

TASK 3: Develop a Naïve Bayesian classifier as an email filter in Python. Namely, the classifier predicts whether emails are ordinary or adverts

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In [1]: import pandas as pd
        from numpy import *
        import numpy as np
        from sklearn.model_selection import StratifiedShuffleSplit
        from sklearn.model_selection import train_test_split
```

```
In [2]: ### -- Load Wordlist to array -- ###
        testsite_array = []
        with open('wordsList') as my_file:
            for line in my_file:
                testsite_array.append(list(line.split('\n')))
```

```
In [3]: ### -- Remove ( ' ' blanks) from all nested array -- ###
        for i, val in enumerate(testsite_array):
            testsite_array[i] = ' '.join(testsite_array[i]).split()
```

```
In [4]: ### -- Check if blanks are removed -- ###  
testsite_array
```

```

Out[4]: [['codeine,15mg,for,203,visa,only,codeine,methylmorphine,narcotic,opioid,pai
n,reliever,have,15mg,30mg,pills,15mg,for,203,15mg,for,385,15mg,for,562,visa,o
nly'],
['peter,with,jose,out,town,you,want,meet,once,while,keep,things,going,and,so
me,interesting,stuff,let,know,eugene'],
['hydrocodone,vicodin,brand,watson,vicodin,750,195,120,570,brand,watson,750,
195,120,570,brand,watson,325,199,120,588,noprescription,required,free,expres
s,fedex,days,delivery,for,over,200,order,major,credit,cards,check'],
['yay,you,both,doing,fine,working,mba,design,strategy,cca,top,art,school,ne
w,program,focusing,more,right,brained,creative,and,strategic,approach,managem
ent,the,way,done,today'],
['you,have,everything,gain,incredible,gains,length,inches,yourpenis,permanan
tly,amazing,increase,thickness,yourpenis,betterejaculation,control,experie
nce,rock,harderections,explosive,intenseorgasms,increase,volume,ofejaculate,do
ctor,designed,and,endorsed,100,herbal,100,natural,100,safe,the,proven,natural
penisenhancement,that,works,100,moneyback,guaranteed'],
['what,going,there,talked,john,email,talked,about,some,computer,stuff,that,w
ent,bike,riding,the,rain,was,not,that,cold,went,the,museum,yesterday,was,get,
and,they,had,free,food,the,same,time,was,giants,game,when,got,done,had,take,t
he,train,with,all,the,giants,fans,they,are,drunk'],
['percocet,625,withoutprescription,tabs,225,percocet,narcotic,analgesic,use
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['been,working,running,website,using,jquery,and,the,jqplot,plugin,not,too,fa
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nly'],
['there,was,guy,the,gas,station,who,told,that,knew,mandarin,and,python,coul
d,get,job,with,the,fbi'],
['oem,adobe,microsoft,softwares,fast,order,and,download,microsoft,office,pro
fessional,plus,2007,2010,129,microsoft,windows,ultimate,119,adobe,photoshop,c
s5,extended,adobe,acrobat,pro,extended,windows,professional,thousand,more,tit
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and,they,had,free,food,the,same,time,was,giants,game,when,got,done,had,take,t
he,train,with,all,the,giants,fans,they,are,drunk'],
['percocet,625,withoutprescription,tabs,225,percocet,narcotic,analgesic,use
d,treat,moderate,moderately,severepain,top,quality,express,shipping,100,safe,

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discreet,private,buy,cheap,percocet,online'],
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r,away,from,having,prototype,launch,you,used,jqplot,right,not,think,you,woul
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fessional,plus,2007,2010,129,microsoft,windows,ultimate,119,adobe,photoshop,c
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nly'],
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he,train,with,all,the,giants,fans,they,are,drunk'],
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nly'],
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les'],
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['you,have,everything,gain,incredible,gains,length,inches,yourpenis,permanently,amazing,increase,thickness,yourpenis,betterejaculation,control,experience,rock,harderections,explosive,intenseorgasms,increase,volume,ofejaculate,doctor,designed,and,endorsed,100,herbal,100,natural,100,safe'],

['this,mail,was,sent,from,notification,only,address,that,cannot,accept,incoming,mail,please,not,reply,this,message,thank,you,for,your,online,reservation,the,store,you,selected,has,located,the,item,you,requested,and,has,placed,held,your,name,please,note,that,all,items,are,held,for,day,please,note,store,prices,may,differ,from,those,online,you,have,questions,need,assistance,with,your,reservation,please,contact,the,store,the,phone,number,listed,below,you,can,also,access,store,information,such,store,hours,and,location,the,web,http,www,borders,com,online,store,storedetailview_98'],

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['peter,these,are,the,only,good,scenic,ones,and,too,bad,there,was,girl,back,one,them,just,try,enjoy,the,blue,sky'],

['ordercializviagra,online,save,0online,pharmacy,noprescription,required,buy,canadian,drugs,wholesale,prices,and,save,fda,approved,drugs,superb,quality,drugs,only,accept,all,major,credit,cards'],

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['you,have,everything,gain,incredible,gains,length,inches,yourpenis,permanently,amazing,increase,thickness,yourpenis,betterejaculation,control,experience,rock,harderections,explosive,intenseorgasms,increase,volume,ofejaculate,doctor,designed,and,endorsed,100,herbal,100,natural,100,safe,the,proven,natural,penisenhancement,that,works,100,moneyback,guaranteed'],

['arvind,thirumalai,commented,your,status,arvind,wrote,you,reply,this,email,comment,this,status'],

['buy,ambiem,zolpidem,5mg,10mg,pill,pills,129,pills,199,180,pills,430,pills,138,120,pills,322'],

['thanks,peter,definitely,check,this,how,your,book,going,heard,chapter,came,and,was,good,shape,hope,you,are,doing,well,cheers,troy'],

