

Question 1

[10 points] Compare classical machine learning vs. representation learning.

Question 2

[15 points] Explain the effect of increasing the dataset size on the field of deep learning. Mention key datasets that have contributed to the evolution of deep learning. Compare the sizes of these datasets.

Question 3

[15 points] Explain how to control the capacity of a neural network.

Question 4

[20 points] Write the equation of Empirical risk minimization and define the utilized symbols. What are the main differences between finding the parameters for a machine learning vs. optimization problem.

Question 5

[20 points] Write a Python program on Google Colab and use numpy to plot the following Activation functions: Sigmoid, Hyperbolic Tangent, and Rectified Linear Units (ReLU), where the independent variable, x , is between -10 and 10 .

Question 6

[20 points] Write a Python program on Google Colab and use pytorch library with manual seed number 1729 to do the following:

- create a random integer vector, x , with dimensions 1×100 with values between 0 and 255.
- change the tensor dimension into a tensor X of dimensions 10×10
- create a mask, M , that selects the elements of odd columns
- visualize the masked tensor $\hat{X} = X \odot M$, where \odot is the element-wise multiplication

Notes: Please upload your answers in one PDF file to your Moodle account by the announced due date above, and refer to your Colab URLs for your answers on the programming questions, where you need to grant access to Eng. Aly Mohamed Abdelmageed (alymohamed@nu.edu.eg) on Colab notebooks to evaluate your answers. Recommended to use Overleaf assignment template¹ or another Latex template. Please remember that this is an individual work assignment.

¹<https://www.overleaf.com/latex/templates/assignment-template/hwddqynqfrhn>