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In [1]: import os
import math
import numpy as np
from collections import Counter
import time
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In [2]: # make prior probabilities dynamic

sizett = 463
x = os.listdir("assignment3_train\\train")
spamwc={}
hamwc = {}
totalwc = {}
for i in x:
    y = os.listdir("assignment3_train\\train\\" + i)
    if i=="spam":
        for j in y:
            f = "assignment3_train\\train\\" + i + "\\" + j
            file=open(f,"r", errors = 'ignore')
            for word in file.read().split():
                if word not in spamwc and word.isalpha():
                    spamwc[word] = 1
                    totalwc[word] = 1
                elif word.isalpha():
                    spamwc[word] += 1
                    totalwc[word] += 1
        else:
            for j in y:
                f = "assignment3_train\\train\\" + i + "\\" + j
                file=open(f,"r", errors = 'ignore')
                for word in file.read().split():
                    if word not in hamwc and word.isalpha():
                        hamwc[word] = 1
                        totalwc[word] = 1
                    elif word.isalpha():
                        hamwc[word] += 1
                        totalwc[word] += 1

# totalwc = Counter(hamwc) + Counter(spamwc)
print(len(totalwc))
```

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In [3]: totalw_s = sum(spamwc.values())
totalw_h = sum(hamwc.values())
novoc = len(totalwc)
cs = 0
ch = 0
cst = 0
cht = 0
# Naive Bayes
for i in x:
    y = os.listdir("assignment3_test\\test\\" + i)
    for j in y:
        test_sh = {}
        f = "assignment3_test\\test\\" + i + "\\" + j
        file=open(f,"r", errors = 'ignore')
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for word in file.read().split():
    if word not in test_sh and word.isalpha():
        test_sh[word] = 1
    elif word.isalpha():
        test_sh[word] += 1
prob_s = math.log(123/sizett)
prob_h = math.log(340/sizett)
# print(prob_s, prob_h)
for k in test_sh:
    if spamwc.get(k) != None:
        prob_s = prob_s + math.log((spamwc.get(k)+1)/((totalw_s)+(novoc)))
    else:
        prob_s = prob_s + math.log((1)/((totalw_s)+(novoc)))
    if hamwc.get(k) != None:
        prob_h = prob_h + math.log((hamwc.get(k)+1)/((totalw_h)+(novoc)))
    else:
        prob_h = prob_h + math.log((1)/((totalw_h)+(novoc)))

    if prob_s > prob_h:
        cs = cs + 1
        if i=="spam":
            cst = cst + 1
    elif prob_h > prob_s:
        ch = ch + 1
        if i=="ham":
            cht = cht + 1

print(cst/cs, cht/ch, (cst+cht)/(cs+ch))

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0.8550707046185592 0.9708009762591524 0.9219214600635702

In [4]:

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ltotalwc = list(totalwc.keys())
mat = np.zeros((sizett, len(ltotalwc)+1))
ind = 0
for i in x:
    y = os.listdir("assignment3_train\\train\\" + i)
    for j in y:
        logwc = {}
        f = "assignment3_train\\train\\" + i + "\\\" + j
        file=open(f, "r", errors = 'ignore')
        for word in file.read().split():
            if word not in logwc and word.isalpha():
                logwc[word] = 1
            elif word.isalpha():
                logwc[word] += 1
        for k in logwc:
            mat[ind][ltotalwc.index(k)] = logwc[k]
        if i=="spam":
            mat[ind][len(ltotalwc)] = 1
        ind = ind + 1
# print(mat[343][mat.shape[0]]+1)

```

In [6]:

```

# def L_one(x):
#     if x<=0:
#         return np.Log(1+np.exp(x))
#     if x>0:
#         return np.Log(1+np.exp(-x))+x

def prob(w,x):

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s = 0
# print(x)
for i in range(len(x)):
    s = s + (w[i]*x[i])
try:
    p = math.exp(w[0]+s)/(1 + math.exp(w[0]+s))
except:
    p = 1
return p

# w_new = np.ones(len(totalwc)+1)
# for k in range(1):
#     w = w_new
#     for i in range(mat.shape[0]):
#         temp = 0
#         probab = prob(w,mat[i])
#         for j in range(mat.shape[1]):
#             temp = temp + mat[i][j]*((mat[i][mat.shape[1]-1])-probab)
#         w_new[i] = w[0]+ (0.01 * temp) - (0.01*0.01*w[0])

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In [7]: # np.set_printoptions(threshold=np.inf)
# print(w_new[:464])

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In [54]: w_new = np.ones(len(totalwc)+1)
w = np.ones(len(totalwc)+1)
j = 0
start = time.time()
for i in range(len(w)):
    temp = 0
    for j in range(mat.shape[0]):
#         probab =
        temp = temp + mat[j][i]*((mat[j][mat.shape[1]-1])-prob(w,mat[j]))
    w_new[i] = w[i]+ (0.01 * temp) - (0.01*0.01*w[i])
end = time.time()

print(f"Runtime of the program is {end - start}")

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Runtime of the program is 14970.166781187057

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In [55]:

