Computer Science 145, Homework 6

Michael Wu
UID: 404751542

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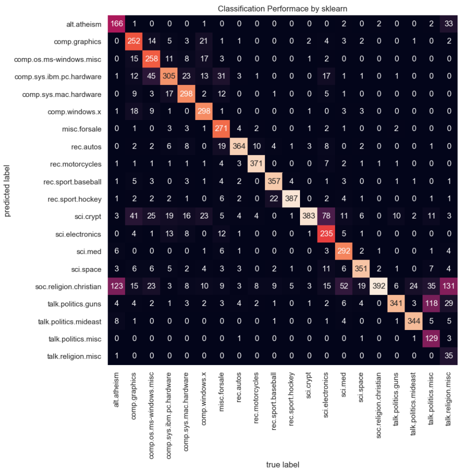
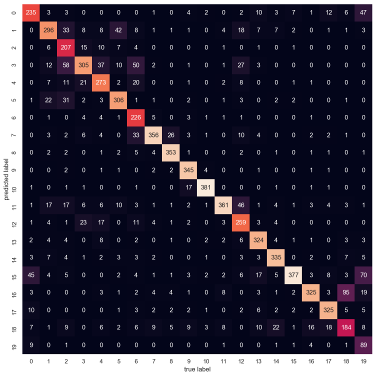
Problem 1

a) The classification accuracy for both implementations as well as the classification matrices are shown below.

	Train Set Accuracy	Test Set Accuracy
sklearn implementation	0.9326498143892522	0.7738980350504514
my implementation	0.941077291685154	0.7810792804796802





b) Naive Bayes is a generative model. This is because it learns the actual probability distribution of words in different document classes. It does not simply learn a decision boundary between the classes. Naive Bayes is different from logistic regression because logistic regression can only separate data. Meanwhile, Naive Bayes can generate data from the model it learns. A pro of Naive Bayes is that it is simple to understand and train. Drawbacks include that it makes a very strong assumption that our document is a bag of words that are independent of each other, and that it will not work very well when our data is imbalanced. If a class in the training data does not contain a word, our classifier would incorrectly classify any document of the class that does contain that word. This is solved with smoothing.

Problem 2

a) The following tables show the most relevant words for each topic on each dataset.

Dataset 1

Topic 1	Topic 2	Topic 3	Topic 4
grand	luffy	crew	luffy
sea	devil	pirates	pirates
blue	fruit	island	haki
island	user	luffy	piece
dressrosa	fruits	straw	manga
red	sea	grand	roger
mountain	ace	robin	zou
bur	crew	franky	captain
half	water	hat	nami
alliance	animals	government	sanji

Dataset 2

Topic 1	Topic 2	Topic 3	Topic 4
bush	people	bank	percent
percent	percent	soviet	people
national	government	police	bush
york	officials	company	president
california	dukakis	oil	fire
noriega	soviet	people	barry
duracell	president	war	report
police	central	roberts	fbi
economic	administration	officers	rating
president	expected	saudi	monday

b) Yes, they generate probability distributions.

c) We need to manually select the number of topics, and it's hard to interpret how the results come about. It can work on a lot of data but it seems to be repeating words.