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1 import numpy as np
2 import pandas as pd
3 import matplotlib.pyplot as plt
4 import collections
5
6 class NB_model():
7     def __init__(self):
8         self.pi = {} # to store prior probability of each class
9         self.Pr_dict = None
10        self.num_vocab = None
11        self.num_classes = None
12
13    def fit(self, train_data, train_label, vocab, if_use_smooth=True):
14        # get prior probabilities
15        self.num_vocab = len(vocab['index'].tolist())
16        self.get_prior_prob(train_label)
17        # ===== YOUR CODE HERE =====
18        # Calculate probability of each word based on class
19        # Hint: Store each probability value in matrix or dict:
20        self.Pr_dict[classID][wordID] or Pr_dict[wordID][classID])
21        # Remember that there are possible NaN or 0 in Pr_dict matrix/dict.
22        Use smooth method
23        self.classes = collections.defaultdict(int)
24
25        word_count_per_class = collections.defaultdict(lambda:
26collections.defaultdict(int))
27        self.Pr_dict = collections.defaultdict(lambda:
28collections.defaultdict(float))
29
30        train_dict = train_data.to_dict()
31        for i in range(len(train_dict['classIdx'])):
32            self.classes[train_dict['classIdx'][i]] += train_dict['count'][i]
33            word_count_per_class[train_dict['classIdx'][i]]
34            [train_dict['wordIdx'][i]] += train_dict['count'][i]
35
36        for classID in word_count_per_class:
37            for wordID in word_count_per_class[classID]:
38                self.Pr_dict[classID][wordID] = (word_count_per_class[classID]
39[wordID] + 1) /
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53     score_dict = {}
54     max_score = 0
55     #Creating a probability row for each class
56     for classIdx in range(1,self.num_classes+1):
57         score_dict[classIdx] = 0
58         # ===== YOUR CODE HERE =====
59         ### Implement the score_dict for all classes for each document
60         ### Remember to use log addition rather than probability
multiplication
61         ### Remember to add prior probability, i.e. self.pi
62         score_dict[classIdx] += np.log(self.pi[classIdx])
63         for wordId in new_dict[docIdx]:
64             if self.Pr_dict[classIdx][wordIdx] == 0:
65                 score_dict[classIdx] += new_dict[docIdx][wordId] *
np.log(1/(self.classes[classIdx] + self.num_vocab))
66             else:
67                 score_dict[classIdx] += new_dict[docIdx][wordId] *
np.log(self.Pr_dict[classIdx][wordId])
68         # =====
69         max_score = max(score_dict, key=score_dict.get)
70         prediction.append(max_score)
71     return prediction
72
73
74     def get_prior_prob(self,train_label, verbose=True):
75         unique_class = list(set(train_label))
76         self.num_classes = len(unique_class)
77         total = len(train_label)
78         for c in unique_class:
79             # ===== YOUR CODE HERE =====
80             ### calculate prior probability of each class ###
81             ### Hint: store prior probability of each class in self.pi
82             counter = 0
83             for label in train_label:
84                 if c is label:
85                     counter += 1
86             self.pi[c] = counter / total
87             # =====
88         if verbose:
89             print("Prior Probability of each class:")
90             print("\n".join("{}: {}".format(k, v) for k, v in
self.pi.items()))
91

```