

National Forensic Sciences University

School of Cyber Security and Digital Forensics

Course Name: M.Tech Artificial Intelligence and Data Science (Batch: 2024-26)

Semester - I Exam: TA - I (September- 2024)

Subject Code: CTMTAIDS SI P1

Time: 10.30 am to 11.15 am

Subject Name: Mathematical and Computational Foundation for Artificial Intelligence

Date: 09-09-2024

Q1. Which of the following is a valid definition of a vector space?

- A) A set of elements with a defined magnitude and direction
- B) A set with two operations: addition and scalar multiplication, satisfying specific axioms
- C) A collection of linearly dependent vectors
- D) A set of vectors all lying on a single plane

Q2. What does it mean for a set of vectors to be linearly independent?

- A) All vectors have the same magnitude
- B) No vector in the set can be written as a linear combination of the others
- C) The vectors all lie in the same direction
- D) The vectors all lie in the same plane

Q3. Which of the following is true about the matrix representation of data?

- A) A matrix can only represent a set of vectors in a two-dimensional space
- B) The rows of a matrix always represent the features of a dataset
- C) The columns of a matrix can represent vectors in a vector space
- D) Matrix representations are only useful for square matrices

Q4. In a vector space, the norm of a vector refers to:

- A) The direction of the vector
- B) The length or magnitude of the vector
- C) The angle between two vectors
- D) The inner product of the vector with itself

Q5. In a vector space, two vectors are orthogonal if:

- A) Their inner product is zero
- B) Their magnitudes are equal
- C) They lie on the same line
- D) They have the same direction

Q6. Draw each of the following vectors in standard position in R^2

- (a) $v = (3,2)$
- (b) $x = (1,-3)$
- (c) $w = (-0.5,3)$
- (d) $y = (-2,-1)$

Q7. Compute the dot product $v \cdot w$ of each of the following pairs of vectors.

- (a) $v = (-2,4)$, $w = (2,1)$
- (b) $v = (1,2,3)$, $w = (-3,2,-1)$
- (c) $v = (3,-1,0,1)$, $w = (0,2,1,3)$
- (d) $v = (\sqrt{2}, \sqrt{3}, \sqrt{5})$, $w = (\sqrt{2}, \sqrt{3}, \sqrt{5})$

Q8. Prove that the following two vectors form the vector space

- (1) $v_1 = (3,4)$
- (2) $v_2 = (-1,2)$
- (3) Scale $a = 2$

Q9. Let V be a vector space of all 2-dimensional real vectors. Consider the following two vectors:

$$v_1 = (1,2)$$
$$v_2 = (3,4)$$

Determine if v_1 and v_2 form a basis for R^2 . If they form a basis, express the vector $v_3 = (5,6)$ as a linear combination of v_1 and v_2 .

National Forensic Sciences University
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Course Name: M.Tech Artificial Intelligence and Data Science (Batch: 2024-26)

Semester – III

Subject Code: CTMTAIDS SI P1 **Time: 11:00-12.30 pm**

Subject Name: Mathematical and Computational Foundation for Artificial Intelligence

Exam: Mid Semester Examination (October - 2024) **Date:** 7-10-2024

Q1. Find k so that u and v are orthogonal 5 marks

- (a) $\mathbf{u} = (1, k, 3)$ and $\mathbf{v} = (2, -5, 4)$
 (b) $\mathbf{u} = (2, 3k, -4, 1, 5)$ and $\mathbf{v} = (6, -1, 3, 7, 2k)$

Q2. Let $A = \begin{bmatrix} 1 & 2 & -3 \\ -3 & -4 & 13 \\ 2 & 1 & -5 \end{bmatrix}$. Perform LU decomposition on the matrix 7 marks

Q3. Solve the following system of linear equations using Gaussian Elimination **8 marks**

$$\begin{aligned} -3x_1 + 2x_2 - x_3 &= -1 \\ 6x_1 - 6x_2 + 7x_3 &= -7 \\ 3x_1 - 4x_2 + 4x_3 &= -6 \end{aligned}$$

