HW6 보고서

2014105024 컴퓨터학부 김재구

A. SVM 실행 보고서

1. svm.py를 실행하여 svm_learn에 대한 input, svm_classify을 위한 input을 생성한다

svm_input을 생성하는 함수는 다음과 같다.

```
def make_svm_input(input_file_name,stopword_list,stemmer,output_file_name,tf_idf_dic,all_word_list):
    input_file = open(input_file_name)
    output_file = open(output_file_name,'w')

    for line in input_file:
        # line list contains => first element : class , last element : newline
        output_str = ''
        line_list = re.split('\t| ', line)
        delete_stopword(line_list, stopword_list)
        UseStemmer(line_list, stemmer)
        word_cnt = len(line_list) - 2
        #extract words from line_list AND make sorted list ascending order
        temp_list = line_list[1:word_cnt+1]

        sorted_list = []
        for word in all_word_list:
            if word in temp_list:
                sorted_list.append(word)
        #make output stirng
        if line_list[0] == 'acq':
            output_str += '1'
        else:
            output_str += '-1'
        for word in sorted_list:
            index = all_word_list.index(word)+1
            if tf_idf_dic[word] == 0:
                continue
            output_str += ' '+str(index) + ':' + str(tf_idf_dic[word])
        output_str += '\n'
        output_file.write(output_str)
    return
```

수행결과 다음과 같은 input이 생성된다.