['ordercializviagra,online,save,0online,pharmacy,noprescription,required,buy,canadian,drugs,wholesale,prices,and,save,fda,approved,drugs,superb,quality,drugs,only,accept,all,major,credit,cards,order,today,from'],

['jay,stepp,commented,your,status,jay,wrote,the,reply,this,email,comment,this,status,see,the,comment,thread,follow,the,link,below'],

['buyviagra,25mg,50mg,100mg,brandviagra,femaleviagra,from,per,pill,viagranoprescription,needed,from,certified,canadian,pharmacy,buy,here,accept,visa,amex,check,worldwide,delivery'],

['linkedin,kerry,haloney,requested,add,you,connection,linkedin,peter,like,add,you,professional,network,linkedin,kerry,haloney'],

['you,have,everything,gain,incredible,gains,length,inches,yourpenis,permanently,amazing,increase,thickness,yourpenis,betterejaculation,control,experience,rock,harderections,explosive,intenseorgasms,increase,volume,ofejaculate,doctor,designed,and,endorsed,100,herbal,100,natural,100,safe'],

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['you,have,everything,gain,incredible,gains,length,inches,yourpenis,permanently,amazing,increase,thickness,yourpenis,betterejaculation,control,experience,rock,harderections,explosive,intenseorgasms,increase,volume,ofejaculate,doctor,designed,and,endorsed,100,herbal,100,natural,100,safe'],

['yeah,ready,may,not,here,because,jar,jar,has,plane,tickets,germany,for'],

['home,based,business,opportunity,knocking,your,door,don,rude,and,let,this,chance,you,can,earn,great,income,and,find,your,financial,life,transformed,learn,more,here,your,success,work,from,home,finder,experts'],

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['codeine,the,most,competitive,price,net,codeine,wilson,30mg,156,codeine,wilson,30mg,291,freeviagra,pills,codeine,wilson,30mg,396,freeviagra,pills,codeine,wilson,30mg,120,492,freeviagra,pills'],

['peter,sure,thing,sounds,good,let,know,what,time,would,good,for,you,will,come,prepared,with,some,ideas,and,can,from,there,regards,vivek'],

['get,off,online,watchesstore,discount,watches,for,all,famous,brands,watches,arolexbulgari,dior,hermes,oris,cartier,and,more,brands,louis,vuitton,bags,wallets,gucci,bags,tiffany,jewelry,enjoy,full,year,warranty,shipment,via,reputable,courier,fedex,ups,dhl,and,ems,speedpost,you,will,100,recieve,your,order,save,off,quality,watches'],

['linkedin,julius,requested,add,you,connection,linkedin,peter,looking,forward,the,book,accept,view,invitation,from,julius'],

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['thought,about,this,and,think,possible,should,get,another,lunch,have,car,now,and,could,come,pick,you,this,time,does,this,wednesday,work,can,have,signed,copy,you,book'],

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['saw,this,the,way,the,coast,thought,might,like,hangzhou,huge,one,day,wasn,enough,but,got,glimpse,went,inside,the,china,pavilion,expo,pretty,interesting,each,province,has,exhibit'],

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['hommies,just,got,phone,call,from,the,roofer,they,will,come,and,spaying,the,foaming,today,will,dusty,pls,close,all,the,doors,and,windows,could,you,help,close,bathroom>window,cat>window,and,the,sliding,door,behind,the,don,now,can,those,cats,survive,sorry,for,any,inconvenience'],

['you,have,everything,gain,incredible,gains,length,inches,yourpenis,permanently,amazing,increase,thickness,yourpenis,betterejaculation,control,experience

e,rock,harderecations,explosive,intenseorgasns,increase,volume,ofejaculate,doctor,designed,and,endorsed,100,herbal,100,natural,100,safe'],

['scifinance,now,automatically,generates,gpu,enabled,pricing,risk,model,source,code,that,runs,300x,faster,than,serial,code,using,new,nvidia,fermi,class,tesla,series,gpu,scifinance,derivatives,pricing,and,risk,model,development,tool,that,automatically,generates,and,gpu,enabled,source,code,from,concise,high,level,model,specifications,parallel,computing,cuda,programming,expertise,required,scifinance,automatic,gpu,enabled,monte,carlo,pricing,model,source,code,generation,capabilities,have,been,significantly,extended,the,latest,release,this,includes'],

['you,have,everything,gain,incredible,gains,length,inches,yourpenis,permanently,amazing,increase,thickness,yourpenis,betterejaculation,control,experience,rock,harderecations,explosive,intenseorgasns,increase,volume,ofejaculate,doctor,designed,and,endorsed,100,herbal,100,natural,100,safe'],

['will,there,the,latest'],

['experience,with,biggerpenis,today,grow,inches,more,the,safest,most,effective,methods,of_penisenlargement,save,your,time,and,money,bettererections,with,effective,maleenhancement,products,maleenhancement,supplement,trusted,millions,buy,today'],

