Assignment #3

CS 539, Fall 2024

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100 points total

Due: Oct 7, 2024 by 11:59pm
[no submission will be accepted after Oct 9, 2024 at 11:59pm]

Delivery: Submit via Canvas

For this assignment, you will:
(70 pts) Implement linear regression with gradient descent
(30 pts) Make predictions by using your implementation

Part 1: Implement linear regression with gradient descent
In this problem, you will implement the linear regression algorithm in python3. We provide the following files:

a) linear_regression.py - You will implement several functions. As we discussed in class, implement the functions by using **vectorization**. You may refer to matrix calculus here: https://en.wikipedia.org/wiki/Matrix_calculus
Do not change the input and the output of the functions.
b) test.py - This file includes unit tests. Run this file by typing 'pytest -v test.py' in the terminal as you did in homework 1 in order to check whether all of the functions are properly implemented. No modification is required.

Part 2: Make predictions by using your implementation
Given training and test sets, you will make predictions of test examples by using your linear regression implementation (linear_regression.py). We provide the following file:

a) application.py – write your code in this file. Do not change X and y.

Please play with the parameters alpha and number of epochs to make sure your testing loss is smaller than 1e-2 (i.e., 0.01). Report your parameters, training loss and testing loss. In addition, based on your observations, report a relationshp between alpha and number of epochs. Note that a single epoch means the single time you see all examples in the training set.

What to turn in:

- Submit to Canvas your linear_regression.py, application.py and a pdf document for part 2.
- This is an individual assignment.