<BNP_train.txt>

```
-1 5:0.006925270059623867 6:0.006101287799200853 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 12:0.00886691997971888 16
-1 8:0.016384554046443005 10:0.019789665297985842 12:0.00886691997971888 15:0.0023581534416526914 17:0.006394307471101231 18:0.021749510836983465
-1 8:0.016384554046443005 10:0.019789665297985842 18:0.021749510836983465 25:0.03353862540732 35:0.0074010424230205344 38:0.016767682627646205 4
1 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 16:0.003842246855271652 17:0.006394307471101231 18:0.021749510836983465
-1 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 17:0.006394307471101231 18:0.021749510836983465 25:0.03353862540732 28:
-1 17:0.006394307471101231 26:0.012593168352602473 38:0.016767682627646205 65:0.00260630723824405 87:0.0033595709815736315 89:0.0040338907009386
1 8:0.016384554046443005 10:0.019789665297985842 17:0.006394307471101231 24:0.009482539841247844 25:0.03353862540732 28:0.009686930293337842 30:
-1 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 17:0.006394307471101231 18:0.021749510836983465 25:0.03353862540732 26:
-1 8:0.016384554046443005 10:0.019789665297985842 16:0.003842246855271652 17:0.006394307471101231 18:0.021749510836983465 20:0.002411367038298887
-1 6:0.006101287799200853 8:0.016384554046443005 10:0.019789665297985842 17:0.006394307471101231 25:0.03353862540732 28:0.009686930293337842 32:
-1 6:0.006101287799200853 9:0.016393850816898536 17:0.006394307471101231 26:0.012593168352602473 30:0.0022381698942324506 44:0.013149623110788171
-1 8:0.016384554046443005 10:0.019789665297985842 18:0.021749510836983465 25:0.03353862540732 28:0.009686930293337842 35:0.0074010424230205344 3
1 6:0.006101287799200853 7:0.00815179893462374 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 12:0.00886691997971888 17:0
-1 8:0.016384554046443005 9:0.016393850816898536 29:0.0021243150555583716 197:0.0035134612281370018 633:0.0031463953020752465 644:0.001732548261
1 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 12:0.00886691997971888 17:0.006394307471101231 18:0.021749510836983465 2
-1 8:0.016384554046443005 18:0.021749510836983465 25:0.03353862540732 26:0.012593168352602473 29:0.0021243150555583716 30:0.0022381698942324506
-1 6:0.006101287799200853 8:0.016384554046443005 10:0.019789665297985842 18:0.021749510836983465 25:0.03353862540732 28:0.009686930293337842 34:
1 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 14:0.009400377083638752 16:0.003842246855271652 25:0.03353862540732 26:0
1 6:0.006101287799200853 8:0.016384554046443005 17:0.006394307471101231 18:0.021749510836983465 25:0.03353862540732 26:0.012593168352602473 30:0
-1 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 12:0.00886691997971888 16:0.003842246855271652 18:0.021749510836983465
-1 8:0.016384554046443005 10:0.019789665297985842 18:0.021749510836983465 25:0.03353862540732 28:0.009686930293337842 35:0.0074010424230205344 3
1 5:0.006925270059623867 6:0.006101287799200853 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 12:0.00886691997971888 16:
-1 8:0.016384554046443005 18:0.021749510836983465 25:0.03353862540732 26:0.012593168352602473 30:0.0022381698942324506 41:0.0037066875709585263
-1 8:0.016384554046443005 17:0.006394307471101231 18:0.021749510836983465 25:0.03353862540732 26:0.012593168352602473 40:0.019268873882164243 44
1 1:0.0022120041805741065 7:0.00815179893462374 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 12:0.00886691997971888 25:
-1 7:0.00815179893462374 8:0.016384554046443005 10:0.019789665297985842 18:0.021749510836983465 24:0.009482539841247844 25:0.03353862540732 26:0
-1 16:0.003842246855271652 82:0.001189404408621469 96:0.0008451727296910197 103:0.008252190416672647 156:0.0004022423421329334 229:0.00068918507
1 6:0.006101287799200853 7:0.00815179893462374 8:0.016384554046443005 10:0.019789665297985842 14:0.009400377083638752 18:0.021749510836983465 24
1 8:0.016384554046443005 103:0.008252190416672647 305:0.0033347224507954353 357:0.0017931661370381663 420:0.008703935648928405 776:0.00160879481
1 1:0.0022120041805741065 6:0.006101287799200853 7:0.00815179893462374 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 17:
-1 1:0.0022120041805741065 7:0.00815179893462374 96:0.0008451727296910197 276:0.0006159909698862033 545:0.0009191817490044648 630:0.000759065239
-1 8:0.016384554046443005 10:0.019789665297985842 18:0.021749510836983465 25:0.03353862540732 38:0.016767682627646205 44:0.013149623110788171 49
-1 7:0.00815179893462374 630:0.0007590652399220948 1374:0.0003548551460239322 3532:8.7077607986050290-05 6785:0.0001050805195912532 7040:9.10823
-1 8:0.016384554046443005 10:0.019789665297985842 18:0.021749510836983465 25:0.03353862540732 28:0.009686930293337842 30:0.0022381698942324506 3
-1 17:0.006394307471101231 24:0.009482539841247844 96:0.0008451727296910197 103:0.008252190416672647 276:0.0006159909698862033 545:0.00091918174
-1 6:0.006101287799200853 7:0.00815179893462374 17:0.006394307471101231 96:0.0008451727296910197 630:0.0007590652399220948 732:0.000552302898173
-1 7:0.00815179893462374 17:0.006394307471101231 30:0.0022381698942324506 96:0.0008451727296910197 226:0.0011315820741369753 276:0.0006159909698
-1 24:0.009482539841247844 84:0.0035845380169542283 103:0.008252190416672647 630:0.0007590652399220948 1374:0.0003548551460239322 3532:8.7077607
-1 6:0.006101287799200853 7:0.00815179893462374 8:0.016384554046443005 10:0.019789665297985842 17:0.006394307471101231 18:0.021749510836983465 2
-1 96:0.0008451727296910197 550:0.007506216789287258 630:0.0007590652399220948 732:0.0005523028981734246 1374:0.0003548551460239322 2059:0.00313
-1 6:0.006101287799200853 10:0.019789665297985842 24:0.009482539841247844 26:0.012593168352602473 65:0.00260630723824405 96:0.0008451727296910191
-1 7:0.00815179893462374 24:0.009482539841247844 26:0.012593168352602473 96:0.0008451727296910197 135:0.0030232377675683876 180:0.004382937962600
-1 17:0.006394307471101231 96:0.0008451727296910197 103:0.008252190416672647 276:0.0006159909698862033 545:0.0009191817490044648 732:0.000552302
-1 1:0.0022120041805741065 6:0.006101287799200853 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 17:0.006394307471101231
1 7:0.00815179893462374 8:0.016384554046443005 10:0.019789665297985842 18:0.021749510836983465 25:0.03353862540732 26:0.012593168352602473 31:0.
-1 16:0.003842246855271652 96:0.0008451727296910197 103:0.008252190416672647 135:0.0030232377675683876 545:0.0009191817490044648 732:0.000552302
```

