NAME: ..... ID: .....

Faculty of Engineering

King Mongkut's Institute of Technology Ladkrabang

Final Examination, First Semester, Academic Year 2024

Subject Code 01286662

Subject Name MACHINE LEARNING

Examination Date: Monday 28 October 2024 Time: 9.30. am. - 12.30. pm.

Note: The university students who cheat on their exam will not be graded in that semester and the next academic semester suspension will then be awarded as a punishment.

- A computer is allowed.
- Open book and searchable exam.
- The answer to each question is no longer than one page, except for a Python JUPYTER program.
- The program should be in the format of *.ipynb file. The non-program answers can be in the *.docx, *.pdf, txt, or markdown file.
- Create the file name with the student ID and name.

Lecturer

Yuttana Kitjaidure

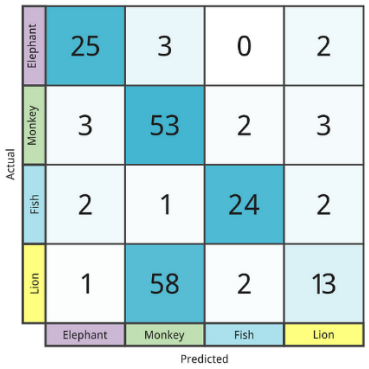
Yuttana Kitjaidure

NAME: ..... ID: .....

1. Can you classify between supervised and unsupervised learning and also between generative and discriminative of all classical machine learning models that we have been studying in the class, except for shallow neural networks, and summarize in what scenarios they are most effective? (Show in table form)
2. Construct a table with the same objectives as in question 1, but for all shallow neural networks, and summarize in what scenarios they are most effective.
3. Summarize in table form all dimensional reduction and feature selection techniques that we have studied in the class and their most appropriate applications, including their strengths and weaknesses.
4. Describe the strengths and weaknesses of the preprocessing technique that you have presented in the class.
5. How can we prevent overfitting in the classical ML models, and what role does cross-validation play? Describe all types of cross-validation techniques.
6. What are the strengths and weaknesses of classical ML models compared to deep learning methods?
7. What are common sources of error in classical machine learning models, and how can they be mitigated?
8. How do you choose the right classical machine learning algorithm studied in the class for a given problem?
9. How would you approach classical ML for a tabular dataset?
10. What are the ethical implications of deploying classical machine learning models in sensitive applications?
11. Show the method to calculate the values of accuracy, precision, recall, and F1-score from a confusion matrix of four class predictions shown in the figure below.

Yuttana Kitjaidure

NAME: ..... ID: .....



12. Show the procedure to create dendrograms of single linkage and average linkage hierarchical clustering using the agglomerative method from the distance matrix below.

	A	B	C	D	E	F
A	0					
B	8	0				
C	20	23	0			
D	16	21	5	0		
E	12	13	20	13	0	
F	4	7	18	17	6	0

Distance matrix

13. Explain what the most effective model of shallow neural network algorithm is used for training a data set of the **MNIST sound** and is combined with an optimum feature extraction model. Show the good reason why it is.
14. Write a JUPYTER Python program using "**any classical machine learning model or a shallow neural network that we have been studying in the class**" together with an appropriate preprocessing model to train a data set of **MNIST sound**. Explain the program step by step. The data file is attached to the exam folder in the MSTEAMs assignment.
15. Write a JUPYTER Python program using "**Naive Bayes classification, Random forests and any type of Decision trees**" to train "**Buying computer.csv**" data set. Explain the program step by step. Show the output tree diagram for the decision tree model.

Yuttana Kitjaidure

NAME: ..... ID: .....

The data file is attached to the exam folder in the MSTEAMs assignment. Use the models above to find the logical expressions for **buys_computer =?** from the conditions below.

a. **(age ≤ 30 ∧ income = medium ∧ student = yes ∧ credit rating = fair)**
b. **(age > 40 ∧ income = high ∧ student = no ∧ credit rating = excellent)**
c. **(age = 31-40 ∧ income = medium) ∨ (age ≤ 30 ∧ student = yes) ∨ (age > 40 ∧ credit rating = fair)**

Yuttana Kitjaidure