**San José State University**
**Computer Science Department**
**CS156, Introduction to Artificial Intelligence, Spring 2021**

**Homework #1**

# Objective:

This homework's objective is to implement gradient descent.

# Details:

For this assignment find the value of x-axis at which the following quadratic function has a minimum y value:

$$f(x) = 3x^2 + 2x - 4$$

Because this a quadratic function, we know that it has a single global minimum. Therefore, the function minimum you will find will be the global minimum.

Use gradient descent algorithm to look for this global minimum. Remember that gradient descent uses the function derivative to compute the gradient and at each iteration takes the step opposite to the gradient, constrained by some learning rate. The derivative of our original quadratic function is:

$$f'(x) = 6x + 2$$

This is a very simple homework with a very simple solution, so do not overthink it. All you need is an understanding of how the gradient descent algorithm works. You are free to use any learning rate and any number of iterations as your hyperparameters, or you could default to learning_rate=0.1 and num_iterations=100. Also remember that gradient descent starts from a randomly generated value of x.

Your solution needs to print out a single value for the x-axis where the global minimum of this function is. You can double check the answer your algorithm implementation returns by manually computing the function minimum by setting the value of the derivative to 0.

# Submission:

Email your assignment submission to me at Yulia.Newton@sjsu.edu and the grader (Akshay Kajale) at akshay.kajale@sjsu.edu. Make sure to email this submission by 11:59pm on the due date listed in Canvas. Your sent email is the proof of submission. The subject of the email should say "CS156 Assignment 1". In the body of the email list your name as it appears on the class roster and your student ID. Attach to this email both the pdf of your Jupyter notebook, which contains the solution for this homework assignment, as well as the notebook itself (the notebook file with .ipynb extension). Make sure to submit both files, otherwise the submission will not be considered complete.

# Grading:

I will return the grades as fast as we can grade this homework. Normally it should not take more than a few weeks.

A total of 10 points are possible for this homework assignment.