<BNP_test.txt>

```
-1 7:0.00815179893462374 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 11:0.00719805979865436 12:0.00886691997971888 16:
1 1:0.0022120041805741065 2:0.002056611592085698 3:0.003696759367319621 4:5.25402597956266e-05 5:0.006925270059623867 6:0.006101287799200853 7:0
-1 7:0.00815179893462374 17:0.006394307471101231 24:0.009482539841247844 29:0.0021243150555583716 30:0.0022381698942324506 33:0.0037169839133694
-1 7:0.00815179893462374 10:0.019789665297985842 17:0.006394307471101231 28:0.009686930293337842 33:0.003716983913369414 38:0.016767682627646205
-1 7:0.00815179893462374 16:0.003842246855271652 17:0.006394307471101231 24:0.009482539841247844 96:0.0008451727296910197 383:0.0036554183697414
-1 6:0.006101287799200853 7:0.00815179893462374 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 18:0.021749510836983465 24
-1 6:0.006101287799200853 7:0.00815179893462374 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 11:0.00719805979865436 12:
-1 7:0.00815179893462374 17:0.006394307471101231 96:0.0008451727296910197 135:0.0030232377675683876 156:0.0004022423421329334 216:0.001029694184
-1 10:0.019789665297985842 17:0.006394307471101231 24:0.009482539841247844 30:0.0022381698942324506 65:0.00260630723824405 67:0.0006566665382166
-1 7:0.00815179893462374 82:0.001189404408621469 96:0.0008451727296910197 135:0.0030232377675683876 156:0.0004022423421329334 309:0.000393384381
-1 1:0.0022120041805741065 16:0.003842246855271652 17:0.006394307471101231 30:0.0022381698942324506 96:0.0008451727296910197 135:0.0030232377675
-1 6:0.006101287799200853 17:0.006394307471101231 24:0.009482539841247844 30:0.0022381698942324506 96:0.0008451727296910197 449:0.00587576604533
-1 8:0.016384554046443005 9:0.016393850816898536 11:0.00719805979865436 18:0.021749510836983465 24:0.009482539841247844 25:0.03353862540732 30:0
-1 9:0.016393850816898536 10:0.019789665297985842 17:0.006394307471101231 24:0.009482539841247844 28:0.009686930293337842 54:0.01810213039751984
1 3:0.003696759367319621 7:0.00815179893462374 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 12:0.00886691997971888 14:0
-1 8:0.016384554046443005 10:0.019789665297985842 16:0.003842246855271652 17:0.006394307471101231 18:0.021749510836983465 24:0.00948253984124784
-1 8:0.016384554046443005 18:0.021749510836983465 25:0.03353862540732 44:0.013149623110788171 54:0.018102130397519848 57:0.0026196797341992793 8
-1 8:0.016384554046443005 33:0.003716983913369414 65:0.00260630723824405 89:0.004033890700938692 96:0.0008451727296910197 197:0.0035134612281370
-1 96:0.0008451727296910197 103:0.008252190416672647 135:0.0030232377675683876 156:0.0004022423421329334 309:0.00039338438119883984 545:0.000919
-1 7:0.00815179893462374 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 14:0.009400377083638752 17:0.006394307471101231 1
-1 8:0.016384554046443005 10:0.019789665297985842 25:0.03353862540732 28:0.009686930293337842 29:0.0021243150555583716 39:0.002047583974028092 4
-1 2:0.002056611592085698 7:0.00815179893462374 8:0.016384554046443005 17:0.006394307471101231 24:0.009482539841247844 25:0.03353862540732 38:0.
-1 7:0.00815179893462374 17:0.006394307471101231 24:0.009482539841247844 30:0.0022381698942324506 96:0.0008451727296910197 249:0.009816772414617
-1 6:0.006101287799200853 7:0.00815179893462374 9:0.016393850816898536 17:0.006394307471101231 24:0.009482539841247844 33:0.003716983913369414 6
1 3:0.003696759367319621 7:0.00815179893462374 8:0.016384554046443005 10:0.019789665297985842 14:0.009400377083638752 25:0.03353862540732 26:0.0
-1 16:0.003842246855271652 82:0.001189404408621469 96:0.0008451727296910197 103:0.008252190416672647 135:0.0030232377675683876 156:0.00040224234
-1 7:0.00815179893462374 9:0.016393850816898536 10:0.019789665297985842 11:0.00719805979865436 17:0.006394307471101231 24:0.009482539841247844 2
-1 17:0.006394307471101231 30:0.0022381698942324506 33:0.003716983913369414 96:0.0008451727296910197 124:0.00035734026828993545 135:0.0030232377
-1 9:0.016393850816898536 20:0.0024113670382988777 25:0.03353862540732 29:0.0021243150555583716 33:0.003716983913369414 44:0.013149623110788171
-1 7:0.00815179893462374 82:0.001189404408621469 96:0.0008451727296910197 144:0.00018579368172214923 156:0.0004022423421329334 692:0.00105100562
-1 82:0.001189404408621469 96:0.0008451727296910197 103:0.008252190416672647 135:0.0030232377675683876 197:0.0035134612281370018 309:0.000393384
-1 7:0.00815179893462374 16:0.003842246855271652 39:0.002047583974028092 96:0.0008451727296910197 135:0.0030232377675683876 156:0.00040224234213
-1 7:0.00815179893462374 82:0.001189404408621469 96:0.0008451727296910197 135:0.0030232377675683876 144:0.00018579368172214923 156:0.00040224234
-1 7:0.00815179893462374 9:0.016393850816898536 10:0.019789665297985842 24:0.009482539841247844 30:0.0022381698942324506 65:0.00260630723824405
1 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 11:0.00719805979865436 12:0.00886691997971888 17:0.006394307471101231 24
-1 16:0.003842246855271652 17:0.006394307471101231 30:0.0022381698942324506 96:0.0008451727296910197 103:0.008252190416672647 226:0.001131582074
-1 7:0.00815179893462374 16:0.003842246855271652 82:0.001189404408621469 96:0.0008451727296910197 135:0.0030232377675683876 144:0.00018579368172
1 7:0.00815179893462374 8:0.016384554046443005 10:0.019789665297985842 12:0.00886691997971888 16:0.003842246855271652 17:0.006394307471101231 18
-1 8:0.016384554046443005 9:0.016393850816898536 10:0.019789665297985842 18:0.021749510836983465 25:0.03353862540732 29:0.0021243150555583716 33
-1 6:0.006101287799200853 7:0.00815179893462374 8:0.016384554046443005 16:0.003842246855271652 17:0.006394307471101231 18:0.021749510836983465 2
-1 8:0.016384554046443005 25:0.03353862540732 30:0.0022381698942324506 41:0.0037066875709585263 43:0.010510835059303947 44:0.013149623110788171
1 8:0.016384554046443005 9:0.016393850816898536 11:0.00719805979865436 12:0.00886691997971888 17:0.006394307471101231 18:0.021749510836983465 24
-1 7:0.00815179893462374 17:0.006394307471101231 24:0.009482539841247844 30:0.0022381698942324506 96:0.0008451727296910197 226:0.001131582074136
-1 8:0.016384554046443005 10:0.019789665297985842 24:0.009482539841247844 25:0.03353862540732 26:0.012593168352602473 28:0.009686930293337842 32
```