['that,cold,there,going,retirement,party,are,the,leaves,changing,color']]

```
In [5]: ### -- TOGET data in final format i.e., converting to '' for all entries -- ##  
#  
B = []  
for i, val in enumerate(testsite_array):  
    for x in testsite_array[i]:  
        B.append(x.split(','))  
print(B)
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'nvidia', 'fermi', 'class', 'tesla', 'series', 'gpu', 'scifinance', 'derivatives', 'pricing', 'and', 'risk', 'model', 'development', 'tool', 'that', 'automatically', 'generates', 'and', 'gpu', 'enabled', 'source', 'code', 'from', 'concise', 'high', 'level', 'model', 'specifications', 'parallel', 'computing', 'cuda', 'programming', 'expertise', 'required', 'scifinance', 'automatic', 'gpu', 'enabled', 'monte', 'carlo', 'pricing', 'model', 'source', 'code', 'generation', 'capabilities', 'have', 'been', 'significantly', 'extended', 'the', 'latest', 'release', 'this', 'includes'], ['you', 'have', 'everything', 'gain', 'incredible', 'gains', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 'thickness', 'yourpenis', 'betterejaculation', 'control', 'experience', 'rock', 'harderecations', 'explosive', 'intenseorgasms', 'increase', 'volume', 'ofejaculate', 'doctor', 'designed', 'and', 'endorsed', '100', 'herbal', '100', 'natural', '100', 'safe'], ['will', 'there', 'the', 'latest'], ['experience', 'with', 'biggerpenis', 'today', 'grow', 'inches', 'more', 'the', 'safest', 'most', 'effective', 'methods', 'of_penisenlarge ment', 'save', 'your', 'time', 'and', 'money', 'bettererections', 'with', 'effective', 'maleenhancement', 'products', 'maleenhancement', 'supplement', 'trusted', 'millions', 'buy', 'today'], ['that', 'cold', 'there', 'going', 'retirement', 'party', 'are', 'the', 'leaves', 'changing', 'color']]

```
In [6]: ### -- Read in Class List -- ###
with open('classList', 'r') as f:
    classList = f.readlines()
```

```
In [7]: ### -- To Remove \n from each number in the List -- ###
stripped_line = [s.rstrip() for s in classList]
```

```
In [8]: ### -- Check if \n is removed -- ###  
stripped_line
```

localhost:8888/nbconvert/html/task3.ipynb?download=false


```
In [9]: ### -- convert String to INT -- ###
        stripped_line = [int(i) for i in stripped_line]
```

```
In [10]: ### -- Check to see if conversion is successful -- ###  
stripped_line
```

localhost:8888/nbconvert/html/task3.ipynb?download=false

```
0,  
1,  
0,  
1,  
0,  
1,  
0,  
1,  
0,  
1,  
0,  
1,  
0,  
1,  
0,  
1,  
0]
```

```
In [11]: ### ---Assign back to read-able variable names --- ###  
classList = stripped_line  
wordsList = B
```

