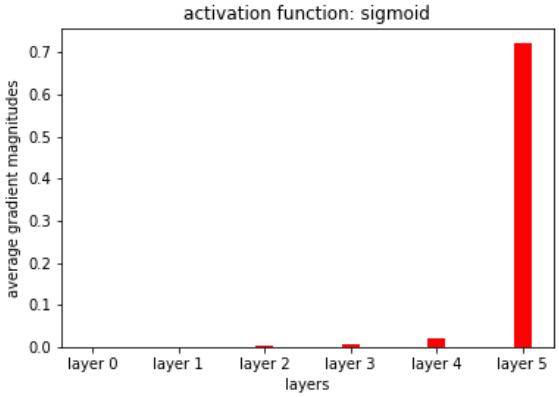
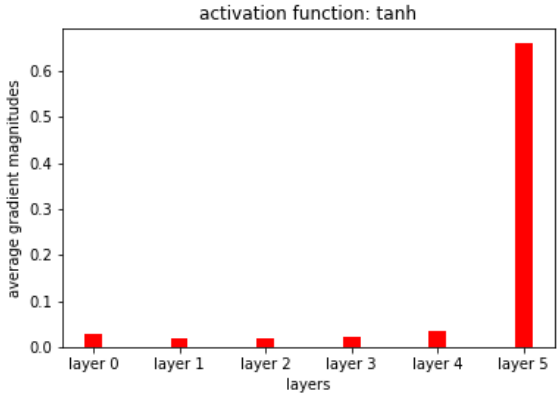
CS-568 Deep Learning - Assignment 1
Backpropagation for MLPs

Spring 2020

Assigned	Wednesday, March 11, 2020
Due	Wednesday, March 18, 2020 before 4:00 pm

- In this assignment, we will implement the backpropagation algorithm for training an MLPs.
- The main python scripts in this assignment are
  1. **driver_nn.py** creates the object of neural network class that can be further used to call train and test functions.
  2. **neural_network.py** contains train and test functions.
  3. **f_load_dataset.py** generates data from three different functions ($\sin(x)\sin(2x)$, $\sin(x)/x$, $\sin(2\pi x)\sin(x)$).
  4. **f_check_gradient.py** confirms the correctness of the analytical derivatives.
  5. **f_utils.py** consists of activation function and their derivatives.
- **neural_network.py** also contains code to plot average gradient magnitudes that show vanishing gradients problem. We can see the two different plots of gradient magnitudes here.





- You have to add the missing code in these scripts
  - **neural_network.py**
  - **f_check_gradient.py**
  - **f_utils.py**
- The submission **.zip** file should only contain
  - **neural_network.py (20 marks)**
  - **f_check_gradient.py (10 marks)**
  - **f_utils.py (10 marks)**
  - Figures 2 to 6 **(60 marks)**
- Plot the output function in Figure 2, 3 and 4 using your code as illustrated in Figure 1.
- Reproduce Figure 5 and 6 using **generate_results.py** script.

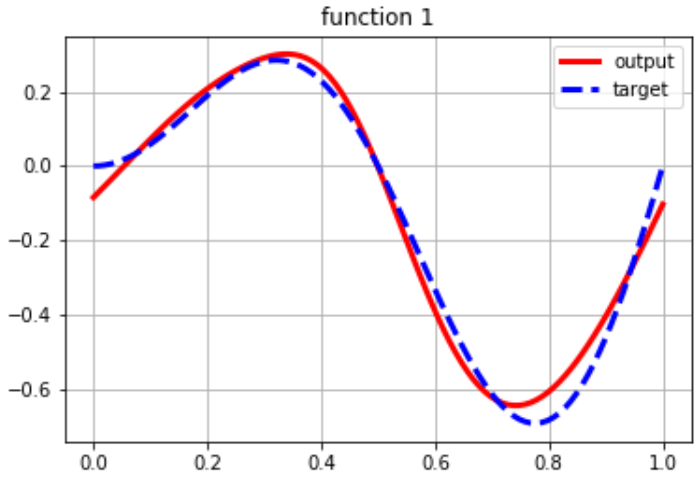


Figure 1: Sinusoidal function output and target plots.

