Assignment 1

Q-1) Consider the following function with two parameters:

$$f(x,y) = x^2 + y^2 + x(y+2) + \cos(3x)$$

a) Take the derivative of the function with respect to x
b) Take the derivative of the function with respect to y
c) Implement and use gradient descent and find the minimum of this function. You can use Python.
d) Plot the gradient descent results.

Note that, include all your solutions in your report. Implementation should be submitted separately.

Q-2) Design your own deep learning architecture and implement it. Implement and apply ResNet-50, VGG-19 and DenseNet-121 deep learning architectures to solve an image classification problem. (Hint: to design your deep learning algorithm, you are free to select any hyperparameters. Use handwritten digit DIDA dataset (single digit dataset 250K from https://didadataset.github.io/DIDA/) You can use Keras, Tensorflow etc.

In your report:

1) Include your own designed deep learning architecture and explain it in details.
2) Plot training and validation loss error for each epoch.
3) Plot training and validation accuracy for each epoch.
4) Test the images over the trained algorithms. Obtain the accuracy results, false positives, false negatives, true positives, and true negatives as well as F1-score. Include as a table.
5) Compare the performance of your algorithm with the ResNet-50, VGG-19 and DenseNet-121 deep learning architectures and discuss the results.

Submission:

Submit your report and implementations in .zip file on Canvas course webpage. Write your name and surname on the zip file. For example, name_surname.zip.

Submission Deadline:

Submission deadline is 28th April 2024 until 23:59.

Evaluation

The assignment is graded with U or G. It is important to note that this is an individual assignment. This means that everything that you submit for grading must be created by you. Plagiarism is not allowed in any form.