```
In [12]: print(classList,wordsList)
```

[illegible]

y'], ['you', 'have', 'everything', 'gain', 'incredible', 'gains', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 'thickness', 'yourpenis', 'betterejaculation', 'control', 'experience', 'rock', 'hardereceti ns', 'explosive', 'intenseorgasns', 'increase', 'volume', 'ofejaculate', 'doc tor', 'designed', 'and', 'endorsed', '100', 'herbal', '100', 'natural', '10 0', 'safe', 'the', 'proven', 'naturalpenisenhancement', 'that', 'works', '10 0', 'moneyback', 'guaranteed'], ['what', 'going', 'there', 'talked', 'john', 'email', 'talked', 'about', 'some', 'computer', 'stuff', 'that', 'went', 'bike', 'riding', 'the', 'rain', 'was', 'not', 'that', 'cold', 'went', 'the', 'mu seum', 'yesterday', 'was', 'get', 'and', 'they', 'had', 'free', 'food', 'th e', 'same', 'time', 'was', 'giants', 'game', 'when', 'got', 'done', 'had', 't ake', 'the', 'train', 'with', 'all', 'the', 'giants', 'fans', 'they', 'are', 'drunk'], ['percocet', '625', 'withoutprescription', 'tabs', '225', 'percoce t', 'narcotic', 'analgesic', 'used', 'treat', 'moderate', 'moderately', 'seve repain', 'top', 'quality', 'express', 'shipping', '100', 'safe', 'discreet', 'private', 'buy', 'cheap', 'percocet', 'online'], ['been', 'working', 'runnin g', 'website', 'using', 'jquery', 'and', 'the', 'jqplot', 'plugin', 'not', 't oo', 'far', 'away', 'from', 'having', 'prototype', 'launch', 'you', 'used', 'jqplot', 'right', 'not', 'think', 'you', 'would', 'like'], ['codeine', '15m g', 'for', '203', 'visa', 'only', 'codeine', 'methyilmorphine', 'narcotic', 'o pioid', 'pain', 'reliever', 'have', '15mg', '30mg', 'pills', '15mg', 'for', '203', '15mg', 'for', '385', '15mg', 'for', '562', 'visa', 'only'], ['there', 'was', 'guy', 'the', 'gas', 'station', 'who', 'told', 'that', 'knew', 'mandar in', 'and', 'python', 'could', 'get', 'job', 'with', 'the', 'fbi'], ['oem', 'adobe', 'microsoft', 'softwares', 'fast', 'order', 'and', 'download', 'micro soft', 'office', 'professional', 'plus', '2007', '2010', '129', 'microsoft', 'windows', 'ultimate', '119', 'adobe', 'photoshop', 'cs5', 'extended', 'adobe', 'acrobat', 'pro', 'extended', 'windows', 'professional', 'thousand', 'mor e', 'titles'], ['codeine', '15mg', 'for', '203', 'visa', 'only', 'codeine', 'methyilmorphine', 'narcotic', 'opioid', 'pain', 'reliever', 'have', '15mg', '30mg', 'pills', '15mg', 'for', '203', '15mg', 'for', '385', '15mg', 'for', '562', 'visa', 'only'], ['peter', 'with', 'jose', 'out', 'town', 'you', 'wan t', 'meet', 'once', 'while', 'keep', 'things', 'going', 'and', 'some', 'inter esting', 'stuff', 'let', 'know', 'eugene'], ['hydrocodone', 'vicodin', 'bran d', 'watson', 'vicodin', '750', '195', '120', '570', 'brand', 'watson', '75 0', '195', '120', '570', 'brand', 'watson', '325', '199', '120', '588', 'nopr escription', 'required', 'free', 'express', 'fedex', 'days', 'delivery', 'fo r', 'over', '200', 'order', 'major', 'credit', 'cards', 'check'], ['yay', 'yo u', 'both', 'doing', 'fine', 'working', 'mba', 'design', 'strategy', 'cca', 'top', 'art', 'school', 'new', 'program', 'focusing', 'more', 'right', 'brain ed', 'creative', 'and', 'strategic', 'approach', 'management', 'the', 'way', 'done', 'today'], ['you', 'have', 'everything', 'gain', 'incredible', 'gain s', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 't hickness', 'yourpenis', 'betterejaculation', 'control', 'experience', 'rock', 'hardereceti ns', 'explosive', 'intenseorgasns', 'increase', 'volume', 'ofeja culate', 'doctor', 'designed', 'and', 'endorsed', '100', 'herbal', '100', 'na tural', '100', 'safe', 'the', 'proven', 'naturalpenisenhancement', 'that', 'w orks', '100', 'moneyback', 'guaranteed'], ['what', 'going', 'there', 'talke d', 'john', 'email', 'talked', 'about', 'some', 'computer', 'stuff', 'that', 'went', 'bike', 'riding', 'the', 'rain', 'was', 'not', 'that', 'cold', 'wen t', 'the', 'museum', 'yesterday', 'was', 'get', 'and', 'they', 'had', 'free', 'food', 'the', 'same', 'time', 'was', 'giants', 'game', 'when', 'got', 'don e', 'had', 'take', 'the', 'train', 'with', 'all', 'the', 'giants', 'fans', 't hey', 'are', 'drunk'], ['percocet', '625', 'withoutprescription', 'tabs', '22 5', 'percocet', 'narcotic', 'analgesic', 'used', 'treat', 'moderate', 'modera tely', 'severepain', 'top', 'quality', 'express', 'shipping', '100', 'safe', 'discreet', 'private', 'buy', 'cheap', 'percocet', 'online'], ['been', 'worki

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8'], ['bargains', 'here', 'buy', 'phentermin', 'buy', 'genuine', 'phentermin', 'low', 'cost', 'visa', 'accepted', '130', '219', '292', '120', '366', '180', '513'], ['peter', 'these', 'are', 'the', 'only', 'good', 'scenic', 'one', 's', 'and', 'too', 'bad', 'there', 'was', 'girl', 'back', 'one', 'them', 'just', 'try', 'enjoy', 'the', 'blue', 'sky'], ['ordercializviagra', 'online', 'save', 'online', 'pharmacy', 'noprescription', 'required', 'buy', 'canadian', 'drugs', 'wholesale', 'prices', 'and', 'save', 'fda', 'approved', 'drugs', 'superb', 'quality', 'drugs', 'only', 'accept', 'all', 'major', 'credit', 'cards'], ['ryan', 'whybrew', 'commented', 'your', 'status', 'ryan', 'wrote', 'turd', 'ferguson', 'butt', 'horn'], ['you', 'have', 'everything', 'gain', 'incredible', 'gains', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 'thickness', 'yourpenis', 'betterejaculation', 'control', 'experience', 'rock', 'harderecetions', 'explosive', 'intenseorgasns', 'increase', 'volume', 'ofejaculate', 'doctor', 'designed', 'and', 'endorsed', '100', 'herbal', '100', 'natural', '100', 'safe', 'the', 'proven', 'naturalpenisenhancement', 'that', 'works', '100', 'moneyback', 'guaranteeed'], ['arvind', 'thirumalai', 'commented', 'your', 'status', 'arvind', 'wrote', 'you', 'know', 'reply', 'this', 'email', 'comment', 'this', 'status'], ['buy', 'ambiem', 'zolpidem', '5mg', '10mg', 'pill', 'pills', '129', 'pills', '199', '180', 'pills', '430', 'pills', '138', '120', 'pills', '322'], ['thanks', 'peter', 'definitely', 'check', 'this', 'how', 'your', 'book', 'going', 'heard', 'chapter', 'came', 'and', 'was', 'good', 'shape', 'hope', 'you', 'are', 'doing', 'well', 'cheers', 'troy'], ['ordercializviagra', 'online', 'save', 'online', 'pharmacy', 'noprescription', 'required', 'buy', 'canadian', 'drugs', 'wholesale', 'prices', 'and', 'save', 'fda', 'approved', 'drugs', 'superb', 'quality', 'drugs', 'only', 'accept', 'all', 'major', 'credit', 'cards', 'order', 'today', 'from'], ['jay', 'stepp', 'commented', 'your', 'status', 'jay', 'wrote', 'the', 'reply', 'this', 'email', 'comment', 'this', 'status', 'see', 'the', 'comment', 'thread', 'follow', 'the', 'link', 'below'], ['buyviagra', '25mg', '50mg', '100mg', 'brandviagra', 'femaleviagra', 'from', 'per', 'pill', 'viagranoprescription', 'needed', 'from', 'certified', 'canadian', 'pharmacy', 'buy', 'here', 'accept', 'visa', 'amex', 'check', 'worldwide', 'delivery'], ['linked in', 'kerry', 'haloney', 'requested', 'add', 'you', 'connection', 'linkedin', 'peter', 'like', 'add', 'you', 'professional', 'network', 'linkedin', 'kerry', 'haloney'], ['you', 'have', 'everything', 'gain', 'incredible', 'gains', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 'thickness', 'yourpenis', 'betterejaculation', 'control', 'experience', 'rock', 'harderecetions', 'explosive', 'intenseorgasns', 'increase', 'volume', 'ofejaculate', 'doctor', 'designed', 'and', 'endorsed', '100', 'herbal', '100', 'natural', '100', 'safe'], ['peter', 'the', 'hotels', 'are', 'the', 'ones', 'that', 'rent', 'out', 'the', 'tent', 'they', 'are', 'all', 'lined', 'the', 'hotel', 'grounds', 'much', 'for', 'being', 'one', 'with', 'nature', 'more', 'like', 'being', 'one', 'with', 'couple', 'dozen', 'tour', 'groups', 'and', 'nature', 'have', 'about', '100m', 'pictures', 'from', 'that', 'trip', 'can', 'through', 'them', 'and', 'get', 'you', 'jpgs', 'favorite', 'scenic', 'pictures', 'where', 'are', 'you', 'and', 'jocelyn', 'now', 'new', 'york', 'will', 'you', 'come', 'tokyo', 'for', 'chinese', 'new', 'year', 'perhaps', 'see', 'the', 'two', 'you', 'then', 'will', 'thailand', 'for', 'winter', 'holiday', 'see', 'mom', 'take', 'care'], ['you', 'have', 'everything', 'gain', 'incredible', 'gains', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 'thickness', 'yourpenis', 'betterejaculation', 'control', 'experience', 'rock', 'harderecetions', 'explosive', 'intenseorgasns', 'increase', 'volume', 'ofejaculate', 'doctor', 'designed', 'and', 'endorsed', '100', 'herbal', '100', 'natural', '100', 'safe'], ['yeah', 'ready', 'may', 'not', 'here', 'because', 'jar', 'jar', 'has', 'plane', 'tickets', 'germany', 'for'], ['home', 'based', 'business', 'opportunity', 'knocking', 'your', 'door', 'don', 'rude', 'and', 'let', 'this', 'chance', 'you', 'can', 'earn', 'great', 'income', 'and', 'fin

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```

Stratified Sampling as follows