Q4. Which of the following matrices are diagonalizable with reasons? Show the decomposition as well

$$(a) B = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix} \quad (b) C = \begin{bmatrix} 2 & 0 & 0 \\ 4 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix} \quad 10 \text{ marks}$$

Q5. Calculate the singular value decomposition of

$$D = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 1 \\ 3 & 2 & 1 \end{bmatrix} \quad \text{10 marks}$$

Q6. Perform Cholesky decomposition of the following system of equations

$$\begin{aligned} 4x_1 + 2x_2 + 14x_3 &= 14 \\ 2x_1 + 17x_2 - 5x_3 &= -101 \\ 14x_1 - 5x_2 + 83x_3 &= 155 \end{aligned}$$

10 marks

National Forensic Sciences University
School of Cyber Security and Digital Forensics

Course Name: M.Tech Artificial Intelligence and Data Science (Batch: 2024-26)

Semester – III

Subject Code: CTMTAIDS SI P1

Time: 11:00-12.30 pm

Subject Name: Mathematical and Computational Foundation for Artificial Intelligence

Exam: Block-Mid Semester Examination (October - 2024) **Date:** 22-10-2024

Q1. Compute the dot product $v \cdot w$ of each of the following pairs of vectors. **10 marks**

- (a) $v = (-2, 4)$, $w = (2, 1)$
- (b) $v = (1, 2, 3)$, $w = (-3, 2, -1)$
- (c) $v = (3, -1, 0, 1)$, $w = (0, 2, 1, 3)$
- (d) $v = (\sqrt{2}, \sqrt{3}, \sqrt{5})$, $w = (\sqrt{2}, \sqrt{3}, \sqrt{5})$

Q2. Let $A = \begin{bmatrix} 2 & -1 & -2 \\ -4 & 6 & 3 \\ -4 & -2 & 8 \end{bmatrix}$. Perform LU decomposition on the matrix **10 marks**

Q3. Solve the following system of linear equations using Gaussian Elimination **10 marks**

$$\begin{aligned} 2x_1 + 3x_2 - x_3 &= 5 \\ 4x_1 + 7x_2 + 2x_3 &= 11 \\ -2x_1 + 4x_2 + 5x_3 &= -1 \end{aligned}$$

Q4. Draw each of the following vectors in standard position in R^2

- (a) $v = (3, 2)$ (b) $x = (1, -3)$ (c) $w = (-0.5, 3)$ (d) $y = (-2, -1)$

10 marks

Q5. Calculate the singular value decomposition of

$$D = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 1 \\ 3 & 2 & 1 \end{bmatrix}$$

10 marks

National Forensic Sciences University
School of Cyber Security and Digital Forensics

Course Name: M.Tech. Cyber Security (Batch: 2024-26)

Semester - I Exam: TA - I (Sep – 2024)

Subject Code: CTMTAIDS SI P2

Time: 2:30-3:15pm

Subject Name: (Network Security and Forensics)

Date: 09/09/2024

Q1. Multiple Choice Question. (Attempt All)

[05 Marks]

1. Which networking device operates primarily at the Data Link layer but also has some functionalities at the Network layer in order to optimize packet delivery?

- A) Hub
- B) Switch
- C) Bridge
- D) Router

2. Which of the following accurately describes the difference between a vulnerability and an exploit?

- A) A vulnerability is an active attack, while an exploit is a weakness in a system.
- B) A vulnerability is a weakness in a system, while an exploit is the method used to take advantage of that weakness.
- C) A vulnerability is the unauthorized use of a system, while an exploit is the recovery of data.
- D) A vulnerability is a type of exploit that affects physical security, while an exploit only affects software.

3 What is a key difference between IDS (Intrusion Detection System) and IPS (Intrusion Prevention System)?

- A) IDS blocks malicious traffic, while IPS only monitors it.
- B) IDS is installed on hosts, while IPS is a network-based device.
- C) IDS detects and alerts on potential threats, while IPS takes proactive measures to block them.
- D) IDS operates at the application layer, while IPS operates at the network layer.

4. In TCP/IP, which protocol is used to resolve IP addresses to MAC addresses?

- A) DNS
- B) ARP
- C) DHCP
- D) ICMP

5. What is the primary function of a router in a network?

- A) Amplify signals across the network
- B) Connect different networks and route packets between them
- C) Filter traffic based on IP addresses
- D) Maintain a list of MAC addresses

Q2. Describe the function of a DNS server in a network.