2. BNP_train.txt로 svm_learn 작업을 수행한다.

```
gimjaeguui-MacBook-Pro:svm_light_osx.8.4_i7 jaegu$ ./svm_learn BNP_train.txt model.txt
Scanning examples...done
Reading examples into memory...100..200..300..400..500..600..700..800..900..1000..1100..1200..1300..1400..1500..1600..1700..1800..1900..2000..2100..2200..2300..2400..2500..2600..2700..2800..2900..3000..
3100..3200..3300..3400..3500..3600..3700..3800..3900..4000..4100..4200..4300..4400..4500..4600..4700..4800..4900..5000..5100..5200..5300..5400..OK. (5485 examples read)
Setting default regularization parameter C=566.5389
Optimizing.....................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................done. (3194 iterations)
Optimization finished (263 misclassified, maxdiff=0.00099).
Runtime in cpu-seconds: 0.75
Number of SV: 1237 (including 1129 at upper bound)
L1 loss: loss=703.45421
Norm of weight vector: |w|=519.55925
Norm of longest example vector: |x|=0.08595
Estimated VCdim of classifier: VCdim<=1839.73692
Computing XiAlpha-estimates...done
Runtime for XiAlpha-estimates in cpu-seconds: 0.00
XiAlpha-estimate of the error: error<=22.06% (rho=1.00,depth=0)
XiAlpha-estimate of the recall: recall=>62.41% (rho=1.00,depth=0)
XiAlpha-estimate of the precision: precision=>62.02% (rho=1.00,depth=0)
Number of kernel evaluations: 234176
Writing model file...done
```

svm_train 작업 결과로 생성된 model.txt는 다음과 같다.