```
In [13]: X_train, X_test, y_train, y_test = train_test_split( wordsList, classList, tes
t_size=6, random_state=42, stratify=classList)
```

```
In [14]: print('X_train: {} \nX_test: {} \ny_train: {} \ny_test: {}'.format(len(X_train
),len(X_test),len(y_train),len(y_test)))
```

```
X_train: 66
X_test: 6
y_train: 66
y_test: 6
```

```
In [15]: ### --- To Train dataset --- ### :

wordsList_Train = X_train
classList_Train = y_train

### --- To Test dataset --- ### :

wordsList_Test = X_test
classList_Test = y_test
```

```
In [16]: print(wordsList_Train,wordsList_Test)
```

[['thanks', 'peter', 'definitely', 'check', 'this', 'how', 'your', 'book', 'going', 'heard', 'chapter', 'came', 'and', 'was', 'good', 'shape', 'hope', 'you', 'are', 'doing', 'well', 'cheers', 'troy'], ['ordercializviagra', 'online', 'save', 'online', 'pharmacy', 'noprescription', 'required', 'buy', 'canadian', 'drugs', 'wholesale', 'prices', 'and', 'save', 'fda', 'approved', 'drugs', 'superb', 'quality', 'drugs', 'only', 'accept', 'all', 'major', 'credit', 'cards'], ['that', 'cold', 'there', 'going', 'retirement', 'party', 'are', 'the', 'leaves', 'changing', 'color'], ['you', 'have', 'everything', 'gain', 'incredible', 'gains', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 'thickness', 'yourpenis', 'betterejaculation', 'control', 'experience', 'rock', 'harderecations', 'explosive', 'intenseorgasns', 'increase', 'volume', 'ofejaculate', 'doctor', 'designed', 'and', 'endorsed', '100', 'herbal', '100', 'natural', '100', 'safe'], ['hydrocodone', 'vicodin', 'brand', 'watson', 'vicodin', '750', '195', '120', '570', 'brand', 'watson', '750', '195', '120', '570', 'brand', 'watson', '325', '199', '120', '588', 'noprescription', 'required', 'free', 'express', 'fedex', 'days', 'delivery', 'for', 'over', '200', 'order', 'major', 'credit', 'cards', 'check'], ['percocet', '625', 'withoutprescription', 'tabs', '225', 'percocet', 'narcotic', 'analgesic', 'used', 'treat', 'moderate', 'moderately', 'severepain', 'top', 'quality', 'express', 'shipping', '100', 'safe', 'discreet', 'private', 'buy', 'cheap', 'percocet', 'online'], ['you', 'have', 'everything', 'gain', 'incredible', 'gains', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 'thickness', 'yourpenis', 'betterejaculation', 'control', 'experience', 'rock', 'harderecations', 'explosive', 'intenseorgasns', 'increase', 'volume', 'ofejaculate', 'doctor', 'designed', 'and', 'endorsed', '100', 'herbal', '100', 'natural', '100', 'safe', 'the', 'proven', 'naturalpenisenhancement', 'that', 'works', '100', 'moneyback', 'guaranteed'], ['codeine', 'the', 'most', 'competitive', 'price', 'net', 'codeine', 'wilson', '30mg', '156', 'codeine', 'wilson', '30mg', '291', 'freeviagra', 'pills', 'codeine', 'wilson', '30mg', '396', 'freeviagra', 'pills', 'codeine', 'wilson', '30mg', '120', '492', 'freeviagra', 'pills'], ['thought', 'about', 'this', 'and', 'think', 'possible', 'should', 'get', 'another', 'lunch', 'have', 'car', 'now', 'and', 'could', 'come', 'pick', 'you', 'this', 'time', 'does', 'this', 'wednesday', 'work', 'can', 'have', 'signed', 'copy', 'you', 'book'], ['peter', 'with', 'jose', 'out', 'town', 'you', 'want', 'meet', 'once', 'while', 'keep', 'things', 'going', 'and', 'some', 'interesting', 'stuff', 'let', 'know', 'eugene'], ['peter', 'these', 'are', 'the', 'only', 'good', 'scenic', 'ones', 'and', 'too', 'bad', 'there', 'was', 'girl', 'back', 'one', 'them', 'just', 'try', 'enjoy', 'the', 'blue', 'sky'], ['experience', 'with', 'biggerpenis', 'today', 'grow', 'inches', 'more', 'the', 'safest', 'most', 'effective', 'methods', 'of_penisenlargement', 'save', 'your', 'time', 'and', 'money', 'bettererections', 'with', 'effective', 'maleenhancement', 'products', 'maleenhancement', 'supplement', 'trusted', 'millions', 'buy', 'today'], ['what', 'going', 'there', 'talked', 'john', 'email', 'talked', 'about', 'some', 'computer', 'stuff', 'that', 'went', 'bike', 'riding', 'the', 'rain', 'was', 'not', 'that', 'cold', 'went', 'the', 'museum', 'yesterday', 'was', 'get', 'and', 'they', 'had', 'free', 'food', 'the', 'same', 'time', 'was', 'giants', 'game', 'when', 'got', 'done', 'had', 'take', 'the', 'train', 'with', 'all', 'the', 'giants', 'fans', 'they', 'are', 'drunk'], ['codeine', '15mg', 'for', '203', 'visa', 'only', 'codeine', 'methyilmorphine', 'narcotic', 'opioid', 'pain', 'reliever', 'have', '15mg', '30mg', 'pills', '15mg', 'for', '203', '15mg', 'for', '385', '15mg', 'for', '562', 'visa', 'only'], ['been', 'working', 'running', 'website', 'using', 'jquery', 'and', 'the', 'jqplot', 'plugin', 'not', 'too', 'far', 'away', 'from', 'having', 'prototype', 'launch', 'you', 'used', 'jqplot', 'right', 'not', 'think', 'you', 'would', 'like'], ['oem', 'adobe', 'microsoft', 'softwares', 'fast', 'order', 'and', 'download', 'microsoft', 'office', 'professional', 'plus', '2007', '2010', '129', 'microsoft', 'windows', 'ultimate', '119',

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['benoit', 'mandelbrot', '1924', '2010', 'benoit', 'mandelbrot', '1924', '2010', 'wilmott', 'team', 'benoit', 'mandelbrot', 'the', 'mathematician', 'the', 'father', 'fractal', 'mathematics', 'and', 'advocate', 'more', 'sophisticated', 'modelling', 'quantitative', 'finance', 'died', '14th', 'october', '2010', 'aged', 'wilmott', 'magazine', 'has', 'often', 'featured', 'mandelbrot', 'his', 'ideas', 'and', 'the', 'work', 'others', 'inspired', 'his', 'fundamental', 'insights', 'you', 'must', 'logged', 'view', 'these', 'articles', 'from', 'past', 'issues', 'wilmott', 'magazine'], ['get', 'off', 'online', 'watch', 'esstore', 'discount', 'watches', 'for', 'all', 'famous', 'brands', 'watches', 'arolexbvlgari', 'dior', 'hermes', 'oris', 'cartier', 'and', 'more', 'brands', 'louis', 'vuitton', 'bags', 'wallets', 'gucci', 'bags', 'tiffany', 'jewelry', 'enjoy', 'full', 'year', 'warranty', 'shipment', 'via', 'reputable', 'courier', 'fedex', 'ups', 'dhl', 'and', 'ems', 'speedpost', 'you', 'will', '100', 'recieve', 'your', 'order'], ['yeah', 'ready', 'may', 'not', 'here', 'because', 'jar', 'jar', 'has', 'plane', 'tickets', 'germany', 'for'], ['oem', 'adobe', 'microsoft', 'softwares', 'fast', 'order', 'and', 'download', 'microsoft', 'office', 'professional', 'plus', '2007', '2010', '129', 'microsoft', 'windows', 'ultimate', '119', 'adobe', 'photoshop', 'cs5', 'extended', 'adobe', 'acrobat', 'pro', 'extended', 'windows', 'professional', 'thousand', 'more', 'titles'], ['hydrocodone', 'vicodin', 'brand', 'watson', 'vicodin', '750', '195', '120', '570', 'brand', 