IR HW2 資管碩二 R05725034 張鑑霖

1. 執行環境 & 作業系統

   Jupyter & win7

2. 程式語言

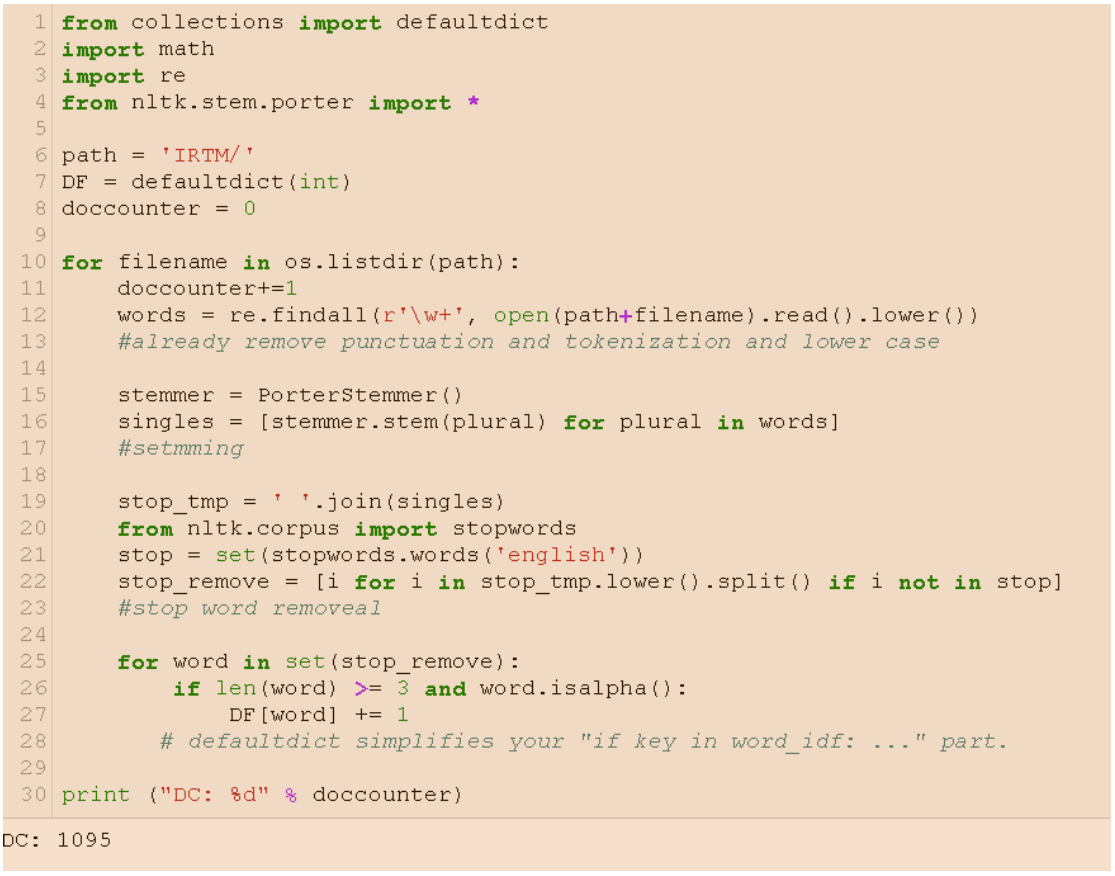
   Python3

3. 作業處理邏輯說明

   甲、 Construct a dictionary:

   i. 讀入每個在資料夾 IRTM 的檔案

      並去除標點、tokenization、小寫化、stemming、去除 stop word，並記錄有幾筆文件(1095 筆)，如果字長度大於 3 和是英文，就把此文字的計數器+1

