ENGINEERING DIVISION | NYU ABU DHABI

ENGR-UH 4560
Selected Topics in Information and Computational Systems

Machine Learning

Project 05 - Classification with Neural Network

Introduction - Neural Network

Artificial Neural Networks (ANN) or connectionist systems are computing systems vaguely inspired by the biological neural networks that constitute animal brains. The neural network itself is not an algorithm, but rather a framework for many different machine learning algorithms to work together and process complex data inputs. Such systems "*learn*" to perform tasks by considering examples, generally without being programmed with any task-specific rules. For example, in image recognition, they might learn to identify images that contain cats by analyzing example images that have been manually labeled as "*cat*" or "*no cat*" and using the results to identify cats in other images. They do this without any prior knowledge about cats, for example, that they have fur, tails, whiskers and cat-like faces. Instead, they automatically generate identifying characteristics from the learning material that they process.

Requirements

- Implement a neural network for multiclass classification task on example data (*ex3data1.mat, ex3weights.mat*).
    - Load MATLAB data files.
    - Multiclass Classification
        - Establish a neural network with 1-2 layers (**Not convolution layer**):
            - Implement via Pytorch, realize the training processing with autogradient and plot its training accuracy;
            - Apply the pre-trained weight in ex3weights.mat to your model and plot the accuracy to evaluate your training process;
        - Compare the performance of the Neural Network and a Regularized Logistic regression module (One-vs-all strategy) for the multi-class classification task.

Deliverables

A zip file containing the following:

1. a working project (source code, makefiles if needed, etc)
2. a report for the detailed description of the project
    a. explain the main aspects of your code
    b. how to run your project
    c. plots and diagrams

Before submitting your project, please make sure to test your program on the given dataset.

Notes

Standard Python library ***can be applied****.*
You may discuss the general concepts in this project with other students, but you must implement the program on your own. ***No sharing of code or report is allowed.*** *Violation of this policy can result in a grade penalty.*

Late submission will be accepted ***upon approval from the instructor****.*