'watson', '750', '195', '120', '570', 'brand', 'watson', '325', '199', '120', '588', 'noprescription', 'required', 'free', 'express', 'fedex', 'days', 'delivery', 'for', 'over', '200', 'order', 'major', 'credit', 'cards', 'check'], ['hommies', 'just', 'got', 'phone', 'call', 'from', 'the', 'roofer', 'they', 'will', 'come', 'and', 'spaying', 'the', 'foaming', 'today', 'will', 'dusty', 'pls', 'close', 'all', 'the', 'doors', 'and', 'windows', 'could', 'you', 'help', 'close', 'bathroom', 'window', 'cat', 'window', 'and', 'the', 'sliding', 'door', 'behind', 'the', 'don', 'know', 'how', 'can', 'those', 'cats', 'survive', 'sorry', 'for', 'any', 'inconvenience'], ['peter', 'with', 'jose', 'out', 'town', 'you', 'want', 'meet', 'once', 'while', 'keep', 'things', 'going', 'and', 'some', 'interesting', 'stuff', 'let', 'know', 'eugene'], ['linkedin', 'kerry', 'haloney', 'requested', 'add', 'you', 'connection', 'linkedin', 'peter', 'like', 'add', 'you', 'professional', 'network', 'linkedin', 'kerry', 'haloney'], ['codeine', '15mg', 'for', '203', 'visa', 'only', 'codeine', 'methyilmorphine', 'narcotic', 'opioid', 'pain', 'reliever', 'have', '15mg', '30mg', 'pills', '15mg', 'for', '203', '15mg', 'for', '385', '15mg', 'for', '562', 'visa', 'only'], ['yay', 'you', 'both', 'doing', 'fine', 'working', 'mba', 'design', 'strategy', 'cca', 'top', 'art', 'school', 'new', 'program', 'focusing', 'more', 'right', 'brained', 'creative', 'and', 'strategic', 'approach', 'management', 'the', 'way', 'done', 'today'], ['buy', 'ambiem', 'zolpidem', '5mg', '10mg', 'pill', 'pills', '129', 'pills', '199', '180', 'pills', '430', 'pills', '138', '120', 'pills', '322'], ['peter', 'sure', 'thing', 'sounds', 'good', 'let', 'know', 'what', 'time', 'would', 'good', 'for', 'you', 'will', 'come', 'prepared', 'with', 'some', 'ideas', 'and', 'can', 'from', 'there', 'regards', 'vivek'], ['scifinance', 'now', 'automatically', 'generates', 'gpu', 'enabled', 'pricing', 'risk', 'model', 'source', 'code', 'that', 'runs', '300x', 'faster', 'than', 'serial', 'code', 'using', 'new', 'nvidia', 'fermi', 'class', 'tesla', 'series', 'gpu', 'scifinance', 'derivatives', 'pricing', 'and', 'risk', 'model', 'development', 'tool', 'that', 'automatically', 'generates', 'and', 'gpu', 'enabled', 'source', 'code', 'from', 'concise', 'high', 'level', 'model', 'specifications', 'parallel', 'computing', 'cuda', 'programming', 'expertise', 'required', 'scifinance', 'automatic', 'gpu', 'enabled', 'monte', 'carlo', 'pricing', 'model', 'source', 'code', 'generation', 'capabilities', 'have', 'been', 'significantly', 'extended', 'the', 'latest', 'release', 'this', 'includes'], ['you', 'have', 'everything', 'gain', 'incredible', 'gains', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 'thickness', 'yourpenis', 'bettererejacul

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'385', '15mg', 'for', '562', 'visa', 'only'], ['what', 'going', 'there', 'tal
ked', 'john', 'email', 'talked', 'about', 'some', 'computer', 'stuff', 'tha
t', 'went', 'bike', 'riding', 'the', 'rain', 'was', 'not', 'that', 'cold', 'w
ent', 'the', 'museum', 'yesterday', 'was', 'get', 'and', 'they', 'had', 'fre
e', 'food', 'the', 'same', 'time', 'was', 'giants', 'game', 'when', 'got', 'd
one', 'had', 'take', 'the', 'train', 'with', 'all', 'the', 'giants', 'fans',
'they', 'are', 'drunk'], ['linkedin', 'julius', 'requested', 'add', 'you', 'c
onnection', 'linkedin', 'peter', 'looking', 'forward', 'the', 'book', 'accep
t', 'view', 'invitation', 'from', 'julius']]
```

```
In [17]: ### --- Load training dataset --- ###
def loadDataSet():
    postingList = wordsList_Train
    classVec = classList_Train ### --- 1 is Ordinary(abusive), 0 Ad (not) Loa
ds the classList_Train list to classVec --- ###
    return postingList, classVec
```

```
In [18]: ### --- Create Vocabulary List for Training --- ###
def createVocabList(dataSet):
    vocabSet = set([])
    for document in dataSet:
        vocabSet = vocabSet | set(document)

    return list(vocabSet)
```

```
In [19]: ### --- To Handle Multiple occurances of words --- ###
def bagOfWords2Vec(vocabList, inputSet):
    returnVec = [0] * len(vocabList)
    for word in inputSet: # Loop through the inputset/Test email
        if word in vocabList: #check if the word exist in test email or the on
e we are trying to predict
            returnVec[vocabList.index(word)] += 1
        else:
            print("word: %s not found!" % word)
    return returnVec
```

```

In [20]: ### -- build naive bayes classifier: step 1 (Using "Laplace smoothing") -- ###

def trainLaPlaceDataSet(trainMatrix, trainCategory): ### --- TrainMatrix has
    words encoded in 1 ; --- ###
    numTrainDocs = len(trainMatrix) ### --- Count No. of Nested Lists or email
s present --- ###
    numWords = len(trainMatrix[0]) ### --- Count No. of words in the 1st neste
d array of trainmatrix or No. of words in 1st email --- ###
    pAbusive = sum(trainCategory) / float(numTrainDocs) ### --- Probability of
being an Ads (Abusive) --- ###
    ### --- Sum No. of 1s (Ads) cr
oss check training dataset/No. of Nested List(emails) --- ###
    p0Num = zeros(numWords) ### --- For both p0 & p1 Make an Array of 0s where
Length = no. of words in 1st email --- ###
    p1Num = zeros(numWords)
    p0Denom = 0 ### --- For both p0 & p1 Set denonimator to 0 --- ###
    p1Denom = 0
    for i in range(numTrainDocs): ### -- Loop for no. of training nested Lists
Or each email -- ###
        if trainCategory[i] == 1: ### -- Check if email is Ad (abusive) by che
cking the category list for particular nested list -- ###
            p1Num += trainMatrix[i] ### -- If Ad then add the particular neste
d array to Probability 1 P1 (Advert email) -- ###
            p1Denom += sum(trainMatrix[i]) ### -- Sum of all the 1s & Add to d
enominator -- ###
        else:
            ### -- If email is Ordinary (Not Abusive) t
hen -- ###
            p0Num += trainMatrix[i] ### -- Else If Ordinary then add the parti
cular nested array to Probability 0 P0 (Ordinary email) -- ###
            p0Denom += sum(trainMatrix[i]) ### -- Sum of all the 1s & Add to d
enominator -- ###

    p1Num = [x+0.00001 for x in p1Num ] ### ZERO COUNT
    p1Vect = p1Num / p1Denom ### -- P1 Vector of being a Advert email is P1 ar
ray / total no.1 of 1s (present in the list) -- ###
    p0Num = [x+0.00001 for x in p0Num ]
    p0Vect = p0Num / p0Denom ### -- P0 Vector of being an Ordinary email is P
0 array / total no.1 of 1s (present in the list) -- ###
    return p0Vect, p1Vect, pAbusive