[3 Marks]

Q3. Describe the functioning of a DHCP server and explain how an attacker might exploit DHCP vulnerabilities to launch a network attack

[5 Marks]

Q4. Define different firewalls.

[5 Marks]

Q 5. Discuss OSI Security architecture

[7 Marks]

National Forensic Sciences University
School of Cyber Security and Digital Forensics

Course Name:M.Tech. AI & DS (Batch: 2024-26)

Semester -I

Subject Code: CTMTAIDS SIP2

Time: 11:00PM to 12:30 PM

Subject Name:(NetworkSecurity andForensics)Total Marks: 50**Exam:** Mid

Semester Examination (March - 2024)

Date: 08-10-2024

Q1. Answer the following questions in short. (Attempt any 4) [20 Marks]

- 1) Discuss the ways of discovering the services which are open or closed
- 2) What is the advantage of checking Operation System and its types of a victim machine. How do you check it
- 3) What is asymmetric key encryption.
- 4) Explain the functionality of firewalls
- 5) Define the concept of Digital Signature
- 6) Differentiate between Independent hashing, Repeated hashing, Combined hashing, Sequential hashing, Hierarchical hashing

Q2. Answer the following questions in detail. (Attempt any 3) [30 Marks]

- 1) Apply the monoalphabetic symmetric key encryption on the data = powerofeducation with Key=5 and discuss the statistical attack on the encrypted text.
- 2) Explain Penetration Testing Life Cycle.
- 3) Explain OSI Security architecture in detail.
- 4) Explain Combination Transposition Cipher in detail with example.

National Forensic Sciences University
School of Cyber Security and Digital Forensics

Course Name: M.Tech AI&DS

Semester -I Exam: MID Sem (OCT- 2024)

Subject Code: CTMTAIDS SI P3

Time: 11.00 to 12.30

Subject Name: P3(Incident Response and Threat Intelligence)

Date:

9/10/24

Q.1 Answer the following questions in short. (Any five) [10 Marks]

Definitions

1.Audit 2. Assessment 3. Laws 4. Guidelines 5. Framework 6. Policy

Q.2 Answer the following questions in brief (Any four) [40 Marks]

1.What is computer incident explain it with types.

2. Explain Audit with its importance and methods of Assessments.

3. Explain Incident Category with details.

4. Explain Containment and Eradication.

5. Write one Case Study related to Cyber IRM.

National Forensic Sciences University
School of Cyber Security and Digital Forensics

Course Name: M.Tech AI_DS (Batch: 2024-25)

Semester - 1 Exam: TA - I (SEP – 2024)

Subject Code: CTMTAIDS SI P4

Time: 2:30 PM to 3:15 PM

Subject Name: Fundamentals of Data Science and Machine Learning

Date: 10-sep-2024

Q1. Multiple Choice Question. (Attempt All)

[05 Marks]

1. Which statistical measure is used to quantify the spread of data around the mean?
 - A. Mode
 - B. Median
 - C. Standard Deviation
 - D. Range
2. In Pandas, what is the primary function of the dropna() method?
 - A. Fills missing values with a specified value.
 - B. Removes rows or columns containing missing values.
 - C. Converts missing values to a specific data type.
 - D. Replaces missing values with interpolated values.
3. Given a Pandas DataFrame df with a missing value in column 'A' at index 2, which interpolation method would be most suitable if you believe the missing value is likely to be close to the average of the values at indices 1 and 3?
 - A. linear
 - B. time
 - C. nearest
 - D. quadratic
4. In a confusion matrix for a binary classification problem, what does the diagonal represent?
 - A. The number of correct predictions.
 - B. The number of incorrect predictions.
 - C. The total number of instances.
 - D. The number of instances in the positive class.
5. A distribution with a long tail to the right is said to be:
 - A. Skewed left
 - B. Skewed right
 - C. Symmetric
 - D. Bimodal

Q2. Answer the following questions in short. (Attempt any 4) [8 Marks]

1. How can you detect outliers using a box plot? What is lower and upper extreme formula using IQR?
2. Why preprocessing of data performed?
3. Write any 2 Data Reduction method.
4. What is use of kurtosis? explain its types with Diagram.
5. Provide step included in Data Science Process
6. Difference between Normalization and Standardization.