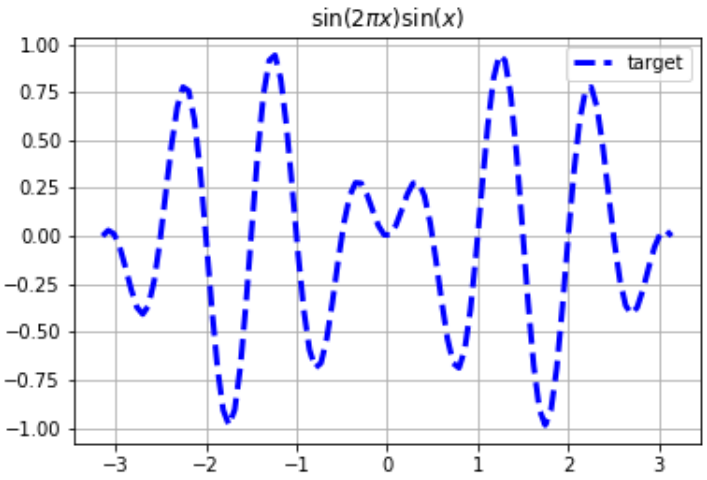


Figure 2: Plot output of this function. **(10 marks)**

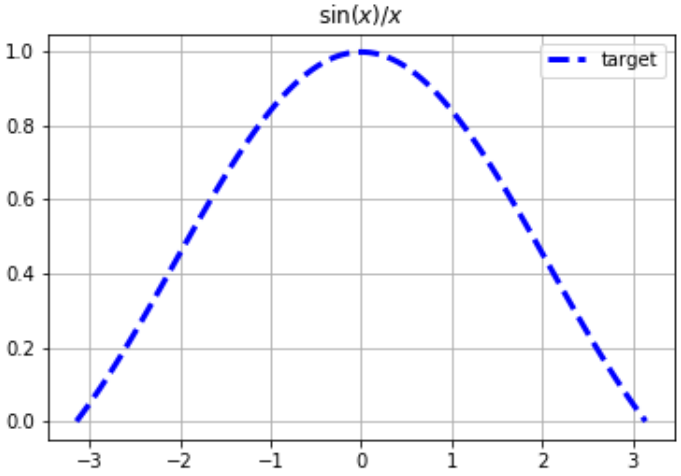


Figure 3: Plot output of this function. **(10 marks)**

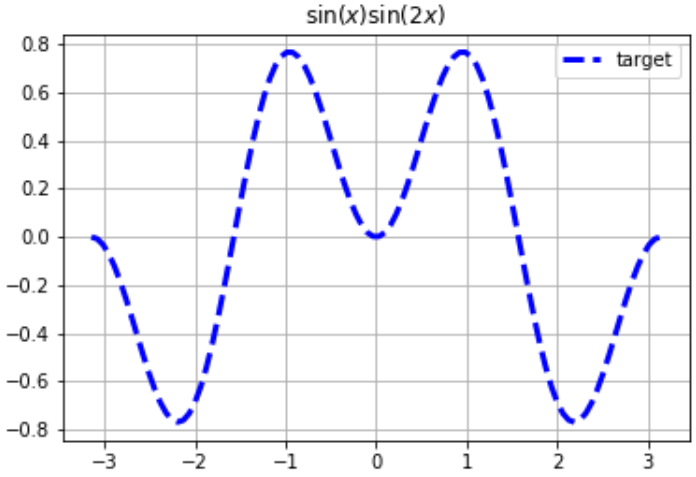


Figure 4: Plot the output of this function. **(10 marks)**

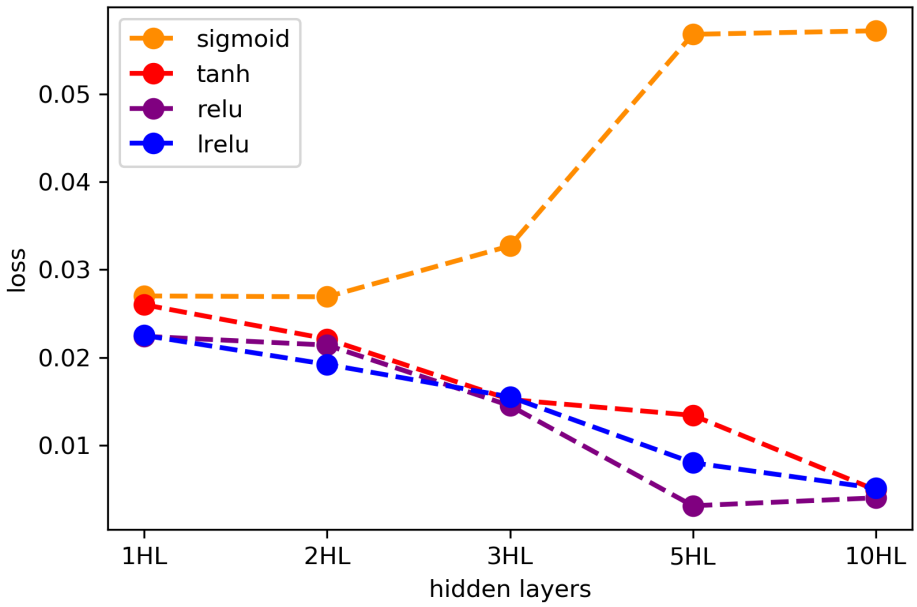


Figure 5: Official image. **(20 marks)**

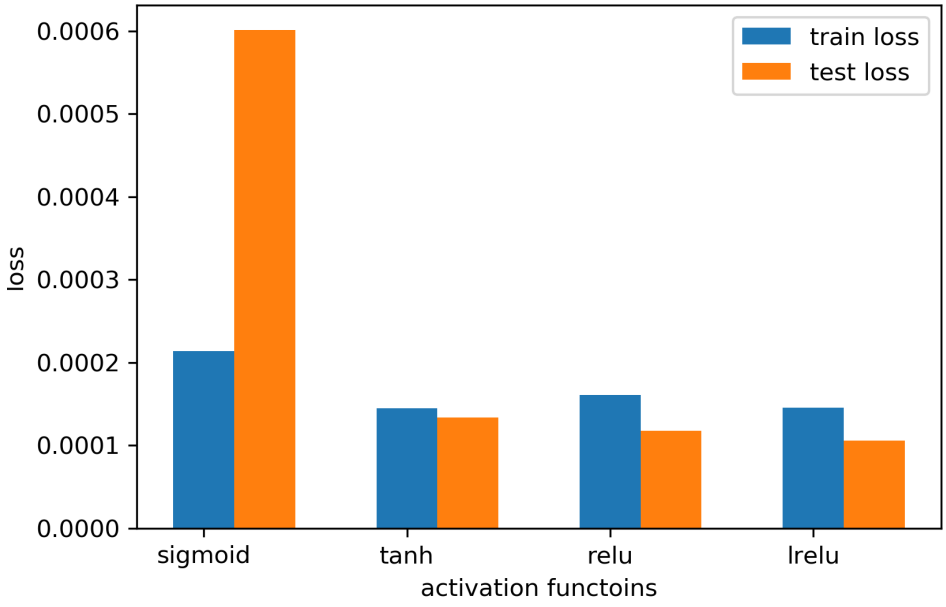


Figure 6: Official image. **(10 marks)**