```

```
In [21]: ### -- build a naive bayes classifier: step 2 -- ###
### -- Includes log to handle Numerical Underflows -- ###

def classifyLaplaceDataset(vec2Classify, p0Vec, p1Vec, pAbusive): ### -- returns product of array of elements -- ###
    #p1 = prod(power(p1Vec, vec2Classify)) * pAbusive ### -- Calc Probability of email being Ad (abusive words) -- ###
    p1 = sum(vec2Classify * np.log(p1Vec)) + np.log(pAbusive)

    #p0 = prod(power(p0Vec, vec2Classify)) * (1.0 - pAbusive) ### -- Calc Probability of email being Ordinary (non-abusive words) -- ###
    p0 = sum(vec2Classify * np.log(p0Vec)) + np.log(1.0 - pAbusive)

    ###-- Print modified classification probabilities -- ###
    if p1 > p0:
        return 1,p1,p0
    else:
        return 0,p1,p0
```

```
In [22]: ### -- Building NB classifier + Applying to dataset: -- ###
def TestLaPlaceDataSet():
    # training
    listOPosts, listClasses = loadDataSet() ### -- Split to 2 different list -- ###
    myVocabList = createVocabList(listOPosts) ### -- Convert List to individual word -- ###
    trainMat = []
    columns = ['classification', 'class_list', 'p0', 'p1', 'test_entry']
    df_classification_output=pd.DataFrame(columns=columns)
    for postinDoc in listOPosts: ### -- Looping through all nested list -- ###
        trainMat.append(bagOfWords2Vec(myVocabList,postinDoc))

    p0V, p1V, pAb = trainLaPlaceDataSet(array(trainMat),array(listClasses))

    for i, test_list_entry in enumerate(wordsList_Test):
        # classifying
        testEntry = test_list_entry
        thisDoc = array(bagOfWords2Vec(myVocabList, testEntry))
        p,p1,p0 = classifyLaplaceDataset(thisDoc, p0V, p1V, pAb)
        df_classification_output.loc[i]={'test_entry': testEntry, 'classification': p, 'p0':p0, 'p1':p1, 'class_list':classList_Test[i]}
        print(testEntry, '\n\nAbove classified as: {} P1: {:.3f} P2: {:.3f}\n'.format(p,p1,p0))

    print('\nClassification Report:\n',df_classification_output.head())
```

