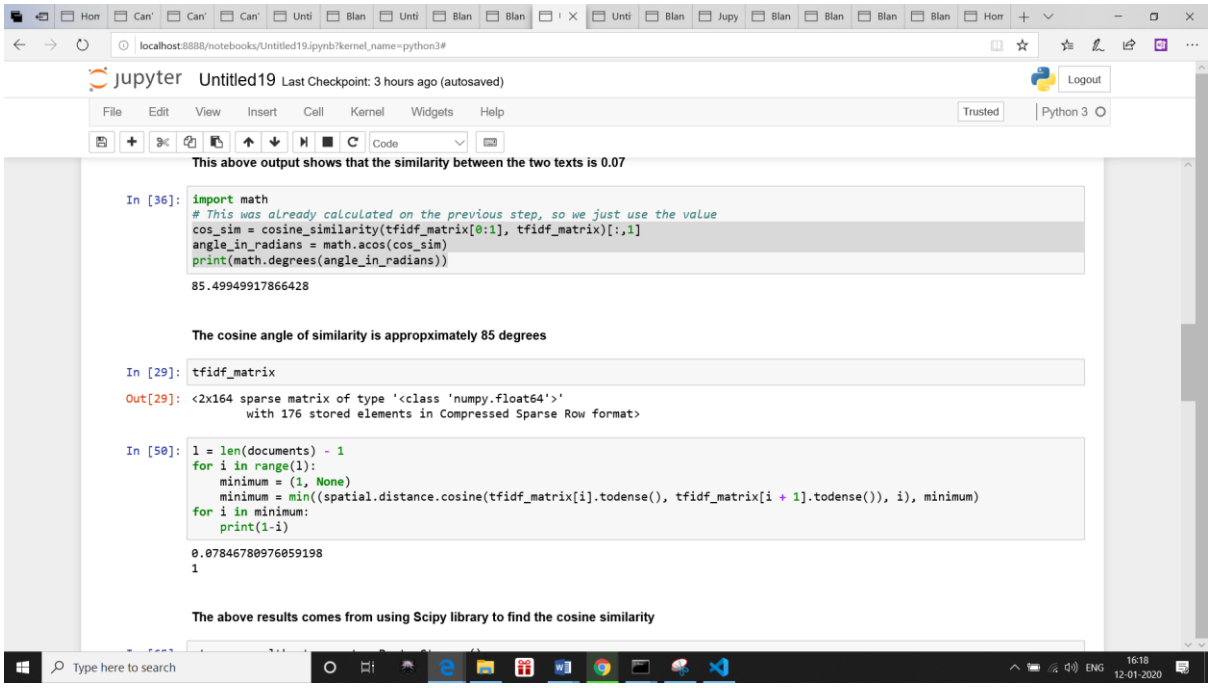
localhost:8888/notebooks/Untitled19.ipynb?kernel_name=python3#
jupyter Untitled19 Last Checkpoint: 3 hours ago (autosaved)
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Trusted Python 3
Code
This above output shows that the similarity between the two texts is 0.07
In [36]:
import math
# This was already calculated on the previous step, so we just use the value
cos_sim = cosine_similarity(tfidf_matrix[0:1], tfidf_matrix)[:,1]
angle_in_radians = math.acos(cos_sim)
print(math.degrees(angle_in_radians))
85.49949917866428
The cosine angle of similarity is appropximately 85 degrees
In [29]:
tfidf_matrix
Out[29]: <2x164 sparse matrix of type '<class 'numpy.float64'>'
with 176 stored elements in Compressed Sparse Row format>
In [50]:
l = len(documents) - 1
for i in range(l):