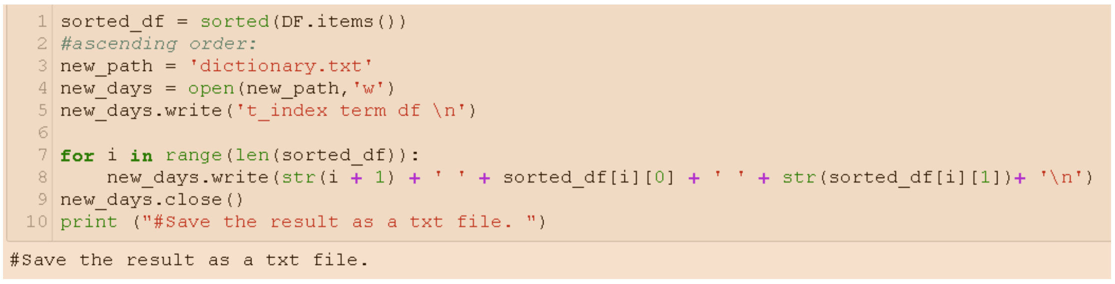


```python
from collections import defaultdict
import math
import re
from nltk.stem.porter import *

path = 'IRTM/'
DF = defaultdict(int)
doccounter = 0

for filename in os.listdir(path):
    doccounter+=1
    words = re.findall(r'\w+', open(path+filename).read().lower())
    #already remove punctuation and tokenization and lower case

    stemmer = PorterStemmer()
    singles = [stemmer.stem(plural) for plural in words]
    #setmming

    stop_tmp = ' '.join(singles)
    from nltk.corpus import stopwords
    stop = set(stopwords.words('english'))
    stop_remove = [i for i in stop_tmp.lower().split() if i not in stop]
    #stop word removeal

    for word in set(stop_remove):
        if len(word) >= 3 and word.isalpha():
            DF[word] += 1
       # defaultdict simplifies your "if key in word_idf: ..." part.

print ("DC: %d" % doccounter)
```

```
DC: 1095
```

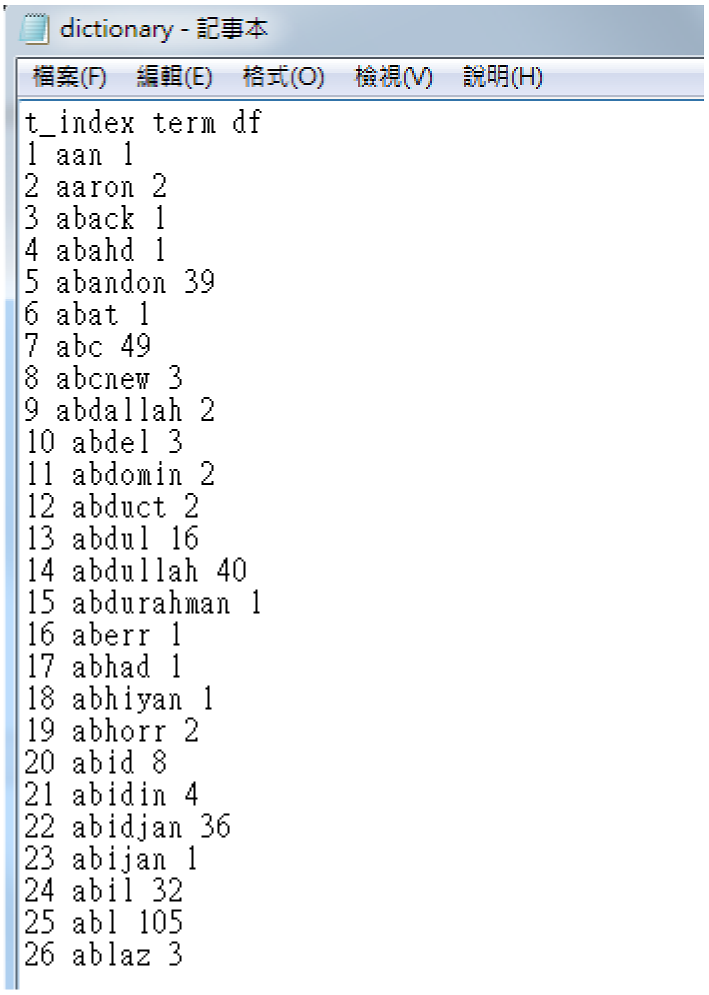
   ii. 輸出

      把紀錄的文字 - 計數依照文字排序，並存入 dictionary.txt



```python
sorted_df = sorted(DF.items())
#ascending order:
new_path = 'dictionary.txt'
new_days = open(new_path,'w')
new_days.write('t_index term df \n')

for i in range(len(sorted_df)):
    new_days.write(str(i + 1) + ' ' + sorted_df[i][0] + ' ' + str(sorted_df[i][1])+ '\n')
new_days.close()
print ("#Save the result as a txt file. ")
```

```
#Save the result as a txt file.
```



```
t_index term df
1 aan 1
2 aaron 2
3 aback 1
4 abahd 1
5 abandon 39
6 abat 1
7 abc 49
8 abcnew 3
9 abdallah 2
10 abdel 3
11 abdomin 2
12 abduct 2
13 abdul 16
14 abdullah 40
15 abdurahman 1
16 aberr 1
17 abhad 1
18 abhiyan 1
19 abhorr 2
20 abid 8
21 abidin 4
22 abidjan 36
23 abijan 1
24 abil 32
25 abl 105
26 ablaz 3
```