```

np.set_printoptions(threshold=np.inf)
print(w_new)

```

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[-3.70099656e-01  7.99900000e-01  7.09900454e-01  1.59902616e-01
 8.09900000e-01  5.59900000e-01  8.99900000e-01  7.39900000e-01
 6.99900000e-01 -1.50100000e-01 -1.25010000e+00 -3.01000000e-02
 8.09900000e-01 -6.80010000e+00 -1.42001000e+01 -4.09009999e+00
-1.31010000e+00 -1.53009665e+00  8.39900000e-01  8.99900000e-01
-1.2800983e+01 -1.11010000e+00  7.09900000e-01  4.69900000e-01
 7.49900000e-01 -1.26010000e+00 -3.40009648e+00 -1.70099601e-01
-6.00996040e-02  9.49900000e-01  9.29900000e-01 -3.61009977e+00
-3.77009540e+00  7.79900000e-01 -6.54009563e+00 -1.08010000e+00
 9.39900000e-01 -5.90096624e-01  7.79900000e-01  9.19900000e-01
-5.70100000e-01  2.99000000e-02  1.39900000e-01 -2.20100000e-01

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8.09900000e-01	-1.10009999e+00	-6.80100000e-01	8.39900000e-01
9.89900000e-01	-8.60100000e-01	-3.88010000e+00	-1.83010000e+00
8.79900000e-01	7.89900000e-01	9.19900000e-01	7.19900000e-01
9.89900000e-01	2.69900000e-01	-1.26009994e+00	-1.41009983e+00
-1.87009279e+00	-9.30100000e-01	9.19900167e-01	4.99000002e-02
8.99900000e-01	9.49900000e-01	8.29900000e-01	7.89900000e-01
-4.26004925e+00	7.59900000e-01	9.49900000e-01	9.59900000e-01
4.09900167e-01	3.29900000e-01	5.19900000e-01	7.29900000e-01
9.89900000e-01	-1.18009983e+00	8.39900000e-01	4.89924726e-01
-1.80100000e-01	8.69900000e-01	9.29900000e-01	8.79903354e-01
9.69900000e-01	8.79900000e-01	7.89900000e-01	-1.51000889e+01
8.89900000e-01	8.29900062e-01	1.49900000e-01	-2.40100000e-01
3.29900000e-01	6.69900000e-01	6.39900000e-01	-3.48009998e+00
-5.50009938e+00	8.79900000e-01	6.99033535e-02	-2.27009954e+00
5.89900000e-01	-1.62009998e+00	5.79900000e-01	6.59900000e-01
2.69900008e-01	1.59900000e-01	-8.70098764e-01	9.09900000e-01
8.69900000e-01	7.99900000e-01	9.19900000e-01	9.79900000e-01
8.29900000e-01	-2.01000000e-02	9.79900000e-01	5.59900000e-01
8.79903354e-01	9.49900000e-01	5.99900000e-01	9.69900000e-01
8.89900000e-01	9.39900000e-01	7.99900000e-01	8.79900000e-01
3.29900000e-01	8.29900000e-01	6.29900000e-01	9.09900000e-01
6.69900000e-01	8.59900000e-01	8.49900000e-01	8.89900000e-01
9.89900000e-01	9.19900000e-01	-3.07009901e+00	9.49900000e-01
9.59900000e-01	8.49900000e-01	6.19900000e-01	-1.50100000e-01
9.69900000e-01	7.79900000e-01	9.79900000e-01	6.39900169e-01
8.89900000e-01	6.19900167e-01	7.49900000e-01	-6.90099546e-01
9.89900000e-01	-1.20100000e-01	5.89900003e-01	4.39900000e-01
8.89900000e-01	-1.03010000e+00	9.79900000e-01	-1.24010000e+00
5.99900000e-01	-3.01000000e-02	8.69900000e-01	5.29900000e-01
9.19901234e-01	9.79900003e-01	-8.10100000e-01	8.89900000e-01
6.89901234e-01	6.79900000e-01	9.89900000e-01	8.49900001e-01
8.79901234e-01	6.79900000e-01	9.29900000e-01	9.89900000e-01
-7.40100000e-01	7.69900000e-01	8.49900000e-01	6.99900000e-01
3.59900000e-01	9.89900000e-01	9.19900000e-01	6.69900000e-01
7.29900000e-01	8.49900000e-01	9.79900000e-01	9.39900000e-01
9.19900000e-01	9.19900000e-01	8.69900000e-01	-2.41010000e+00
9.49900000e-01	8.39900000e-01	9.69900000e-01	6.19900000e-01
9.59900000e-01	9.19900000e-01	2.49900000e-01	8.59900000e-01
9.39900000e-01	8.29900000e-01	9.90000083e-03	9.79900000e-01
5.99900000e-01	9.09900000e-01	8.49900000e-01	8.99900000e-01
8.79900000e-01	9.79900000e-01	9.79900000e-01	-3.80100000e-01
9.09900000e-01	9.59900000e-01	8.39900000e-01	8.29900000e-01
6.59900008e-01	4.39900000e-01	9.89900000e-01	8.09900000e-01
5.69900000e-01	-1.90100000e-01	-1.00009870e+00	9.89900000e-01
9.39900000e-01	3.29900000e-01	-1.70100000e-01	9.39900000e-01
9.49900000e-01	4.69900000e-01	8.19900000e-01	8.39900000e-01
9.89900000e-01	8.79900000e-01	9.39900000e-01	7.89900000e-01
7.09900001e-01	8.69900000e-01	9.09900000e-01	9.89900000e-01
9.09900000e-01	9.09900000e-01	9.49900000e-01	9.59900000e-01
9.59900000e-01	8.49900000e-01	6.79900000e-01	8.89900000e-01
-2.10010000e+00	9.59900000e-01	7.89900000e-01	7.99000000e-02
2.99000000e-02	9.69900000e-01	8.59900000e-01	9.79900000e-01
9.09900000e-01	9.69900000e-01	9.29900000e-01	8.89900000e-01
9.79900000e-01	9.89900000e-01	6.19900167e-01	9.59900000e-01
5.69900000e-01	3.79900000e-01	6.89900000e-01	7.09900000e-01
7.69900000e-01	-5.00009660e+00	9.39900000e-01	9.49900000e-01
8.59900000e-01	9.59900000e-01	9.49900000e-01	9.69900000e-01
9.89900000e-01	8.69900000e-01	7.89900000e-01	6.49903825e-01
5.39900000e-01	9.59900000e-01	5.99900000e-01	9.89900000e-01
9.89900000e-01	9.69900000e-01	-1.67009418e+00	8.79900167e-01
8.29900000e-01	5.09900000e-01	8.19900001e-01	4.99000015e-02
9.49900000e-01	9.69900000e-01	9.89900000e-01	6.29900000e-01
9.89900000e-01	9.79900000e-01	9.29900000e-01	9.79900000e-01
9.79900000e-01	9.79900000e-01	6.99900000e-01	9.59900000e-01
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8.09900000e-01	7.99900000e-01	9.19900000e-01	9.39900000e-01
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9.39900000e-01	4.79900000e-01	9.39900000e-01	9.09900000e-01
6.69900000e-01	8.59900000e-01	9.89900000e-01	8.29900000e-01
-1.16009645e+00	8.79900000e-01	9.39900000e-01	9.79900000e-01
8.99900000e-01	8.89900023e-01	9.79900000e-01	9.89900000e-01
9.89900000e-01	1.39900000e-01	3.99900000e-01	1.39900000e-01
6.09900000e-01	9.29900000e-01	7.39900000e-01	9.79900000e-01
7.29900939e-01	9.49900000e-01	5.79900000e-01	7.99900000e-01
9.69900000e-01	9.39900000e-01	8.69900000e-01	8.99900000e-01
6.19900000e-01	3.69900000e-01	8.29900000e-01	9.69900000e-01
9.39900000e-01	9.09900000e-01	8.89900000e-01	3.99900000e-01
9.09900000e-01	9.89900000e-01	9.89900000e-01	9.19900000e-01
9.79900000e-01	5.79900000e-01	9.69900000e-01	2.79900000e-01
2.99901175e-01	7.49900000e-01	6.49900000e-01	7.29900000e-01
9.09900000e-01	9.59900000e-01	7.89900519e-01	9.89900000e-01
9.89900000e-01	2.89900000e-01	9.69900000e-01	8.49900003e-01
9.89900000e-01	9.69900000e-01	9.09900000e-01	6.89900000e-01
8.89900000e-01	7.59900000e-01	9.29900000e-01	9.49900000e-01
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7.89900418e-01	9.19900000e-01	7.89900000e-01	7.69900000e-01
7.89903354e-01	9.39900000e-01	9.89900000e-01	9.49900000e-01
9.89900000e-01	5.89900000e-01	9.59900000e-01	9.69900000e-01
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7.19900230e-01	9.89900000e-01	7.69900000e-01	6.29900000e-01
4.19900000e-01	9.09900000e-01	9.59900000e-01	6.19900000e-01
5.59900000e-01	9.19900000e-01	9.89900000e-01	2.59900167e-01
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9.19900000e-01	-6.01000000e-02	5.99039117e-02	5.19901360e-01
6.99031734e-02	9.29900000e-01	9.69900000e-01	7.19900000e-01
4.89900001e-01	8.89900000e-01	9.79900000e-01	8.89900000e-01
9.69900000e-01	7.39900008e-01	9.79900000e-01	9.89900000e-01
9.29900000e-01	9.79900000e-01	9.69900000e-01	9.49900000e-01
5.99900167e-01	7.89900000e-01	6.19900003e-01	7.19900000e-01
8.39900000e-01	5.09910344e-01	8.59900000e-01	9.79900000e-01
8.89900000e-01	4.59900000e-01	6.89900000e-01	7.69900000e-01
9.89900000e-01	9.79900000e-01	9.49900000e-01	9.19900000e-01
9.69900000e-01	7.39900000e-01	7.09900000e-01	9.89900000e-01
5.09900000e-01	9.29900000e-01	6.39900000e-01	9.79900000e-01
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8.29903354e-01	9.29900000e-01	8.79900000e-01	5.09900000e-01
9.59900000e-01	9.49900000e-01	9.39900000e-01	9.69900000e-01
8.49900000e-01	9.29900000e-01	8.79900000e-01	9.39910344e-01
9.09909111e-01	9.79909111e-01	8.19910346e-01	9.89900000e-01
4.49900000e-01	9.49900000e-01	7.99900000e-01	9.49900000e-01
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9.89900000e-01	9.59900000e-01	9.89900000e-01	9.39900000e-01
9.19900000e-01	9.69900000e-01	9.69900000e-01	9.89900000e-01
9.89900000e-01	9.79900000e-01	9.89900000e-01	9.39900000e-01
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8.99900000e-01	9.49900000e-01	9.79900000e-01	9.79900000e-01
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8.99900000e-01	9.89900000e-01	9.79900000e-01	9.79900000e-01
9.49900000e-01	9.89900000e-01	9.89900000e-01	9.79900000e-01
9.89900000e-01	9.89900000e-01	9.89900000e-01	9.89900000e-01
9.59900000e-01	9.29900000e-01	9.69900000e-01	9.89900000e-01
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9.99900000e-01 9.99900000e-01 9.99900000e-01 9.99900000e-01
9.99900000e-01 9.99900000e-01 1.00132772e+00]

