NAME OF STUDENT: Ahmed Ali Ansari **No:** 1402-20202

Assignment-02
Spring 2023

Department / Faculty	Program	Semester	Course Title	Instructor	Issue Date	Due Date	Faculty Signature	Total Marks
FCIT	BS Computer Science	6th Offer No 66311	**Artificial Intelligence**	Ms. Komal Chohan	**29/05/2023**	**05/06/2023**		**5**

Instructions

1. This paper contains **3 Questions**. Attempt all questions.
2. This assignment should be completed within assigned time, after the due date, assignment will not be accepted.
3. Students of particular course will download assignment and submit solution which will only be accepted through CMS portal. Also bring hardcopy with you.
4. Please ensure that no part of your assignment should be copied from any other source without acknowledgment of the source and proper referencing (IEEE).
5. Please note that copy-paste is a serious nature of academic dishonesty, it is called "Plagiarism" and the penalties are attached to being found guilty of committing such offenses.
6. It is allowed using lecture notes, books, and other sources, however needing to refer/cite properly, Reference list must be given at end of the assignment.
7. Assignment can be compressed or break in two parts if file size is larger than uploading limit.
8. The font size should be 12 in Times New Roman, Line Space 1.5, Main Heading font size Bold 14, Subheading font size 12 Bold and text font size 12 should be used. All figures and illustrations should be properly titled or numbered on the left side, below.
9. Also ensure that no part of your assignment has been written by any other person, except to the extent of collaboration and /or group work.
10. You must have to upload the source file of this assignment.
11. Expected outcome of this assignment follows **CLO # 2 (P4, PLO-4) - Psychomotor Domain:4(Mechanism)**; **PLO-4: Design\Development of solutions**

This table is for official use; do not write anything on it.

CLOs	CLO_1	CLO_2	CLO_2	**TOTAL**
Question Number	1	2	3	
Student's Score				
Maximum Score	1	2	2	5

Faculty of Computing and Information Technology (FCIT)
Department of Computing Indus University, Karachi

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Assignment # 2

Spring 2023

Artificial Intelligence

Expected Outcome:

CLO 2: Achieve the ability to developing Artificial Intelligence Based Solutions that meet specified needs for an engineering problem at hand. (P4, PLO-4)

Total (5 marks)

A: What is Anomaly detection? anomaly detection is commonly used for? 2 MARKS

B: Create a code to find anomaly using sklearn library.. 3 MARKS

Note:

- If you submit your assignment after the given deadline **Zero** will be awarded to you.
- Copied assignment will be marked **zero**.
- Viva will be conducted for this assignment and on the basis of that your assignment will be evaluated.

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Solution

Answer (a):

Anomaly detection refers to the process of identifying patterns or data points that deviate significantly from the expected or normal behavior within a given dataset. It involves finding observations that are rare, unusual, or different from the majority of the data. Anomalies can be caused by various factors such as errors, outliers, fraudulent activities, system failures, or other unexpected events.

Anomaly detection is commonly used in a wide range of fields and applications, including:

1. Network security: Detecting unusual network traffic patterns or suspicious activities that may indicate a cyber attack or intrusion.

2. Fraud detection: Identifying abnormal transactions, fraudulent credit card usage, money laundering, or insurance claim anomalies.

3. Intrusion detection: Monitoring system logs, network traffic, or user behavior to identify unauthorized access attempts or malicious activities.

4. Manufacturing and quality control: Detecting defects or anomalies in products, identifying faulty equipment or machinery, and improving production processes.

5. Health monitoring: Analyzing medical data to identify abnormal patient conditions, disease outbreaks, or adverse drug reactions.

6. Financial market analysis: Detecting unusual trading patterns, identifying market manipulation, or predicting stock market anomalies.

7. Internet of Things (IoT): Monitoring sensor data from devices and detecting anomalies in industrial systems, environmental monitoring, or predictive maintenance.

8. Customer behavior analysis: Identifying unusual patterns in customer activities, such as

sudden changes in shopping behavior or fraudulent account usage.

9. Energy and infrastructure management: Monitoring energy consumption patterns, detecting anomalies in power grids, or predicting equipment failures.

Anomaly detection techniques can vary depending on the specific application and characteristics of the data. They may involve statistical analysis, machine learning algorithms, data mining approaches, or domain-specific knowledge. The goal is to flag and investigate potential anomalies for further analysis or action, helping organizations maintain security, efficiency, and reliability in their operations.

Answer (b):

Ahmed Ali Ansari 1402-2020

Code

Python 3 (ipykernel)

[2]:
```
import numpy as np
from sklearn.ensemble import IsolationForest

# Create a sample dataset
X = np.random.randn(1000, 2)  # 1000 data points with 2 features

# Create an Isolation Forest model
model = IsolationForest(contamination=0.1)  # Contamination parameter represents the expec

# Fit the model to the data
model.fit(X)

# Predict the anomaly scores for each data point
scores = model.decision_function(X)

# Identify anomalies by setting a threshold on the scores
threshold = np.percentile(scores, 10)  # Select the lowest 10% of scores as anomalies

# Find the indices of anomalies
anomaly_indices = np.where(scores < threshold)[0]

# Print the indices of the anomalies
print("Anomaly indices:", anomaly_indices)
```

```
Anomaly indices: [ 14  19  33  35  72  89 112 119 126 137 142 157 167 181 185 188 193 202
 215 218 233 234 235 237 253 274 275 282 299 300 306 321 323 327 340 342
 400 410 429 430 441 454 459 460 469 473 508 513 522 559 565 576 579 583
 584 585 598 610 616 620 623 624 629 634 635 656 665 675 695 715 728 744
 750 756 797 801 803 808 814 817 823 827 838 841 844 854 878 883 895 901
 925 929 943 950 954 960 964 968 982 996]
```