乙、 Tfidf unit vector

i. 計算每個文字的 idf(log 以 10 為底)，並排序

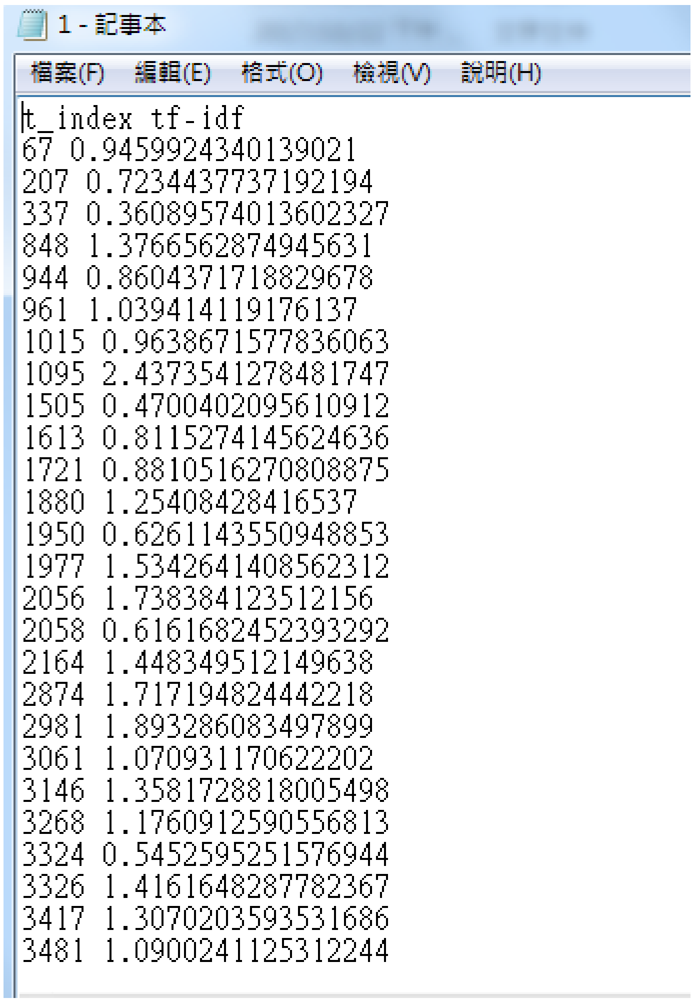
```python
# Now you can compute IDF.
IDF = dict()
for word in DF:
    IDF[word] = math.log10(doccounter / float(DF[word]))

sorted_idf = sorted(IDF.items())
#print (sorted_tfidf)

