

Module Code	Examiner	Department	Tel
INT104	Shengchen Li	INT	3077

2nd SEMESTER 22-23 RESIT EXAMINATION

Undergraduate

Artificial Intelligence

TIME ALLOWED: 2 hours

INSTRUCTIONS TO CANDIDATES

1. This is a blended open-book exam and the duration is 2 hours.
2. Total marks available are 100. This accounts for 70% of the final mark.
3. Answer all questions. Relevant and clear steps should be included in the answers.
4. Please use MCQ card delivered to answer MCQ questions (for onsite students). Please use answer booklet for answer other questions.
5. Only English solutions are accepted. For online students, answers need to be handwritten and fully and clearly scanned or photographed for submission as one single PDF file via LEARNING MALL.
6. Online students should use the format “Module Code-Student ID.filetype” to name their files before submitting to Learning Mall. For example, “INT104-19181881.pdf”.

Section 1 Multiple Choice Questions

This section of the exam contains multiple-choice questions. Each question will be followed by four options A, B, C, and D. You are required to choose ONE answer that you deem to be the most appropriate.

Section 2 Fill in the blanks marked as [a] to [h]. Each blank is worth 2 marks

1. A classification tree was built to predict a dependent variable categorized as "Yes", "No". 80% of the data set were used to train the classification tree and the remaining 20% was used to test the resulting model. The prediction result on the test set is given by the confusion matrix below:

- (1) The total number of correct predictions is [a] 147, the total number of incorrect predictions is [b] 53
- (2) The overall accuracy is [c] 73.5% and the precision is [d] 81.3%

n=200	Prediction=No	Prediction=Yes
Actual=No	47	23
Actual=Yes	30	100

(8 Marks)

2. The following code is to create a specific length of Fibonacci list. The Fibonacci sequence is a sequence in which each number is the sum of the two preceding ones. For example, if the input is set to 8, the output is [1, 1, 2, 3, 5, 8, 13, 21]. Please fill in the blanks to complete the code.

```
def Fibonacci(num):  
    results = []  
    for n in range(num):  
        if n < 2:  
            results.append(1)  
        else:  
            value = results[n-1] + results[n-2]  
            results.append(value)  
    return results
```

(8 Marks)

Section 3 Computation Questions

The following table shows the preference of golf players for playing golf or not.

	Outlook	Humidity	Wind Speed	Preference
1	Rainy	80%	0.5m/s	Yes
2	Rainy	40%	0.2m/s	Yes
3	Rainy	50%	5.0m/s	No
4	Rainy	50%	0.2m/s	Yes
5	Rainy	75%	4.0m/s	No
6	Sunny	70%	5.0m/s	No
7	Sunny	75%	0.4m/s	No
8	Sunny	80%	0.1m/s	No
9	Sunny	50%	0.2m/s	Yes
10	Sunny	40%	4.0m/s	Yes

Based on the information presented in the table, please answer the following questions.

3. Using Naïve Bayes, what is the golf player preference under the condition of sunny weather and wind speed is higher than 2.0 m/s?

$$P(\text{Yes} | \text{sunny}, >2.0) \propto P(\text{Sunny} | \text{Yes}) \cdot P(>2.0 | \text{Yes}) \cdot P(\text{Yes}) = \frac{2}{5} \cdot \frac{1}{5} \cdot \frac{5}{10} = 0.04 \quad (14 \text{ Marks})$$

$$P(\text{No} | \text{sunny}, >2.0) \propto P(\text{Sunny} | \text{No}) \cdot P(>2.0 | \text{No}) \cdot P(\text{No}) = \frac{3}{5} \cdot \frac{3}{5} \cdot \frac{5}{10} = 0.18 \quad \therefore \text{No}$$

4. What is the golf player preference under the condition of 65% (Humidity) and 3.0 m/s (Wind Speed) in a Sunny day? Please build a kNN system where $k = 1$, $k = 2$ and $k = 5$ respectively. Please comment on which k value among 1, 2 and 5 is the best value?

Please use City Block distance to calculate the distance between two samples, i.e., $D\{A, B\} = D(x_1, y_1), (x_2, y_2) = |x_1 - x_2| + |y_1 - y_2|$.

We assign different values to the property of Outlook: Sunny is 0 and rainy is 1 (16 Marks)

END OF EXAM PAPER

THIS PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

$$D_6 = 5 + 2 = 7$$

$$D_{10} = 25 + 1 = 26$$

$$D_7 = 10 + 2 \cdot 6 = 12.6$$

$$k=1: D_6 \therefore \text{No}$$

$k=1$ is best

$$D_8 = 15 + 2 \cdot 9 = 17.9$$

$$k=2: D_6, D_7 \therefore \text{No}$$

$$D_9 = 15 + 2 \cdot 8 = 17.8$$

$$k=5: \text{No}$$

the number of samples is small.

$$D_1: 1 + 15 + 0.5 = 16.5$$

$$D_2: 1 + 25 + 2.8 = 28.8$$

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