# Assignment 3

**OBJECTIVES**

You will implement all the building blocks of a neural network and use these building blocks to build a neural network that performs image and text classification. By completing this assignment you will:

* Develop an intuition of the overall structure of a neural network.
* Write functions (e.g. forward propagation, backward propagation, logistic loss, etc...) that help you decompose your code and ease the process of building a neural network.
* Initialize/update parameters according to your desired structure.

**DELIVERABLES:**

**Part 1 (4 pts)**. Conceptual understanding of ANN workflow

1. Study the tutorial thoroughly, conduct the exercise in Python notebook:

<https://www.bogotobogo.com/python/scikit-learn/Artificial-Neural-Network-ANN-1-Introduction.php>

1. Out of the following core concepts of DL, select two and explain step-by-step “what” each is and “how” it is conducted mathematically and programmatically. \*\*\* *Please select two that you have not worked on from homework #2* \*\*\*\*
   1. [Bias-variance tradeoff](https://www.bogotobogo.com/python/scikit-learn/scikit_machine_learning_Bias-variance-Tradeoff.php)
   2. [Forward Propagation](https://www.bogotobogo.com/python/scikit-learn/Artificial-Neural-Network-ANN-2-Forward-Propagation.php)
   3. [Gradient Descent](https://www.bogotobogo.com/python/scikit-learn/Artificial-Neural-Network-ANN-3-Gradient-Descent.php)
   4. [Backward Propagation](https://www.bogotobogo.com/python/scikit-learn/Artificial-Neural-Network-ANN-2-Forward-Propagation.php)
   5. [Overfitting & Regularization](https://www.bogotobogo.com/python/scikit-learn/Artificial-Neural-Network-ANN-7-Overfitting-Regularization.php)

**Part 2 (8 pts)**. Python implementation of a two-layer neural network

1. Submit Python code in Python notebook (*HW3.ipynb*) to fill in all the coding lines as required to create a two-layer neural network from scratch
2. Submit a 1-2 page report, explaining what you have tried, e.g. what hyperparameters you have tested and what was your best model. This report should also include answers for some questions in the notebook.

None of the parts of this assignment require use of a machine with a GPU. You may complete the assignment using your local machine or you may use Google Colaboratory. However, we encourage you to try using Google Cloud platform for Assignment 3 and get familiar with it as it would be helpful in upcoming assignments.

**Credits**: The format of this assignment is inspired by the Stanford courses. We have borrowed some of their data loading and instructions in our assignment ipython notebook.