DATA ANALYSIS CLUB, IITPKD

Optimization

[Feb. 18 , 2018]

Q.1) Given below are some functions. Use the backpropagation method to compute the gradients recursively while implementing your gradient descent algorithm(in your favorite programming language) to find the optimum points. You are given some initial points (x_0 , y_0) , initialize your input parameters to these initial values and find the minima points.
Always remember that the minima you will get is fairly dependent on the starting point(initial point) of the gradient descent. You can implement in any programming language but python is preferred.

- $f(x,y) = x^2 + y^2$
  - (x_0 , y_0) : any random point
- $f(x,y) = y^4 + x^2 - y^2$
  - (x_0 , y_0) ≡ (-1 , 0)
  - (x_0 , y_0) ≡ (1 , 0)
- $f(x,y) = 10xy\, e^{-(x^2 + y^2)}$
  - (x_0 , y_0) ≡ (2 , 2)
  - (x_0 , y_0) ≡ (0.5 , 0.5)
  - (x_0 , y_0) ≡ (1 , 0)

- $(x_0, y_0) \equiv (0, 1)$

Q2.) [Thomas Calculus Sec. 14.8, Eg.1] Find the point p(x, y, z) on the plane 2x + y - z - 5 = 0 that is closest to the origin. Solve this problem using the gradient descent method. If possible try to make a plot.