Natural Language Processing

Assignment 11

Type of Question: MCQ

Number of Questions: 7 Total Marks: 10 (4*1 + 3*2) [Q5, Q6, Q7 carries two marks each]

Question 1:

Your teacher recommended you to read the book “Introduction to Deep Learning’. After reading the book, you want to summarize it. What kind of summarization method would you use for this purpose?

1. Abstractive single document summarization
2. Abstractive multi document summarization
3. Extractive single document summarization
4. Extractive multi document summarization

a. 1, 2

b. 3, 4

c. 1, 3

d. 2, 4

Answer: c

Solution

For question 2-5, use the data given in Table 1.

Suppose you have trained an image classifier with 5 classes - cat, dog, lion, tiger, and deer. Consider the confusion matrix shown in Table 1.

		Gold Labels				
		cat	dog	lion	tiger	deer
Predicted Labels	cat	130	17	9	7	40
	dog	15	150	25	10	7
	lion	10	45	150	23	5
	tiger	15	15	20	120	30
	deer	40	30	20	10	155

Table 1

Question 2:

What is the macro averaged precision?

a. 0.6696
b. 0.6078
c. 0.6433
d. None of the above

Answer: c

Question 3:

What is the macro averaged recall?

a. 0.6464
b. 0.6540
c. 0.6190
d. None of the above

Answer: a

Solution:

Question 4:

What is the accuracy of your classifier?

a. 0.6421
b. 0.6536
c. 0.6319
d. None of the above

Answer: a

Solution:

Question 5:

What is the micro averaged precision?

a. 0.6915
b. 0.6421
c. 0.6245
d. None of the above

Answer: b

Solution: Separate confusion matrix for each class is as follows:

class	TP	FP
	FN	TN

cat	130	73
	80	815

dog	150	57
	107	784

lion	150	83
	74	791

tiger	120	80
	50	848

deer	155	100
	82	761

$\text{recall} = \frac{TP}{TP+FN}$

$\text{precision} = \frac{TP}{TP+FP}$

$$\text{accuracy} = \frac{TP+TN}{TP+FP+TN+FN} = \frac{\text{number of correct predictions}}{\text{the total number of predictions}} = \frac{705}{1098} \approx 0.6421$$

$$\text{macro averaged precision} = (0.6404 + 0.7246 + 0.6438 + 0.6 + 0.6078)/5 \approx 0.6433$$

$$\text{macro averaged recall} = (0.6190 + 0.5837 + 0.6696 + 0.7059 + 0.6540)/5 \approx 0.6464$$

For micro averaged results, create pooled confusion matrix from all the classes.

$$\text{micro averaged precision} = \text{micro averaged recall} = \frac{705}{705+393} \approx 0.6421$$

Question 6:

It is estimated that 30% of articles generated by an AI system are unreliable. Another AI model is used to filter these unreliable articles. The AI model claims that it can correctly detect 95% of unreliable articles, with a false positive rate (classifying a reliable article as unreliable) of 5%. If an article is flagged as unreliable by the AI model, what is the probability that it is actually a reliable article?

a. 0.019

b. 0.119

c. 0.109

d. None of the above

Answer: c

Solution:

Let, A = Event that a content is detected as fake

B = Event that a generated text is fake

$P(B) = 0.2 = 0.3$

$P(B'') = 0.8 = 0.7$

$P(A|B) = 0.98 = 0.95$

$P(A|B') = 0.03 = 0.05$

$$P(B'|A) = P(A|B')P(B')/P(A)$$

$$= P(A|B')P(B')/(P(A|B)P(B) + P(A|B')P(B'))$$

$$= (0.05 \times 0.7)/(0.95 \times 0.3 + 0.05 \times 0.7)$$

$$\approx 0.109$$

Question 7:

Consider the system-generated summary (S) and the reference summary (R) as follows:

S: The AI model processes language by leveraging neural networks and large datasets for training.
R: The AI model uses neural networks and extensive datasets to understand language patterns.

What is the ROUGE-1 recall for the given summary with respect to the reference?

a. 0.625
b. 0.600
c. 0.571
d. None of the above

Answer: d

Unigrams in S: The, AI, model, processes, language, by, leveraging, neural, networks, and, large, datasets, for, training.
Unigrams in R: The, AI, model, uses, neural, networks, and, extensive, datasets, to, understand, language, patterns.

Overlapping unigrams: The, AI, model, neural, networks, and, datasets, language.
Count of overlapping unigrams = 8.
Total unigrams in R = 13.

ROUGE-1 recall = 8/13 ≈ 0.615