ACADEMIC CITY UNVERSITY
FACULTY OF COMPUTATIONAL SCIENCES AND INFORMATICS
END OF SECOND SEMESTER EXAMINATION – 2024/2025
CE4143/CS4241/IT4230-Introduction to Artificial Intelligence
QUESTION PAPER

Time: 10 days   **Maximum Marks: 60**   **Credits Hours : 3**

Examination Date : _____   **Student's Roll No: _____**

Instructions :

Answer ALL Questions.

This is a project-based examination. You are required to answer all questions. Your solutions should incorporate the methodologies, technologies, and criteria specified. Your project will demonstrate your ability to apply Artificial Intelligence concepts and tools.

Push your solution to github and deploy the solution to the cloud. The repository name should be **ai_index number** . where **index number** is your student index number. Also include your name and index number in the readme file and every file.

You are to share **both** your GitHub (private repository) and the deployed solutions(URL) links with the email: godwin.danso@acity.edu.gh.

Add or invite godwin.danso@acity.edu.gh or GodwinDansoAcity   as a GitHub collaborator. Failure to do so will result in getting nothing for your exams.

Design and implement a Streamlit-based application that allows users to explore and solve diverse machine learning and AI problems, including regression, clustering, neural networks, and large language models. The application should have separate sections to showcase each task with interactive interfaces, visualizations, and predictions.

Subsections:
a) Regression Problem[6 marks]
Build a regression model to predict a continuous variable based on user-provided input data.
Requirements:
1. Allow users to upload a regression related, specify the naming of the expected target column in the dataset (e.g., CSV file).

2. Implement a simple linear regression model (such as predicting house prices based on features like size, location, etc.).

3. Display results, including model performance metrics (e.g., Mean Absolute Error, R² score) and a scatter plot of predictions vs. actual values.

4. Enable users to input custom data to make predictions.

Expected Features:
- Dataset preview.
- Data preprocessing options.
- Visualization of the regression line.

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b) Clustering[6 marks]
Perform clustering on a dataset and visualize the results.
Requirements:
1. Allow users to upload a dataset with multiple features (e.g., customer segmentation data).

2. Use the **K-Means Clustering** algorithm to group data points into clusters.

3. Visualize the clusters using scatter plots (if 2D) or 3D visualizations (if possible).

4. Enable users to select the number of clusters interactively.

Expected Features:
- Interactive slider for selecting the number of clusters.
- Visualization of cluster centroids and cluster memberships.
- Downloadable clustered dataset.

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c) Neural Network[6 marks]
Design and train a neural network on user-uploaded data.
Requirements:
1. Allow users to upload a dataset for classification tasks, specify the target column name (such as MNIST digits dataset or custom CSV).

2. Build a simple **Feedforward Neural Network** using TensorFlow or PyTorch.

3. Display training and validation accuracy/loss during the training process.

4. Provide an option for users to make predictions on new data using the trained model.

Expected Features:
- Real-time training progress visualization (e.g., loss/accuracy graphs).
- Option to tweak hyperparameters (e.g., epochs, learning rate).
- Upload custom test samples for prediction.

d) Large Language Model (LLM)[10 mark]
Develop a Large Language Model Solution, Q&A, with the following requirements.
Requirements:
1. Use an open sources pre-trained LLM model such as mistralai/Mistral-7B-Instruct-v0.1, etc choose ONE LLM approach below and ONE Dataset to perform natural language processing task such as Question and answers from the custom data.

    i.   LLM Approach:

        a. LLM RAG,

        b. LLM Multimodal

    ii.   Dataset :

        a. Academic City Student policy document(pdf)
        b. Academic City Multimedia data(get multimedia data from acity)
        c. The dataset (
https://github.com/GodwinDansoAcity/acitydataset/blob/main/Ghana_Election_Result.csv)
        d. The file stored
https://mofep.gov.gh/sites/default/files/budget-statements/2025-Budget-Statement-and-Economic-Policy_v4.pdf

2. Draw the architecture for the approach.

3. Explain the methodology in detail

4. Allow users to perform Q & A tasks.

5. Display the generated responses in real time.

Expected Features:
- Input box for text queries.

- Display confidence scores or additional metadata.

Project Deliverables:
1. **Streamlit Application**:**[2 marks]**

    o   Unified dashboard with navigation for all sub-tasks(a, b, c and d).

    o   Interactive interfaces for data uploads, model training, and results visualization.

2. **Documentation:[20 marks]**

    o   Clear instructions on how to use each feature.**[2 marks]**

    o   For (d), a detailed description of datasets and models used.**[2 marks]**

    o   Detailed architecture for (d). A high mark will be given to the novelty of the approach**[6 marks]**

    o   For (d), a Detailed description of the methodology**[6 marks]**

o For (d), evaluate, analyse and compare your result with results from ChatGPT**[4 marks]**

Good Luck!!