Assignment 7

In this module, you will write one Python notebook to create required outputs. You will also participate in module 7 forum discussion. Video “4_assignment” describes the requirements.

You will use markdown cells and be creative of summarizing/commenting your notebook. You will also add detailed comments in your Python code (using “#” or triple quote signs)

Notebook 1: adaptive_gradient-descent

Watch the lectures and continue working on the gradient descent algorithm.

Requirements:

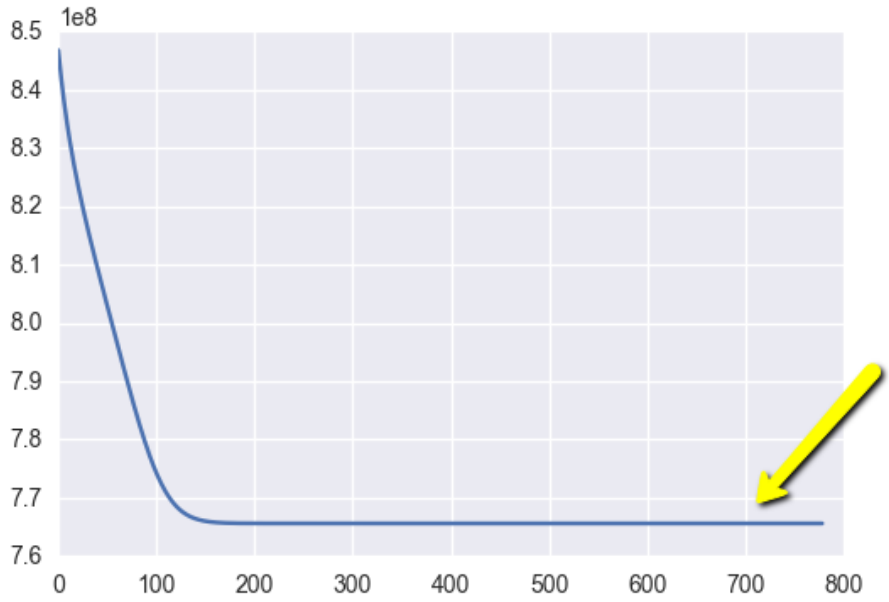
Find the optimum of $f(x)=x^4+200*(x+2000)^2+10000$ using gradient descent

1. Create 4 functions
    a. f(x)
    b. df(x) #derivative of f(x)
    c. find_optimum(x_old,x_new,gamma,precisions)
    d. adaptive_optimum(x_old, x_new, gamma, t, precision)

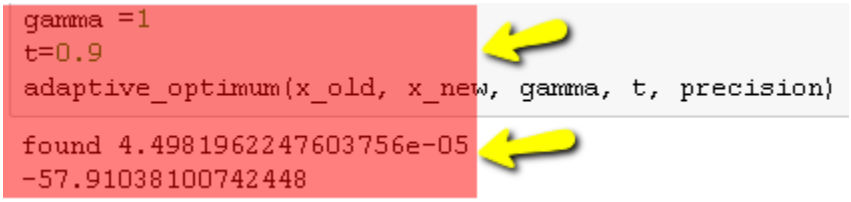
Sample inputs of find_optimum()

```
x_old = 70 # The value does not matter as long as abs(x_new - x_old) > precision
x_new = 50 # The algorithm starts at x=50
gamma = 0.000001
precision = 1e-12
find_optimum(x_old,x_new,gamma,precision)
```

```
779  iternations
The local minimum occurs at -57.910381
gamme =  1e-06
```



Sample inputs and output of adaptive_optimum():



Gamma can be a positive number close to 1. t is the decreasing rate of gamma. You will output gamma and the converged x values.

The algorithm is based on the backtracking method at http://www.onmyphd.com/?p=gradient.descent

***Please challenge yourself to solve the problem on your own first. If you are stuck and the assignment already takes you more than 2 hours, you can use the attached assignment template to complete it.**

Submissions:

You will export your notebook to both .html and .py formats. You will submit the following 1 files to Blackboard. In your html file, you should **include all the outputs** of your python script without error messages.

1. Firstname_Lastname_gradient_descent.zip (zip the .html and .ipynb files)

Attachment:

Optimization_assignment_template.ipynb : a template to help you complete the gradient descent assignment