```

In [60]:

```

mat_test = np.zeros((478,len(ltotalwc)+1))
ind = 0
for i in x:
    y = os.listdir("assignment3_test\\test\\" + i)
    for j in y:
        logwc = {}
        f = "assignment3_test\\test\\" + i + "\\" + j
        file=open(f,"r", errors = 'ignore')
        for word in file.read().split():
            if word not in logwc and word.isalpha():
                logwc[word] = 1
            elif word.isalpha():
                logwc[word] += 1
        for k in logwc:
            if k in ltotalwc:
                mat_test[ind][ltotalwc.index(k)] = logwc[k]
        if i=="spam":
            mat_test[ind][len(ltotalwc)] = 1
        ind = ind + 1

```

In [73]:

```

th = 0
ts = 0
tt = 0
for i in range(mat_test.shape[0]):
    s = 0
    for j in range(mat_test.shape[1]-1):
        s = s + (w_new[j]*mat_test[i][j])
    s = s + w[0]
    tt += 1
    if mat_test[i][len(ltotalwc)]==1 and s>0:
        ts += 1
    elif mat_test[i][len(ltotalwc)]==0 and s<0:
        th += 1
print("Accuracy:",(ts+th)/tt)

```

Accuracy: 0.7719665271966527

With Stopwords

In [76]:

```

stopWords = ["a", "about", "above", "after", "again", "against", "all", "am", "an", "and", "any", "are", "aren't", "as", "at", "be", "because", "been", "before", "be", "between", "both", "but", "by", "can't", "cannot", "could", "couldn't", "d", "do", "does", "doesn't", "doing", "don't", "down", "during", "each", "few", "further", "had", "hadn't", "has", "hasn't", "have", "haven't", "having", "he'll", "he's", "her", "here", "here's", "hers", "herself", "him", "himse", "how's", "i", "i'd", "i'll", "i'm", "i've", "if", "in", "into", "is", "isn

```

```
"itself", "let's", "me", "more", "most", "mustn't", "my", "myself", "no",
"off", "on", "once", "only", "or", "other", "ought", "our", "ours", "ourse",
"own", "same", "shan't", "she", "she'd", "she'll", "she's", "should", "sho",
"such", "than", "that", "that's", "the", "their", "theirs", "them", "thems",
"there's", "these", "they", "they'd", "they'll", "they're", "they've", "th",
"to", "too", "under", "until", "up", "very", "was", "wasn't", "we", "we'd",
"were", "weren't", "what", "what's", "when", "when's", "where", "where's",
"who's", "whom", "why", "why's", "with", "won't", "would", "wouldn't", "yo",
"you're", "you've", "your", "yours", "yourself", "yourselves"]
```

In [82]:

```
sizett = 463
x = os.listdir("assignment3_train\\train")
spamwc={}
hamwc = {}
totalwc = {}
for i in x:
    y = os.listdir("assignment3_train\\train\\" + i)
    if i=="spam":
        for j in y:
            f = "assignment3_train\\train\\" + i + "\\" + j
            file=open(f,"r", errors = 'ignore')
            for word in file.read().split():
                if word not in stopWords:
                    if word not in spamwc and word.isalpha():
                        spamwc[word] = 1
                        totalwc[word] = 1
                    elif word.isalpha():
                        spamwc[word] += 1
                        totalwc[word] += 1
        else:
            for j in y:
                f = "assignment3_train\\train\\" + i + "\\" + j
                file=open(f,"r", errors = 'ignore')
                for word in file.read().split():
                    if word not in stopWords:
                        if word not in hamwc and word.isalpha():
                            hamwc[word] = 1
                            totalwc[word] = 1
                        elif word.isalpha():
                            hamwc[word] += 1
                            totalwc[word] += 1

# totalwc = Counter(hamwc) + Counter(spamwc)
print(len(totalwc))
```

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In [83]:

```
totalw_s = sum(spamwc.values())
totalw_h = sum(hamwc.values())
novoc = len(totalwc)
cs = 0
ch = 0
cst = 0
cht = 0
# Naive Bayes
for i in x:
    y = os.listdir("assignment3_test\\test\\" + i)
    for j in y:
        test_sh = {}
```

```

f = "assignment3_test\\test\\" + i + "\\" + j
file=open(f,"r", errors = 'ignore')
for word in file.read().split():
    if word not in stopWords:
        if word not in test_sh and word.isalpha():
            test_sh[word] = 1
        elif word.isalpha():
            test_sh[word] += 1
prob_s = math.log(123/sizett)
prob_h = math.log(340/sizett)
# print(prob_s, prob_h)
for k in test_sh:
    if spamwc.get(k) != None:
        prob_s = prob_s + math.log((spamwc.get(k)+1)/((totalw_s)+(novoc)))
    else:
        prob_s = prob_s + math.log((1)/((totalw_s)+(novoc)))
    if hamwc.get(k) != None:
        prob_h = prob_h + math.log((hamwc.get(k)+1)/((totalw_h)+(novoc)))
    else:
        prob_h = prob_h + math.log((1)/((totalw_h)+(novoc)))

    if prob_s > prob_h:
        cs = cs + 1
        if i=="spam":
            cst = cst + 1
    elif prob_h > prob_s:
        ch = ch + 1
        if i=="ham":
            cht = cht + 1

print("Accuracy",(cst+cht)/(cs+ch))