model.txt

```
SVM-light Version V6.02
0 # kernel type
3 # kernel parameter -d
1 # kernel parameter -g
1 # kernel parameter -s
1 # kernel parameter -r
empty# kernel parameter -u
8172 # highest feature index
5485 # number of training documents
1238 # number of support vectors plus 1
1.1544428 # threshold b, each following line is a SV (starting with alpha*y)
-566.53888571579159361135680228472 8:0.016384553 10:0.019789666 18:0.021749511
25:0.033538625 38:0.016767683 44:0.013149623 50:0.0055565289 54:0.01810213
96:0.00084517273 124:0.00035734026 126:0.0059264963 127:0.0013702284 133:0.0026865716
147:0.0022198537 200:0.0052741929 201:0.014689588 299:0.0022997088 305:0.0033347225
313:0.0029094089 358:0.0010465623 430:0.0012855664 458:0.0020801506 459:0.0016814971
479:0.0034885367 529:0.00045332962 542:0.00629802 608:0.0036667094 688:0.0010800606
730:0.0013370522 735:0.0015095737 765:0.00076288299 770:0.0021074559 805:0.0017250171
842:0.0023054637 904:0.0010132007 943:0.0016537941 952:0.003111905 996:0.0025563736
1083:0.00030468579 1164:0.00024531482 1214:0.0017381095 1436:7.5814693e-05
1461:0.00084322499 1469:0.00013129524 1602:0.00028902653 1608:0.0013359392
1862:0.0020361268 1920:0.00016296659 2125:0.00019040664 2322:0.00025224363
2529:0.00013224162 2530:0.00013224162 3287:0.00022425821 3449:5.3055381e-05
3457:0.00023670334 5767:8.3212457e-05 5974:8.8161076e-05 #
566.53888571579159361135680228472 5:0.00692527 6:0.0061012879 8:0.016384553 10:0.019789666
14:0.0094003771 18:0.021749511 25:0.033538625 26:0.012593169 35:0.0074010426
38:0.016767683 40:0.019268874 54:0.01810213 77:0.0016064595 80:0.0052598831
96:0.00084517273 131:0.0044333953 132:0.0012673686 197:0.0035134612 201:0.014689588
212:0.00053734303 267:0.005499742 291:0.0027949237 327:0.0027215697 348:0.0031609824
357:0.0017931662 363:0.0021962137 514:0.0021314137 550:0.0075062169 556:0.0032876073
```

3. BNP_test.txt와 model.txt로 svm_classify 작업을 수행

```
gimjaeguui-MacBook-Pro:svm_light_osx.8.4_i7 jaegu$ ./svm_classify BNP_test.txt model.txt output.txt
Reading model...OK. (1237 support vectors read)
Classifying test examples..100..200..300..400..500..600..700..800..900..1000..1100..1200..1300..1400..1500..1600..1700..1800..1900..2000..2100..done
Runtime (without IO) in cpu-seconds: 0.00
Accuracy on test set: 95.48% (2090 correct, 99 incorrect, 2189 total)
Precision/recall on test set: 97.61%/87.93%
```

작업 수행결과 95.48%의 정확도가 나옴을 확인할 수 있다.

