CSC-343 ARTIFICIAL INTELLIGENCE LECTURE 5.3 PROGRAMMING ASSIGNMENT 4

DATA:

emails = [("Where to hide a dead body", 1), ("Grateful dead body of work", 0)]

MODEL: (Naïve Bayes)

$$P(\text{Spam}|word1,word2,...wordn) = \alpha P(\text{Spam}) \prod P(wordi|\text{Spam})$$

CLASSIFIER:

 $P(\text{spam}|\ word1,\ word2,...wordn) > P(\neg \text{spam}|\ word1,\ word2,...\ wordn)$

B-BOW:

email	Where	То	Hide	A	Dead	Body	Grateful	Of	Work	Spam
1	1	1	1	1	1	1	0	0	0	True
2	0	0	0	0	1	1	1	1	1	False

PART 1 - PRIORS

$$P(\text{Spam}|word1,word2,...wordn) = \alpha \frac{P(\text{Spam})}{P(\text{Spam})} \prod_{i=1}^{n} P(wordi|\text{Spam})$$

 $P(spam) = count(spam \ emails) / count(all \ emails)$ $P(\neg spam) = count(ham \ emails) / count(all \ emails)$

Spam	P(Spam)
True	p1
False	p2

PART 2 – JOINT PROBABILITIES

 $P(\text{Spam}|word1,word2,...wordn) = \alpha P(\text{Spam}) \prod_{i=1}^{n} P(wordi|\text{Spam})$

 $\frac{P(wordi \mid \text{Spam})}{P(wordi, \text{Spam})} / P(\text{Spam})$

Joint Probabilities: P(wordi, Spam)

jp1 = count(spam emails containing *wordi*) / count(all emails)

jp2 = count(spam emails NOT containing *wordi*) / count(all emails)

jp3 = count(ham emails containing wordi) / count(all emails)

jp4 = count(ham emails NOT containing *wordi*) / count(all emails)

word _i	Spam	P(word _i , Spam)	word _i	Spam	P(word _i , Spam)	word _i	Spam	P(word _i , Spam)
Т	Т	jp1	Т	T	jp1	Т	Т	jp1
F	T	jp2	F	T	jp2	F	T	jp2
T	F	jp3	T	F	јр3	T	F	jp3
F	F	jp4	F	F	jp4	F	F	jp4
word	Spam	P(word, Spam)	word	Spam	P(word _i , Spam)	word _i	Spam	P(word, Spam)
T	T	jp1	Т	T	jp1	Т	T	jp1
F	T	jp2	F	T	jp2	F	T	jp2
T	F	jp3	T	F	jp3	T	F	jp3
F	F	jp4	F	F	jp4	F	F	jp4
word _i	Spam	P(word _i , Spam)	word _i	Spam	P(word _i , Spam)	word _i	Spam	P(word, Spam)
Т	Т	jp1	Т	T	jp1	Т	T	jp1
F	T	jp2	F	T	jp2	F	T	jp2
Т	F	јр3	Т	F	jp3	Т	F	jp3
F	F	jp4	F	F	jp4	F	F	jp4

PART 3 – CONDITIONAL PROBABILITIES

 $P(\text{Spam}|word1,word2,...wordn) = \alpha P(\text{Spam}) \prod_{i=1}^{n} P(word_i|\text{Spam})$

 $P(word \ i | \text{Spam}) = P(word \ i, \text{Spam}) / P(\text{Spam})$

word _i	Spam	P(word _i Spam)	word _i	Spam	P(word _i Spam)	word _i	Spam	P(word _i Spam)
Т	Т	cp1	Т	Т	cp1	Т	T	cp1
F	T	cp2	F	T	cp2	F	Т	cp2
T	F	ср3	Т	F	ср3	Т	F	ср3
F	F	cp4	F	F	cp4	F	F	cp4
word _i	Spam	P(word _i Spam)	word _i	Spam	P(word, Spam)	word _i	Spam	P(word _i , Spam)
T	T	cp1	T	T	cp1	T	T	cp1
F	T	cp2	F	T	cp2	F	T	cp2
T	F	ср3	T	F	cp3	T	F	cp3
F	F	cp4	F	F	cp4	F	F	cp4
word	Spam	P(word _i Spam)	word _i	Spam	P(word _i Spam)	word _i	Spam	P(word _i Spam)
T	T	cp1	T	T	cp1	T	T	cp1
F	T	cp2	F	T	cp2	F	T	cp2
T	F	ср3	T	F	ср3	T	F	cp3
F	F	cp4	F	F	cp4	F	F	cp4

PART 4 - CLASSIFICATION

email	P(spam email)	P(¬spam∣email)	Our Prediction	Data
	= $P(\text{spam} word_1, word_2,word_n)$ = $P(\text{spam}) \prod P(wordi \text{spam})$ = $P(\text{spam}) \text{ cp1}$	$= P(\neg \text{spam} word1,word2,wordn)$ $= P(\neg \text{spam}) \prod_{i=1}^{n} P(wordi \neg \text{spam})$ $= P(\neg \text{spam}) \text{ cp3}$	P(spam email) > P(¬spam email)	Spam
1				True
2				False

PART 5 – ACCURACY

Accuracy = Count(Our Prediction == Prediction from Data) / Count(Emails)