In [23]: TestLaPlaceDataSet()

['you', 'have', 'everything', 'gain', 'incredible', 'gains', 'length', 'inches', 'yourpenis', 'permanantly', 'amazing', 'increase', 'thickness', 'yourpenis', 'betterejaculation', 'control', 'experience', 'rock', 'harderecetions', 'explosive', 'intenseorgasns', 'increase', 'volume', 'ofejaculate', 'doctor', 'designed', 'and', 'endorsed', '100', 'herbal', '100', 'natural', '100', 'safe', 'the', 'proven', 'naturalpenisenhancement', 'that', 'works', '100', 'mone yback', 'guaranteed']

Above classified as: 1 P1: -202.169 P2: -696.004

['bargains', 'here', 'buy', 'phentermin', 'buy', 'genuine', 'phentermin', 'low', 'cost', 'visa', 'accepted', '130', '219', '292', '120', '366', '180', '513']

Above classified as: 1 P1: -113.544 P2: -323.640

['there', 'was', 'guy', 'the', 'gas', 'station', 'who', 'told', 'that', 'knew', 'mandarin', 'and', 'python', 'could', 'get', 'job', 'with', 'the', 'fbi']

Above classified as: 0 P1: -273.946 P2: -103.338

['codeine', '15mg', 'for', '203', 'visa', 'only', 'codeine', 'methyilmorphine', 'narcotic', 'opioid', 'pain', 'reliever', 'have', '15mg', '30mg', 'pills', '15mg', 'for', '203', '15mg', 'for', '385', '15mg', 'for', '562', 'visa', 'only']

Above classified as: 1 P1: -121.132 P2: -408.196

['what', 'going', 'there', 'talked', 'john', 'email', 'talked', 'about', 'some', 'computer', 'stuff', 'that', 'went', 'bike', 'riding', 'the', 'rain', 'was', 'not', 'that', 'cold', 'went', 'the', 'museum', 'yesterday', 'was', 'get', 'and', 'they', 'had', 'free', 'food', 'the', 'same', 'time', 'was', 'giants', 'game', 'when', 'got', 'done', 'had', 'take', 'the', 'train', 'with', 'all', 'the', 'giants', 'fans', 'they', 'are', 'drunk']

Above classified as: 0 P1: -813.829 P2: -283.996

word: julius is not in my Vocabulary!

word: forward is not in my Vocabulary!

word: invitation is not in my Vocabulary!

word: julius is not in my Vocabulary!

['linkedin', 'julius', 'requested', 'add', 'you', 'connection', 'linkedin', 'peter', 'looking', 'forward', 'the', 'book', 'accept', 'view', 'invitation', 'from', 'julius']

Above classified as: 0 P1: -188.574 P2: -76.190

Classification Report:

	classification	class_list	p0	p1	\
0	1	1	-696.004432	-202.168575	
1	1	1	-323.640047	-113.544132	
2	0	0	-103.338498	-273.945893	
3	1	1	-408.196459	-121.131556	
4	0	0	-283.995701	-813.828600	

test_entry

```
0 [you, have, everything, gain, incredible, gain...
1 [bargains, here, buy, phentermin, buy, genuine...
2 [there, was, guy, the, gas, station, who, told...
3 [codeine, 15mg, for, 203, visa, only, codeine,...
4 [what, going, there, talked, john, email, talk...
```

Naive Bayes classifier explanation:

We first calculate the number of documents in each class & for every training document & class, if a token appears in the document then we'll increase the total count for that token.

We then derive the conditional probabilities for each class as such ### : token count / total token count