B. Adaboost 구현코드 및 실행결과

1. model1, model2 생성

```
#make expected value list
expected_val_list = make_expected_val_list(train_input_f_name)
#make output files
first_output_name = 'input1.txt'
second_output_name = 'input2.txt'

output_f1_name = 'output1.txt'
output_f2_name = 'output2.txt'
make_svm_input(train_input_f_name,stopword_list,stemmer,first_output_name,tf_idf_dic,complete_word_list)
print('################### model1 생성 ######################')
os.system("./svm_learn input1.txt model1.txt")
os.system("./svm_classify input1.txt model1.txt "+ output_f1_name)
new_weight_list = make_new_weight_list(output_f1_name,expected_val_list,len(expected_val_list))
make_new_svm_input(train_input_f_name,stopword_list,stemmer,second_output_name,tf_idf_dic,complete_word_list,new_weight_list)
print('################### model2 생성 ######################')
os.system("./svm_learn input2.txt model2.txt")
os.system("./svm_classify input2.txt model2.txt "+ output_f2_name)
```

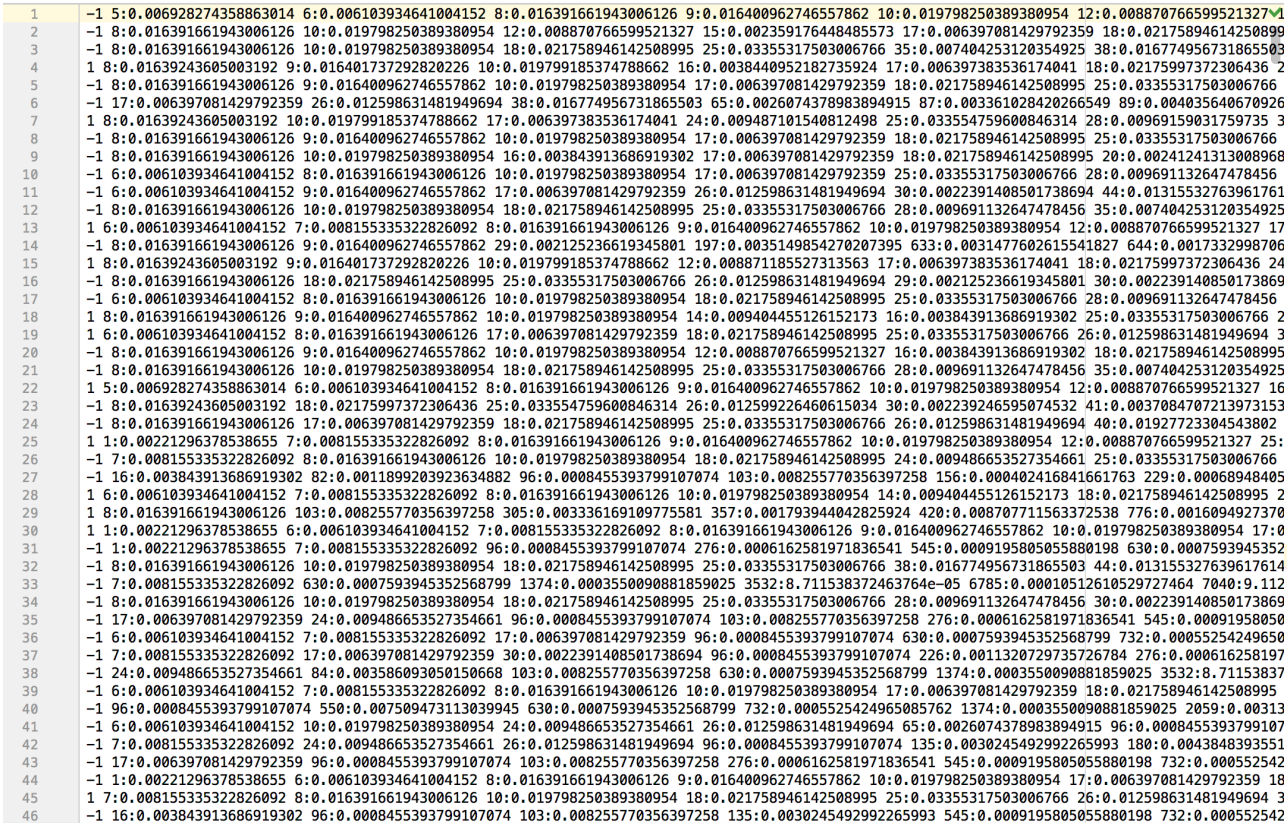
input 파일을 생성하기 전에 svm_classify의 결과로 생성된 output.txt 바탕으로 에러를 계산해야 하므로 output.txt를 내용으로 리스트를 생성한다.

```
def make_output_list(input_file_name):
    input_file = open(input_file_name)
    output_list = []

    for output_val in input_file:
        if float(output_val) > 0 :
            output_list.append(1)
        else:
            output_list.append(-1)

    return output_list
```