```

Accuracy 0.9231868643222761

In [84]:

```

ltotalwc = list(totalwc.keys())
mat = np.zeros((sizett,len(ltotalwc)+1))
ind = 0
for i in x:
    y = os.listdir("assignment3_train\\train\\" + i)
    for j in y:
        logwc = {}
        f = "assignment3_train\\train\\" + i + "\\" + j
        file=open(f,"r", errors = 'ignore')
        for word in file.read().split():
            if word not in stopWords:
                if word not in logwc and word.isalpha():
                    logwc[word] = 1
                elif word.isalpha():
                    logwc[word] += 1
        for k in logwc:
            mat[ind][ltotalwc.index(k)] = logwc[k]
        if i=="spam":
            mat[ind][len(ltotalwc)] = 1
        ind = ind + 1

```

In [85]:

```

w_new = np.ones(len(totalwc)+1)
w = np.ones(len(totalwc)+1)
j = 0
for k in range(itr):

```



```

w = w_new.copy()
w_new = np.ones(len(totalwc)+1)
for i in range(len(w)):
    temp = 0
    if i%20==0:
        print(i)
    for j in range(mat.shape[0]):
        # probab =
        temp = temp + mat[j][i]*((mat[j][mat.shape[1]-1])-prob(w,mat[j]))
w_new[i] = w[i]+ (0.01 * temp) - (0.01*0.01*w[i])

```

0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
560
580
600
620
640
660
680
700
720
740
760
780
800
820
840
860
880
900
920
940
960
980
1000
1020
1040

1060
1080
1100
1120
1140
1160
1180
1200
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In [86]:

