THE UNIVERSITY OF HONG KONG

FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE

FITE7410 Financial Fraud Analytics

Date: Dec 9, 2023 **Time: 6:30 – 8:30pm**

Answer ALL questions in SEPARATE ANSWER BOOK provided.

Question No.	Mark
1 (20 marks)	
2 (20 marks)	
3 (30 marks)	
4 (30 marks)	
Total (100 marks)	

Only approved calculators as announced by the Examinations Secretary can be used in this examination. It is candidates' responsibility to ensure that their calculator operates satisfactorily, and candidates must record the name and type of the calculator used on the front page of the examination script.

This is an open book examination. Candidates may bring to their examination any printed/written materials.

University Numbers: _____

Brand and Type of Calculator: _____

QUESTION 1.

QUESTION 1.1 (5 marks)
Please name 4 key recommendations of the Financial Action Task Force ("FATF").

QUESTION 1.2 (5 marks)
What are the 4 risk factors to be considered using a Risk-based Approach in combating money Laundering and terrorist financing in Hong Kong?

QUESTION 1.3 (10 marks)
You are working as a data analyst for a financial institution that has recently detected suspicious activity related to potential financial statement fraud. The company suspects that one of its subsidiaries has manipulated financial data to inflate profits and deceive investors. Your task is to investigate the case using Benford's Law.

a) Explain how Benford's Law can be applied to detect potential financial statement fraud. Describe the key steps involved in analyzing financial data using Benford's Law.

b) Apply Benford's Law to the dataset provided below and interpret the results.

First leading digit	Observed frequency (%) (O)	Expected frequency (%) (E)	Chi-square value X^2
1	30.83		
2	13.79		
3	9.09		
4	17.97		
5	9.90		
6	4.58		
7	4.49		
8	4.15		
9	5.20		

Calculate the **Expected frequency (in percentage)** and **Chi-square value** in the table above. (**NOTE: Please write your answer in the ANSWER BOOK**)
Base on the result of the above table, interpret and explain if there is any potential fraud detected.

QUESTION 2. (20 marks)

Case Background

A whistle blower complaint was received by the Chairman of a pharmaceutical company in its head office in Paris, alleging irregularities, fraud and diversion of business in its operation in Beijing.

You are an external consultant engaged by the head office in Paris to assist with the investigation. Please prepare an Action Plan setting out how you would investigate the potential irregularities/ issues highlighted above based on what you have learned in fraud investigation.

Please also explain what technology/ IT tools you have learned to assist with the investigation, e.g. data analytics and/or any other tools.

QUESTION 3. (30 marks)

A company wants to build a credit card fraud detection model using neural network. The dataset contains 10,000 credit card transactions, out of which 100 are fraudulent. The company randomly splits the data into training (70%) and testing (30%) sets. In the training set, it contains 7,000 transactions, out of which 70 are fraudulent transactions. The neural network model predicts 60 fraudulent transactions correctly and incorrectly identifies 150 non-fraudulent transactions as fraudulent. In the testing set, it contains 3,000 transactions, out of which 30 are fraudulent cases. The model predicts 15 fraudulent transactions correctly and incorrectly identifies 30 non-fraudulent transactions as fraudulent.

a. Calculate the true positives, false positives, true negatives, and false negatives of the neural network model on the training and testing sets based on the provided information.

b. Calculate the precision, recall, and F1-score of the neural network model on the training and testing set. Interpret the results and evaluate the model's performance.

c. The dataset is imbalanced, with a small number of fraudulent transactions compared to non-fraudulent transactions. Discuss the challenges associated with imbalanced datasets in credit card fraud detection and propose strategies to address these challenges.

d. Considering the company's objective of minimizing the business cost associated with misclassifications, discuss potential approaches or techniques to incorporate the business objective into the model's training or decision-making process.

QUESTION 4. (30 marks)
Multiple choice questions, choose **ONE** answer for each question.

Write your answers in the **ANSWER BOOK** provided. **2 marks for each question** with correct answer, **2 marks penalty** for incorrect answer or for selecting more than one answers for the same question.

Maximum mark in Question 4 is 30 marks. The minimum mark in Question 4 is 0 marks. Select your answer with care.

Answer ALL questions in ANSWER BOOK provided.

(Questions continue on the next page.)

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