

INF3490 exercises - week 1 2013

Problem 1

Maximize $f(x) = -x^4 + 2x^3 + 2x^2 - x$ using gradient ascent (the gradient is $f'(x) = -4x^3 + 6x^2 + 4x - 1$). How does the choice of starting point and step size affect the algorithm's performance? Is there a starting point where the algorithm would not even be able to find a local maximum?

Problem 2

Assume that we are only interested in maximums of $f(x)$ where x is between -2 and 3 , and x increases in steps of length 0.5 . Perform an exhaustive search to maximize $f(x)$ and plot the result.

Problem 3

In what way would greedy search and hill climbing differ for the maximization problem in Problem 2? Can you identify a starting position where the two algorithms might give different results?

Problem 4

Which algorithm do you think is the most efficient at maximizing $f(x)$ under the conditions in Problem 2: exhaustive search or simulated annealing? Explain.

Problem 5

Gradient ascent, greedy search and hill climbing are quite similar, and are all based almost exclusively on exploitation. Can you think of any additions to these algorithms in order to do more exploration?