Q3. Answer the following questions in Detail. (Attempt any 3) [12 Marks]

- ✓ 1. Write a python function to perform following transformation
(final value can be float)

$$1 \text{ feet} = 30.48 \text{ cm}$$

$$1 \text{ inch} = 2.54 \text{ cm}$$

Name	Height
Ram	5' 11"
Shyam	6' 1"
Sita	5' 5"

=>

Name	Height
Ram	180
Shyam	185
Sita	165

- ✓ 2. Write a pandas code for creation of Dataframe as per following values.

Name	Height	Age	Weight	Salary
Ram	180	32	82	60K
Shyam	185	37	78	70K
Sita	165	30	58	50K

3. Provide 3 ways to handled null value with supportive python code.
4. What is Confusion Matrix, recall rate?

A model outputs 3 TP, 4 TN, 2 FP, and 1 FN.

Calculate the Accuracy, precision, FPR and Recall in Percentage.

5x30 x 2+11
150x 22
150 2/2

Seat No: _____

Enrolment No: 240103007003

National Forensic Sciences University
School of Cyber Security and Digital Forensics

Course Name: M.Tech AI_DS (Batch: 2024-25)

Semester - 1 Exam: MID (OCT – 2024)

Subject Code: CTMTAIDS SI P4

Time: 11:00 AM to 12:30 PM

Subject Name: Fundamentals of Data Science and Machine Learning

Date: 10-Oct-2024

Instruction:

1. Do all necessary assumptions.
2. Support your answer with proper diagram
3. Make a cross line on the unused part of your answer sheet.
4. New question on new page.

Q1. True/False (Attempt All)

[10 Marks]

1. Range is a statistical measure used to quantify the spread of data around the mean.
2. A distribution with a long tail to the right is said to be Skewed right.
3. Machine learning algorithms can learn from data and improve their performance over time.
4. ROC curves are used to evaluate the performance of classification models.
5. EDA cannot be an iterative process.
6. A distribution with a kurtosis of 0 is considered mesokurtic, meaning it has tails similar to a normal distribution.
7. A Type 2 error is also known as a false negative.
8. A Confidence Interval = 1 + significance level (alpha).
9. As Threshold value increases, the number of true negatives will decrease.
10. A sigmoid function is utilized in logistic regression to model the relationship between the independent variables and the binary dependent variable.

Q2. Answer the following questions. (Attempt any 4)

[20 Marks]

1. Difference between Normalization and Standardization with equations.
2. Explain any 2 classification techniques in detail.
3. Difference between Regression and Classification with example.
4. What is the use of ROC? explain it with a Diagram.
5. Provide diagram of real-world Data Science Process and elaborate.
6. What is the Confusion Matrix?

A model outputs 13 TP, 14 TN, 2 FP, and 1 FN.

Calculate the Accuracy, Sensitivity, Specificity, FPR and Precision.

Seat No: _____

Enrolment No: _____

Q3. Answer the following questions. (Attempt any 2)**[20 Marks]**

1. Write a python function to perform following transformation

Name	Weight	Salary
Ram	82.1	60,000
Shyam	78.3	70-000
Sita	58.2	50:000



Name	Weight	Salary
Ram	82	60,000
Shyam	78	70,000
Sita	58	50,000

2. Write a code where csv file provided as per following values. Now use linear regression to predict about salary from Experience=120, Age=40, IQ = 90.

Name	Experience	Age	IQ	Salary
Ram	5	32	82	60000
Shyam	6.5	37	78	70000
Sita	6	30	58	50000

3. Suppose we are now given a new feature vector:

Weather condition: Rain, Road condition: good, Traffic condition: normal, Engine problem: no. The task is to predict if an accident will happen?

Which classification will you apply here? why? how?