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print(w_new)
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  0.8999      0.7399      0.6999      -0.1501     -0.0301
  0.8099     -6.8001     -14.2001     0.8399      0.8999
 -1.1101      0.7099      0.4699      0.7499     -1.2601
  0.9499      0.9299      0.9399     -0.59007403  0.7799
  0.9199     -0.57009993  0.0299      0.1399     -0.2201
  0.8099      0.8399      0.9899     -0.8601      0.8799
  0.7899      0.9199      0.7199      0.9899      0.2699
 -1.4100983   -1.86996029  0.91990911  0.04990001  0.8999
  0.9499      0.8299      0.7899      0.7599      0.9499
  0.9599      0.40990911  0.32990002  0.5199      0.7299
  0.9899     -1.18009954  0.48996693  -0.1801      0.8699
  0.9299      0.87992473  0.9699      0.8799      0.7899
  0.8899      0.82990017  0.6699      0.6399      0.8799
 -1.62009976  0.5799      0.6599      0.1599      0.9099
  0.7999      0.9199      0.9799      0.8299     -0.0201
  0.9799      0.5599      0.87990911  0.9499      0.5999
  0.9699      0.8899      0.9399      0.7999      0.8799
  0.3299      0.8299      0.6299      0.9099      0.6699
  0.8599      0.8499      0.8899      0.9899      0.9199
  0.9499      0.9599      0.8499      0.61990017  -0.1501
  0.9699      0.9799      0.63990046  0.8899      0.61990123
  0.7499     -0.69007527  0.9899     -0.1201      0.4399
  0.9799      0.5999      0.8699      0.52990002  0.91996693
  0.9799      0.8899      0.68990123  0.6799      0.9899
  0.84990124  0.87990123  0.6799      0.9299      0.9899
 -0.7401      0.8499      0.6999      0.3599      0.9899
  0.6699      0.9799      0.9399      0.9199      0.9199
  0.8699      0.9499      0.8399      0.9699      0.9599
  0.9199      0.8599      0.9399      0.8299      0.9799
  0.5999      0.9099      0.8499      0.8999      0.9799
  0.9799     -0.3801      0.9099      0.9599      0.82990001
  0.65990123  0.9899      0.8099     -0.1901      0.9899
  0.9399      0.3299      0.9399      0.8199      0.8399
  0.9899      0.8799      0.9399      0.78990123  0.70990123
  0.8699      0.9099      0.9899      0.9099      0.9099
  0.9499      0.9599      0.9599      0.8499      0.6799
  0.8899     -2.10009997  0.9599      0.7899      0.0799
  0.0299      0.9699      0.8599      0.9799      0.9099
  0.9699      0.9299      0.8899      0.9799      0.9899
  0.61990914  0.9599      0.56990006  0.3799      0.6899
  0.7099      0.7699     -5.00009074  0.9399      0.9499
  0.8599      0.9599      0.9499      0.9699      0.9899
  0.8699      0.7899      0.64992191  0.9599      0.5999
  0.9899      0.9899      0.9699      0.87990911  0.8299
  0.5099      0.81990012  0.04990247  0.9499      0.9699
  0.9899      0.6299      0.9899      0.9799      0.9299
  0.9799      0.9799      0.9799      0.6999      0.9599
  0.9599      0.9399      0.8899      0.9899      0.8099
  0.7999      0.9199      0.9399      0.9599      0.9699]
```


0.9699	0.9799	0.9699	0.5399	0.9399
0.8599	0.9899	0.9399	0.9499	0.8399
0.9399	0.4799	0.9399	0.9099	0.6699
0.85990006	0.9899	0.8299	-1.16009035	0.8799
0.9399	0.9799	0.8999	0.88990017	0.9799
0.9899	0.9899	0.6099	0.9299	0.7399
0.9799	0.9499	0.5799	0.7999	0.9699
0.8699	0.8999	0.6199	0.8299	0.9699
0.9399	0.9099	0.8899	0.3999	0.9099
0.9899	0.9899	0.9199	0.9799	0.5799
0.9699	0.2799	0.2999032	0.74990123	0.6499
0.9099	0.9599	0.78990297	0.9899	0.9899
0.9699	0.8499	0.9899	0.9699	0.9099
0.6899	0.8899	0.7599	0.9299	0.9499
0.9299	0.9899	0.9899	0.9599	0.9499
0.8199	0.9899	0.11990001	0.9799	0.8999
0.9899	0.4899	0.8699	0.8699	0.9499
0.9499	0.81990001	0.9599	0.8099	0.9299
0.7699	0.9799	0.9899	0.78990114	0.7899
0.9399	0.9899	0.94990123	0.9899	0.5899
0.9599	0.9699	0.9899	0.9899	0.9299
0.9699	0.71990062	0.9899	0.7699	0.62990006
0.9099	0.9599	0.5599	0.9199	0.9899
0.9899	0.8999	0.6099005	0.8399	0.9799
0.6999	0.9699	0.9699	0.9199	-0.0601
0.05991545	0.5199037	0.06990786	0.9299	0.9699
0.7199	0.48990123	0.8899	0.9799	0.8899
0.9699	0.73990123	0.9799	0.9899	0.9299
0.9799	0.9699	0.9499	0.59990336	0.7899
0.61990045	0.7199	0.8399	0.50997604	0.8599
0.9799	0.8899	0.4599	0.6899	0.7699
0.9899	0.9799	0.9499	0.9199	0.9699
0.70990001	0.9899	0.5099	0.9299	0.9799
0.9799	0.32996741	0.70990481	0.9699	0.82996693
0.9299	0.8799	0.5099	0.9599	0.9499
0.9399	0.9699	0.9299	0.8799	0.93997604
0.97996693	0.8199773	0.9899	0.9499	0.9499
0.8699	0.9499	0.8899	0.9499	0.9299
0.8599	0.9799	0.90990459	0.9499	0.7099671
0.8799	0.9699	0.9599	0.9699	0.5999
0.6099	0.73990123	0.9099	0.8799	0.9599
0.9699	0.8299	0.9699	0.8999	0.9599
0.9899	0.86990123	0.8699	0.9599	0.9899
0.9899	0.9399	0.9599	0.9799	0.9899
0.9799	0.9799	0.9399	0.9599	0.9599
0.8899	0.46990001	0.9599	0.9799	0.9899
0.8999	0.9499	0.9299	0.9899	0.9899
0.9499	0.9799	0.9199	0.8199	0.6799