minimum = (1, None)
minimum = min((spatial.distance.cosine(tfidf_matrix[i].todense(), tfidf_matrix[i + 1].todense()), i), minimum)
for i in minimum:
print(1-i)
0.07846780976059198
1
The above results comes from using Scipy library to find the cosine similarity
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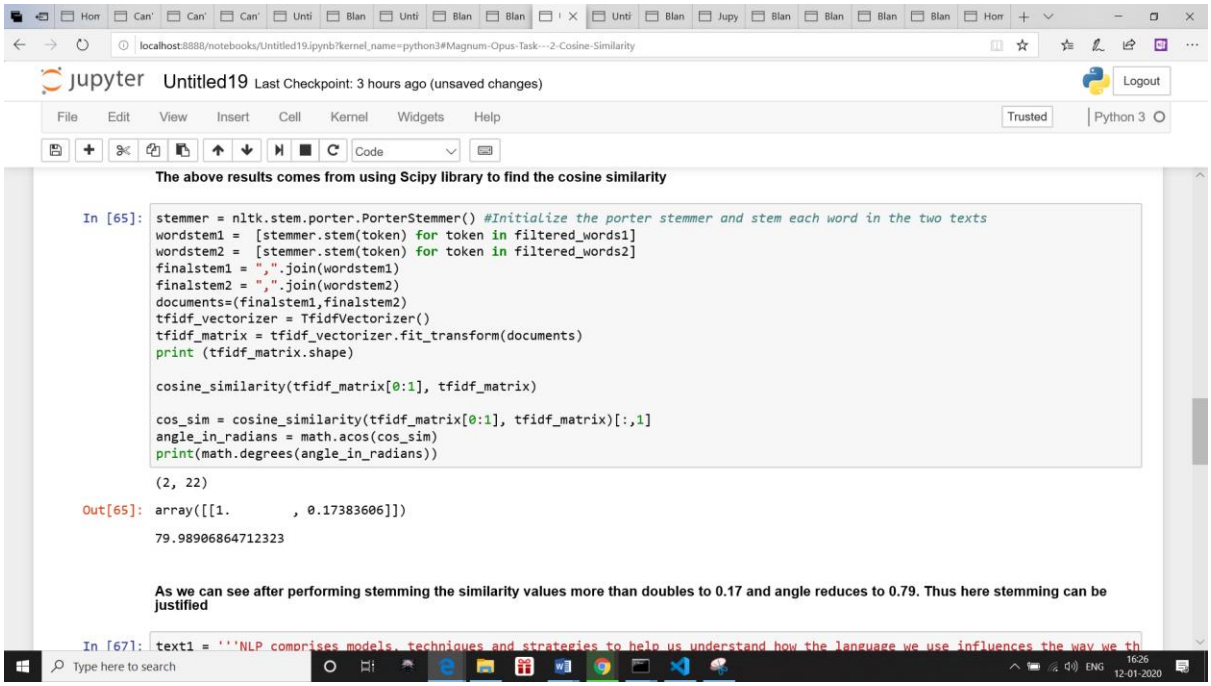
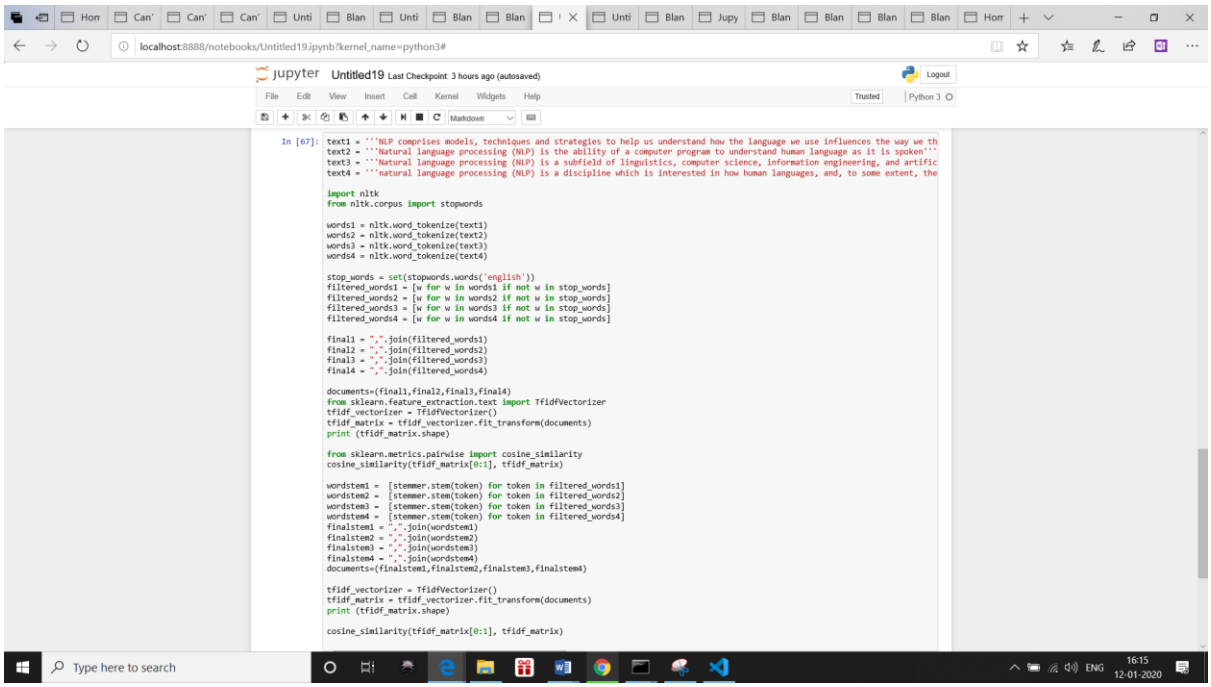
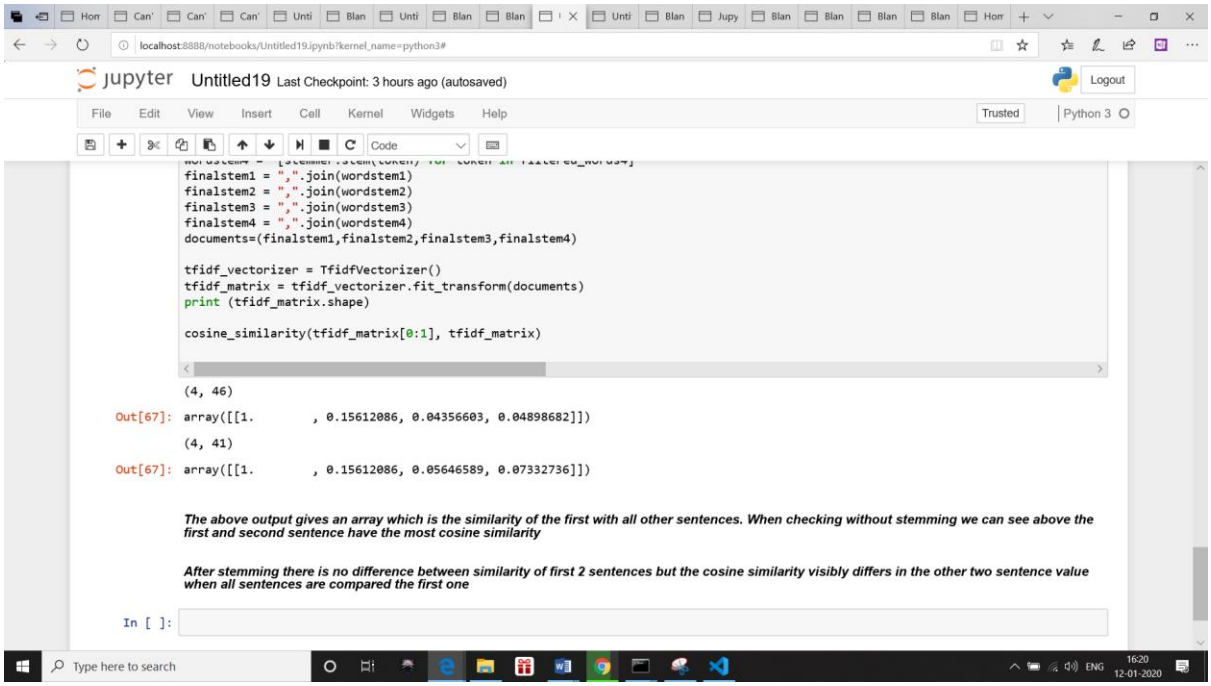


Here we take 4 different definitions of NLP to compare the similarity and compare the results of before and after stemming




jupyter Untitled19 Last Checkpoint: 3 hours ago (autosaved)
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Python 3
Code
finalstem1 = " ".join(wordstem1)
finalstem2 = " ".join(wordstem2)
finalstem3 = ",".join(wordstem3)
finalstem4 = ",".join(wordstem4)
documents=(finalstem1,finalstem2,finalstem3,finalstem4)
tfidf_vectorizer = TfidfVectorizer()
tfidf_matrix = tfidf_vectorizer.fit_transform(documents)
print (tfidf_matrix.shape)
cosine_similarity(tfidf_matrix[0:1], tfidf_matrix)
(4, 46)
Out[67]: array([[1. , 0.15612086, 0.04356603, 0.04898682]])
(4, 41)
Out[67]: array([[1. , 0.15612086, 0.05646589, 0.07332736]])
The above output gives an array which is the similarity of the first with all other sentences. When checking without stemming we can see above the first and second sentence have the most cosine similarity
After stemming there is no difference between similarity of first 2 sentences but the cosine similarity visibly differs in the other two sentence value when all sentences are compared the first one
In [ ]:
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