Assignment 4

Total points: 40

Due date: December 12

Develop a test case in R for the various optimization algorithms covered in class.

1. Choose a 2-dimensonal objective function of interest (shouldn't be as simple as a quadratic function, and should ideally involve local minima or saddle points).
2. Plot the contours.
3. Implement the vanilla gradient descent, Newton's method, damped Newton's method, conjugate gradient descent method, momentum, Nesterov accelerated gradient, Adagrad, Adadelta/RMSprop, and Adam. Choose proper hyperparameters by reading corresponding literature.
4. Choose 5 starting points.
   a) For each starting point, record the optimization track from each algorithm.
   b) Plot the tracks over the contour.
   c) Compare the tracks in another plot whose x-axis is the number of steps, and whose y-axis is the value of the objective function.
5. Write a short report to accompany the plots and summarize your findings.
6. Submit your report online with your R code. Your code should include both your implementation of the optimization algorithms and the experiments. The graders must be able to run your code. If you have multiple files for your code, name the one to be executed by the grader as 'main.R'.