0.9899	0.9799	0.9799	0.9199	0.9799
0.9699	0.9899	0.9799	0.9899	0.8399
0.8999	0.8499	0.6999	0.9799	0.9899
0.8899	0.9499	0.9899	0.9699	0.9499
0.9799	0.9799	0.8799	0.9499	0.9499
0.8999	0.9899	0.9699	0.9699	0.9899
0.8999	0.9899	0.9199	0.9899	0.71990091
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0.9899	0.9799	0.9899	0.9499	0.9799
0.8199	0.9799	0.9299	0.9699	0.9099
0.9199	0.9799	0.9899	0.9799	0.9499
0.8799	0.9899	0.9399	0.9899	0.9899
0.9199	0.9599	0.9299	0.7799	0.9499
0.8199	0.9899	0.8799	0.9499	0.20990174
0.9899	0.9699	0.9899	0.9499	0.9799
0.9299	0.9799	0.7599	0.9699	0.8899
0.9399	0.9899	0.79990123	0.60992508	0.78990001

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0.9199	0.9799	0.9899	0.4399	0.9899
0.9499	0.9499	0.8899	0.8599	0.7999
0.7299	0.9699	0.8799	0.9399	0.9599
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0.81990123	0.9799	0.7099	0.9099	0.9799
0.9799	0.7899	0.9499	0.9799	0.9099
0.9199	0.8999	0.9899	0.9499	0.8999
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0.9899	0.9699	0.9599	0.7299	0.9599
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0.9499	0.8899	0.9299	0.9599	0.9799
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0.78990123	0.9399	0.9299	0.8799	0.9899
0.9699	0.9799	0.9699	0.9799	0.9799
0.7999	0.9699	0.9499	0.9399	0.9899
0.9899	0.9899	0.9799	0.9899	0.9499
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0.9199	0.8899	0.9799	0.9299	0.9399
0.9799	0.9699	0.9599	0.9699	0.9499

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0.9599	0.9599	0.9899	0.9699	0.9199
0.9599	0.9899	0.9499	0.9899	0.7199
0.8599	0.9699	0.9799	0.9799	0.8899
0.7399	0.8499	0.9799	0.8499	0.8999
0.9099	0.8999	0.9599	0.9799	0.9299
0.8899	0.9399	0.98990123	0.9699	0.8999
0.9399	0.9599	0.88990006	0.8999	0.9599
0.9799	0.9599	0.9499	0.9199	0.9499
0.9099	0.9699	0.9899	0.8799	0.9399
0.9899	0.9799	0.9499	0.9899	0.9899
0.9799	0.9399	0.9899	0.8599	0.9899
0.9899	0.9799	0.9699	0.9899	0.8699
0.9799	0.9599	0.9599	0.9899	0.94996693
0.9399	0.9499	0.9899	0.9699	0.9899
0.5499	0.9899	0.9599	0.9899	0.9799
0.9899	0.9499	0.9799	0.9699	0.9599
0.9899	0.9899	0.9699	0.9699	0.9599
0.9699	0.9899	0.9299	0.9899	0.9399
0.9499	0.9899	0.9899	0.9899	0.9899
0.6999	0.9799	0.9799	0.7899	0.9799
0.8299	0.7699	0.9899	0.8599	0.9799
0.8099	0.9499	0.9699	0.9799	0.46990036
0.9699	0.9799	0.8699	0.9799	0.8999
0.9699	0.9799	0.9499	0.9199	0.9899
0.9899	0.7799	0.9799	0.9899	0.9599
0.95990002	0.9099	0.9699	0.9299	0.9799
0.9399	0.9899	0.8499	0.9499	0.9899
0.9599	0.9799	0.9699	0.9899	0.9899
0.9799	0.9799	0.9799	0.9599	0.8799
0.9699	0.9099	0.8699	0.9799	0.9899
0.9899	0.9899	0.9599	0.9699	0.9599
0.9899	0.9799	0.9199	0.9799	0.9399
0.9699	0.9799	0.9899	0.88990123	0.9799
0.9099	0.9899	0.9299	0.9799	0.9699
0.9899	0.9699	0.8999	0.8999	0.9499
0.9899	0.9699	0.9699	0.8599	0.9499
0.7799	0.9699	0.9799	0.9799	0.9399
0.9799	0.8799	0.9799	0.9899	0.9699
0.9399	0.9699	0.9399	0.9899	0.9899
0.9899	0.9599	0.9699	0.9899	0.9799
0.9899	0.9899	0.9899	0.9899	0.9299
0.9899	0.9599	0.9899	0.9599	0.9699
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0.9899	0.9899	0.9899	0.9499	0.43990001
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0.9799	0.9899	0.9499	0.9899	0.9199

0.9599	0.9899	0.9899	0.9899	0.9899
0.9899	0.9899	0.9799	0.9699	0.7899
0.9899	0.9699	0.9899	0.9899	0.8999
0.9799	0.9599	0.9799	0.9899	0.9799
0.9899	0.9499	0.9799	0.9899	0.9899
0.9899	0.9299	0.9599	0.9699	0.9499
0.9299	0.8899	0.9699	0.8999	0.9799
0.9899	0.9499	0.9799	0.9599	0.9799
0.9699	0.9899	0.9899	0.9799	0.9899
0.9899	0.9899	0.9899	0.9899	0.9299
0.9699	0.9799	0.9899	0.9899	0.9899
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0.98990001	0.9899	0.9899	0.9799	0.9399
0.9899	0.8899	0.9399	0.9899	0.9899
0.9599	0.9899	0.9799	0.9899	0.9899
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0.9899	0.9699	0.9899	0.9799	0.9699
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0.9899	0.9799	0.9899	0.9699	0.9499
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0.9899	0.9599	0.9799	0.9799	0.9699
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0.9599	0.9599	0.9799	0.9499	0.9799
0.9899	0.9899	0.9899	0.8099	0.9899
0.9899	0.9799	0.9199	0.9899	0.9899
0.9899	0.9899	0.9599	0.9899	0.9599
0.9799	0.9599	0.9299	0.9499	0.9899
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0.9399	0.9499	0.6799	0.9899	0.9899
0.9799	0.9899	0.9899	0.7699	0.9699
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0.9499	0.9899	0.9899	0.9899	0.9899
0.9699	0.9899	0.9799	0.9899	0.9699
0.9899	0.9899	0.9899	0.9099	0.9399
0.9899	0.9899	0.7299	0.9899	0.7799
0.9799	0.9699	0.9899	0.9699	0.9699
0.9699	0.9199	0.6999	0.8899	0.9799
0.9099	0.9899	0.9199	0.9199	0.9799
0.9799	0.9199	0.9799	0.8499	0.9799
0.9599	0.9799	0.9799	0.9799	0.9799