그리고 가중치를 곱한후 새로운 input 파일생성하고 model2를 생성한다.
weight를 구하는 함수는 다음과 같다.



```
-1 5:0.0069282743588630l4 6:0.006103934641004152 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 12:0.008870766599521327 1
-1 8:0.016391661943006126 10:0.019798250389380954 12:0.008870766599521327 15:0.002359176448485573 17:0.006397081429792359 18:0.021758946142508995 25:0.03355317503006766
-1 8:0.016391661943006126 10:0.019798250389380954 18:0.021758946142508995 25:0.03355317503006766 35:0.007404253120354925 38:0.016774956731865503
1 8:0.01639243605003192 9:0.016401737292820226 10:0.019799185374788662 16:0.0038440952182735924 17:0.006397383536174041 18:0.021759973723064362
-1 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 17:0.006397081429792359 18:0.021758946142508995 25:0.03355317503006766
-1 17:0.006397081429792359 26:0.012598631481949694 38:0.016774956731865503 65:0.0026074378983894915 87:0.003361028420266549 89:0.004035640670926
1 8:0.01639243605003192 10:0.019799185374788662 17:0.006397383536174041 24:0.009487101540812498 25:0.033554759600846314 28:0.00969159031759735
-1 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 17:0.006397081429792359 18:0.021758946142508995 25:0.03355317503006766
-1 8:0.016391661943006126 10:0.019798250389380954 16:0.0038439136869193O2 17:0.006397081429792359 18:0.021758946142508995 20:0.00241241313008968
-1 6:0.006103934641004152 8:0.016391661943006126 10:0.019798250389380954 17:0.006397081429792359 25:0.03355317503006766 28:0.009691132647478456
-1 6:0.006103934641004152 9:0.016400962746557862 17:0.006397081429792359 26:0.012598631481949694 30:0.002239140850173869 44:0.013155327639617614
-1 8:0.016391661943006126 10:0.019798250389380954 18:0.021758946142508995 25:0.03355317503006766 28:0.009691132647478456 35:0.007404253120354925
1 6:0.006103934641004152 7:0.008155335322826092 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 12:0.008870766599521327 17
-1 8:0.016391661943006126 9:0.016400962746557862 29:0.002125236619345801 197:0.0035149854270207395 633:0.0031477602615541827 644:0.0017332998706
1 8:0.01639243605003192 9:0.016401737292820226 10:0.019799185374788662 12:0.008871185527313563 17:0.006397383536174041 18:0.021759973723064362 24
-1 8:0.016391661943006126 18:0.021758946142508995 25:0.03355317503006766 26:0.012598631481949694 29:0.002125236619345801 30:0.002239140850173869
-1 6:0.006103934641004152 8:0.016391661943006126 10:0.019798250389380954 18:0.021758946142508995 25:0.03355317503006766 28:0.009691132647478456
1 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 14:0.009404455126152173 16:0.003843913686919302 25:0.03355317503006766 2
1 6:0.006103934641004152 8:0.016391661943006126 17:0.006397081429792359 18:0.021758946142508995 25:0.03355317503006766 26:0.012598631481949694 3
-1 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 12:0.008870766599521327 16:0.003843913686919302 18:0.021758946142508995
-1 8:0.016391661943006126 10:0.019798250389380954 18:0.021758946142508995 25:0.03355317503006766 28:0.009691132647478456 35:0.007404253120354925
1 5:0.006928274358863014 6:0.006103934641004152 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 12:0.008870766599521327 16
-1 8:0.01639243605003192 18:0.021759973723064362 25:0.033554759600846314 26:0.012599226460615034 30:0.002239246595074532 41:0.0037084707213973153
-1 8:0.016391661943006126 17:0.006397081429792359 18:0.021758946142508995 25:0.03355317503006766 26:0.012598631481949694 40:0.01927723304543802
1 1:0.00221296378538655 7:0.008155335322826092 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 12:0.008870766599521327 25:
-1 7:0.008155335322826092 8:0.016391661943006126 10:0.019798250389380954 18:0.021758946142508995 24:0.009486653527354661 25:0.03355317503006766
-1 16:0.003843913686919302 82:0.0011899203923634882 96:0.0008455393799107074 103:0.008255770356397258 156:0.0004024168416617O3 229:0.00068948405
1 6:0.006103934641004152 7:0.008155335322826092 8:0.016391661943006126 10:0.019798250389380954 14:0.009404455126152173 18:0.021758946142508995 2
1 8:0.016391661943006126 103:0.008255770356397258 305:0.003336169109775581 357:0.001793944042825924 420:0.008707711563372538 776:0.0016094927370
1 1:0.00221296378538655 6:0.006103934641004152 7:0.008155335322826092 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 17:0
-1 1:0.00221296378538655 7:0.008155335322826092 96:0.0008455393799107074 276:0.0006162581971836541 545:0.0009195805055880198 630:0.0007593945352
-1 8:0.016391661943006126 10:0.019798250389380954 18:0.021758946142508995 25:0.03355317503006766 38:0.016774956731865503 44:0.013155327639617614
-1 7:0.008155335322826092 630:0.0007593945352568799 1374:0.0003550090881859025 3532:8.711538372463764e-05 6785:0.0001051261052972746 7040:9.112
-1 8:0.016391661943006126 10:0.019798250389380954 18:0.021758946142508995 25:0.03355317503006766 28:0.009691132647478456 30:0.002239140850173869
-1 17:0.006397081429792359 24:0.009486653527354661 96:0.0008455393799107074 103:0.008255770356397258 276:0.0006162581971836541 545:0.000919585050
-1 6:0.006103934641004152 7:0.008155335322826092 17:0.006397081429792359 96:0.0008455393799107074 630:0.0007593945352568799 732:0.000552542496502
-1 7:0.008155335322826092 17:0.006397081429792359 30:0.002239140850173869 96:0.0008455393799107074 226:0.0011320729735726784 276:0.000616258197
-1 24:0.009486653527354661 84:0.003586093050150668 103:0.008255770356397258 630:0.0007593945352568799 1374:0.0003550090881859025 3532:8.71153837
-1 6:0.006103934641004152 7:0.008155335322826092 8:0.016391661943006126 10:0.019798250389380954 17:0.006397081429792359 18:0.021758946142508995
-1 96:0.0008455393799107074 550:0.007509473113039945 630:0.0007593945352568799 732:0.0005525424965085762 1374:0.0003550090881859025 2059:0.00313
-1 6:0.006103934641004152 10:0.019798250389380954 24:0.009486653527354661 26:0.012598631481949694 65:0.0026074378983894915 96:0.0008455393799107
-1 7:0.008155335322826092 24:0.009486653527354661 26:0.012598631481949694 96:0.0008455393799107074 135:0.0030245492992265993 180:0.0043848393551
-1 17:0.006397081429792359 96:0.0008455393799107074 103:0.008255770356397258 276:0.0006162581971836541 545:0.0009195805055880198 732:0.000552542
-1 1:0.00221296378538655 6:0.006103934641004152 8:0.016391661943006126 9:0.016400962746557862 10:0.019798250389380954 17:0.006397081429792359 18
1 7:0.008155335322826092 8:0.016391661943006126 10:0.019798250389380954 18:0.021758946142508995 25:0.03355317503006766 26:0.012598631481949694 3
-1 16:0.003843913686919302 96:0.0008455393799107074 103:0.008255770356397258 135:0.0030245492992265993 545:0.0009195805055880198 732:0.000552542
```

2. model1, model2 의 알파값을 바탕으로 새로운 결과값을 계산하여 예측값과 비교한다.

```
gimjaeguui-MacBook-Pro:svm_light_osx.8.4_i7 jaegu$ ./svm_classify new_test.txt model.txt new_output.txt
Reading model...OK. (1237 support vectors read)
Classifying test examples..100..200..300..400..500..600..700..800..900..1000..1100..1200..1300..1400..1500..1600..1700..1800..1900..2000..2100..done
Runtime (without IO) in cpu-seconds: 0.01
Accuracy on test set: 95.48% (2090 correct, 99 incorrect, 2189 total)
Precision/recall on test set: 97.61%/87.93%
```

작업 수행결과 95.48%의 정확도가 나옴을 확인할 수 있다.