```

ii. 開起每個在資料夾 IRTM 的檔案，做一樣的前處理

得到每個 TF，每個 TF 再乘上剛剛相對應的 IDF，即可得到結果，檔案存於

tfidf 資料夾內

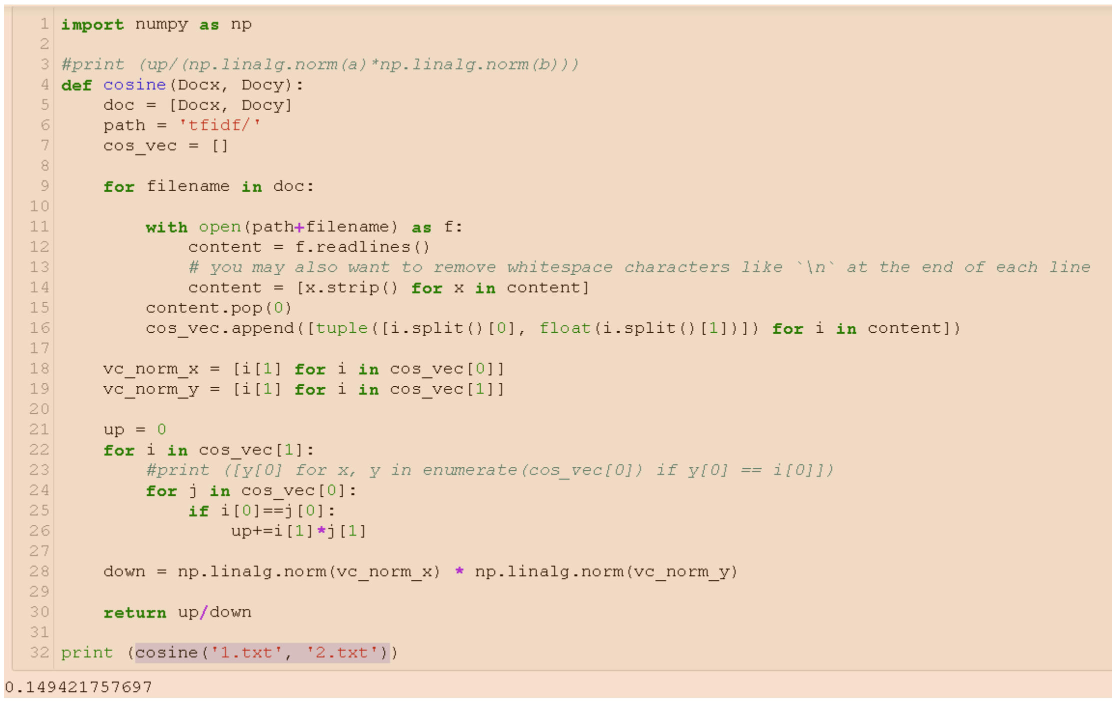
```python
#doccounter = 1
for filename in os.listdir(path):
    tmp = defaultdict(float)
    new_path = 'tfidf/'+filename
    new_days = open(new_path,'w')
    new_days.write('t_index tf-idf \n')
    #doccounter+=1

    words = re.findall(r'\w+', open(path+filename).read().lower())
    #already remove punctuation and tokenization and lower case

    stemmer = PorterStemmer()
    singles = [stemmer.stem(plural) for plural in words]
    #setmming

    stop_tmp = ' '.join(singles)
    from nltk.corpus import stopwords
    stop = set(stopwords.words('english'))
    stop_remove = [i for i in stop_tmp.lower().split() if i not in stop]
    #stop word removeal

    for word in set(stop_remove):
        if len(word) >= 3 and word.isalpha():
            tmp[word] += 1


    sp = sorted(tmp.items())

    for i in range(len(sp)):
        #y= idf, sp = 1.txt
        ide = [x+1 for x, y in enumerate(sorted_idf) if y[0] == sp[i][0]]
        new_days.write(str(ide[0]))
        new_days.write(' ' + str(sp[i][1] * IDF[sp[i][0]])+'\n')
    new_days.close()
    print (filename)
print ("done")
```



```
t_index tf-idf
67 0.9459924340139021
207 0.7234437737192194
337 0.36089574013602327
848 1.3766562874945631
944 0.8604371718829678
961 1.039414119176137
1015 0.9638671577836063
1095 2.4373541278481747
1505 0.4700402095610912
1613 0.8115274145624636
1721 0.8810516270808875
1880 1.25408428416537
1950 0.6261143550948853
1977 1.5342641408562312
2056 1.738384123512156
2058 0.6161682452393292
2164 1.448349512149638
2874 1.717194824442218
2981 1.893286083497899
3061 1.070931170622202
3146 1.3581728818005498
3268 1.1760912590556813
3324 0.5452595251576944
3326 1.4161648287782367
3417 1.3070203593531686
3481 1.0900241125312244
```

丙、 function *cosine*

i. 輸入兩個文件名計算 cosine similarity，先讀入問題”乙”的檔案，並計算兩個檔案的 norm 當分母，而分子只需要算兩份文件都有出現的 term，並把他們的 tfidf 相乘後相加即可，例如 cosine('1.txt', '2.txt') =0.149421757697



```python
import numpy as np

#print (up/(np.linalg.norm(a)*np.linalg.norm(b)))
def cosine(Docx, Docy):
    doc = [Docx, Docy]
    path = 'tfidf/'
    cos_vec = []

    for filename in doc:

        with open(path+filename) as f:
            content = f.readlines()
            # you may also want to remove whitespace characters like `\n` at the end of each line
            content = [x.strip() for x in content]
        content.pop(0)
        cos_vec.append([tuple([i.split()[0], float(i.split()[1])]) for i in content])

    vc_norm_x = [i[1] for i in cos_vec[0]]
    vc_norm_y = [i[1] for i in cos_vec[1]]

    up = 0
    for i in cos_vec[1]:
        #print ([y[0] for x, y in enumerate(cos_vec[0]) if y[0] == i[0]])
        for j in cos_vec[0]:
            if i[0]==j[0]:
                up+=i[1]*j[1]

    down = np.linalg.norm(vc_norm_x) * np.linalg.norm(vc_norm_y)

    return up/down

print (cosine('1.txt', '2.txt'))
```

```
0.149421757697
```

4. 任何在此作業中的心得

有些地方會執行緩慢，可能有地方可以優化執行效率，是我可以努力的目標，而且在處理這三小題中，有些地方感覺用到的變數也是有重複，如果能更佳善用可以節省記憶體空間，也可以運算得更快速