0.9699	0.9699	0.9899	0.6399	0.7599
0.9899	0.8599	0.8699	0.8699	0.9899
0.9899	0.9799	0.9599	0.9699	0.8799
0.9299	0.9899	0.9899	0.9899	0.9899
0.9299	0.9899	0.72990336	0.9199	0.8899
0.9899	0.89990018	0.9899	0.9899	0.9699
0.9899	0.7099	0.9599	0.9399	0.9899
0.9499	0.9699	0.9899	0.66990001	0.9899
0.7099	0.5899	0.8399	0.9399	0.9899
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0.8999	0.8999	0.9099	0.9899	0.9899
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0.9699	0.9699	0.9899	0.9599	0.9299
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0.9799	0.9499	0.9799	0.9899	0.9699
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0.9899	0.9899	0.2399	0.51990476	0.9599

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0.9399	0.9899	0.9899	0.9499	0.91990006
0.9899	0.9899	0.9899	0.9099	0.9399
0.8399	0.9899	0.8899	0.9699	0.9799
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0.9599	0.9899	0.9799	0.9899	0.9599
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0.9899	0.9799	0.94990018	0.9799	0.9799
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0.9699	0.9099	0.8799	0.7699	0.8099
0.7499	0.9799	0.9799	0.9699	0.9699
0.9299	0.8899	0.6299	0.8499	0.9699
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0.9799	0.9799	0.8699	0.9499	0.9599
0.8099	0.9899	0.9899	0.9599	0.9899
0.9899	0.9499	0.9899	0.9399	0.9299
0.9499	0.9399	0.9399	0.9399	0.9899
0.9599	0.9699	0.9299	0.9399	0.9899
0.8999	0.9399	0.9699	0.9599	0.9799
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0.9599	0.9599	0.9899	0.9299	0.9599

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0.9899	0.9899	0.89992473	0.9899	0.9599
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0.9799	0.9799	0.9599	0.9699	0.9799
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0.9899	0.9699	0.9699	0.9699	0.9899
0.9799	0.9699	0.9599	0.9599	0.93990123
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0.9799	0.9899	0.9899	0.9899	0.9899
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0.9899	0.9799	0.9799	0.9899	0.9799
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0.9899	0.9899	0.9799	0.9699	0.9899
0.8299	0.9899	0.9899	0.9499	0.9599
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0.9799	0.9799	0.9899	0.9899	0.9599
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0.95990123	0.98990123	0.9799	0.9699	0.9799
0.9599	0.9899	0.9299	0.9899	0.8599
0.9899	0.9899	0.9899	0.9799	0.9899
0.9899	0.9899	0.7099	0.9899	0.9899
0.9899	0.9899	0.9799	0.9899	0.9799
0.9699	0.9699	0.8099	0.9799	0.9799
0.9599	0.9799	0.9799	0.9099	0.9899
0.9499	0.9699	0.9899	0.9699	0.9899
0.9299	0.9799	0.9899	0.9899	0.9599
0.9699	0.9699	0.9799	0.9899	0.9699
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0.9899	0.9899	0.9499	0.9199	0.9399
0.9899	0.9899	0.9799	0.9899	0.9899
0.9899	0.9899	0.9899	0.9899	0.9899

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0.9899	0.9899	0.9799	0.9099	0.9899
0.9799	0.9799	0.9899	0.9899	0.9299
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0.9899	0.9899	0.9899	0.9699	0.9799
0.9899	0.9899	0.9899	0.9899	0.9899
0.9799	0.9899	0.9799	0.9699	0.9899
0.9899	0.9899	0.9899	0.9799	0.9799
0.9899	0.9899	0.9899	0.9899	0.9899
0.9899	0.9899	0.9899	0.98990045	0.9899
0.9899	0.9899	0.9899	0.9899	0.9899
0.9799	0.9799	0.9899	0.9899	0.9899
0.9899	0.9899	0.9899	0.9899	0.9799
0.9899	0.9799	0.9899	0.9899	0.9899
0.98992473	0.9899	0.9799	0.9899	0.9899
0.9899	0.9799	0.9799	0.9899	0.9899
0.9899	0.9899	0.9899	0.9899	0.9899
0.9899	0.97990123	0.9799	0.9699	0.9599
0.9899	0.9899	0.9899	0.9899	0.9899
0.9899	0.9799	0.9899	0.9899	0.9799
0.98996693	0.98996693	0.8699	0.9899	0.9799
0.9399	0.9599	0.9799	0.9799	0.9599
0.9699	0.9499	0.9299	0.9799	0.9899
0.9799	0.9899	0.9899	0.9899	0.9899
0.9899	0.9899	0.9799	0.9899	0.9899
0.9899	0.9899	0.9799	0.9599	0.9899
0.9799	0.9899	0.9899	0.9899	0.9899
0.9899	0.9899	0.9799	0.9899	0.9899
0.9899	0.9699	0.9899	0.9899	0.9899
0.9899	0.9899	0.9899	0.9899	0.9899
0.9899	0.9799	0.9899	0.9899	0.9899
0.9899	0.9599	0.9899	0.9899	0.9899

0.97990911

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[rt/html/Downloads/Assignment 3/Assignment 3.ipynb?download=false](https://www.kaggle.com/rt/html/Downloads/Assignment%203/Assignment%203.ipynb?download=false)

0.99990911

0.99990335

0.99996693

[illegible]

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[illegible]

0.99990017

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0.9999	0.9999	0.9999	0.9999	0.9999
0.9999	0.9999	0.9999	0.9999	0.9999
0.9999	0.9999	0.9999	0.9999	0.9999
0.9999	0.9999	0.9999	1.00007986	0.9999
0.9999	0.9999	0.9999	0.9999	0.9999
0.9999	0.9999	0.9999	0.9999	0.9999
0.9999	0.9999	0.9999	0.9999	0.9999
0.9999	0.9999	0.9999	0.9999	0.9999
0.9999	0.9999	0.9999	0.9999	0.9999
0.9999	0.9999	0.9999	1.00154393	