SNo.	Weather condition	Road condition	Traffic condition	Engine problem	Accident
1	Rain	bad	high	no	yes
2	snow	average	normal	yes	yes
3	clear	bad	light	no	no
4	clear	good	light	yes	yes
5	snow	good	normal	no	no
6	rain	average	light	no	no
7	rain	good	normal	no	no
8	snow	bad	high	no	yes
9	clear	good	high	yes	no
10	clear	bad	high	yes	yes

National Forensic Sciences University
School of Cyber Security and Digital Forensics

Course Name: M. Tech. Artificial Intelligence and Data Sciences (Batch: 2024-26)
Semester - I Exam: TA - I (SEPTEMBER – 2024)

Subject Code: CTMTAI_DS SI P5 **Time:** 10:30 AM to 11:15 AM
Subject Name: Introduction to Forensic Science and Cyber Law **Date:** 11/09/2024

Q1. Multiple Choice Question. (Attempt All) [05 Marks]

Q2. Answer the following questions in short. (Attempt any 4) [8 Marks]

1. What is meant by Modus Operandi, and how does it contribute to criminal identification?
 2. Define the terms: (i) Testimonial Evidence and (ii) Trace Evidence.

3. Mention the role and responsibilities of a forensic scientist in the investigation of a forensic case.
4. What is the chain of custody, and why is it important in legal proceedings?
5. How does a factual witness differ from an expert witness?

Q3. Answer the following questions in Detail. (Attempt any 2) [12 Marks]

1. Explain the key principles of forensic science that form the foundation for scientific investigations.
2. Write a brief note on any six branches of a Forensic Science Laboratory in India.
3. Provide a brief overview of the historical development of forensic science in India.

END OF THE PAPER

National Forensic Sciences University

School of Cyber Security and Digital Forensics

Course Name: M. Tech. Artificial Intelligence and Data Sciences (Batch: 2024-26)
Semester – I

Subject Code: CTMTAI_DS SI P5 **Time:** 11:30 AM to 12:30 PM

Subject Name: Introduction to Forensic Science and Cyber Law **Total Marks:** 50

Exam: Mid Semester Examination (October - 2024) **Date:** 11-10-2024

Instruction: 1. Read the questions carefully before attempting.
2. Mention the question number clearly on the answer sheet.

Q1. Answer the following questions in short. (Attempt any 4) [20 Marks]

- 1) Write a brief note on (i) INTERPOL and (ii) FBI.
- 2) How has the integration of digital forensics transformed modern forensic science investigations?
- 3) What is chain of custody and how is it relevant in court?
- 4) Describe the nature and scope of forensic science in modern investigations.
- 5) Expand and discuss PDD.
- 6) Discuss the advantages of scientific investigations in forensic science.

Q2. Answer the following questions in detail. (Attempt any 3) [24 Marks]

- 1) Elaborate on the role of tools and techniques used in forensic science and their impact on solving cases.
- 2) Describe the different branches of forensic science and their specific applications in criminal investigations.
- 3) Explain the historical development of forensic science in India.
- 4) Define forensic science and discuss its basic principles.

Q3. Select the correct answer from the options (Attempt all) [06 Marks]

- 1) Contemporary forensic science practices emphasise the use of:

a) Handwritten notes	b) High-tech analytical tools
c) Traditional investigation methods	d) Non-scientific evidence
- 2) Where is the headquarters of INTERPOL located?

a) Washington, D.C.	b) Paris	c) Lyon	d) Brussels
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- 3) Who is considered the father of forensic science?

a) Alphonse Bertillon	b) Edmond Locard
c) Francis Galton	d) Hans Gross

4) Which of the following is a primary principle outlined in the code of conduct for forensic scientists?

- a) Personal bias in evidence interpretation
- b) Confidentiality of case information
- c) Public disclosure of all findings
- d) Favoring law enforcement interests

5) Where was the first central forensic science laboratory established in India?

- a) Calcutta, 1957
- b) Shimla, 1906
- c) Guwahati, 1959
- d) Delhi, 1974

6) Which of the following best describes the role of forensic science in the justice system?

- a) To establish legal precedents
- b) To provide objective and scientific analysis of evidence
- c) To determine guilt or innocence without evidence
- d) To replace law enforcement agencies

END OF THE PAPER