```
In [87]: mat_test = np.zeros((478,len(ltotalwc)+1))
ind = 0
for i in x:
    y = os.listdir("assignment3_test\\test\\" + i)
    for j in y:
        logwc = {}
        f = "assignment3_test\\test\\" + i + "\\\" + j
        file=open(f,"r", errors = 'ignore')
        for word in file.read().split():
            if word not in stopWords:
                if word not in logwc and word.isalpha():
                    logwc[word] = 1
                elif word.isalpha():
                    logwc[word] += 1
        for k in logwc:
            if k in ltotalwc:
                mat_test[ind][ltotalwc.index(k)] = logwc[k]
        if i=="spam":
            mat_test[ind][len(ltotalwc)] = 1
        ind = ind + 1
```

```
In [88]: th = 0
ts = 0
tt = 0
for i in range(mat_test.shape[0]):
    s = 0
    for j in range(mat_test.shape[1]-1):
        s = s + (w_new[j]*mat_test[i][j])
    s = s + w[0]
    tt += 1
    if mat_test[i][len(ltotalwc)]==1 and s>0:
        ts += 1
    elif mat_test[i][len(ltotalwc)]==0 and s<0:
        th += 1
print("Accuracy:",(ts+th)/tt)
```

Accuracy: 0.502092050209205

In []: