Lecture 07a

Using 'fminsearch' to Minimize a Function Specified by a File with Extra Parameters



Lecture is on YouTube

The YouTube video entitled 'Using 'fminsearch' to Minimize a Function Specified by a File with Extra Parameters' that covers this lecture is located at https://youtu.be/VMd-z3qBQsI.

Outline

-fminsearch

fminsearch

Consider the Rosenbrock function of

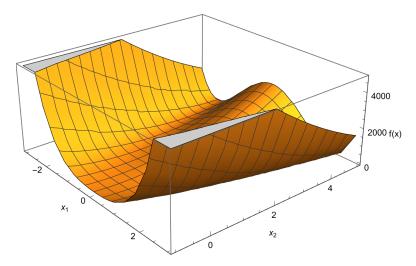
$$f(x) = 100(x_2 - x_1^2)^2 + (a - x_1)^2$$

where a = constant

$$f[x1_, x2_, a_] = 100 (x2 - x1^2)^2 + (a - x1)^2;$$

We can quickly visualize this function

Plot3D[f[x1, x2, 2], {x1, -3, 3}, {x2, -1, 5},
AxesLabel
$$\rightarrow$$
 {"x₁", "x₂", "f(x)"}]



We can evaluate at various locations and various values of a. For example, if we evaluate at

$$x_1 = -1/2$$

$$x_2 = 1/3$$

$$a = 2, 4, 8$$

6.94444

20.9444

72.9444

We can analytically find the minimum by finding where the gradient is zero

Solve[{dfdx1[x1, x2, a] == 0, dfdx2[x1, x2, a] == 0}, {x1, x2}]
$$\left\{ \left\{ x1 \to a, \ x2 \to a^2 \right\} \right\}$$

So we see this function has a minimum at

$$x^* = \begin{pmatrix} a \\ a^2 \end{pmatrix}$$

$$x^* = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$$

Let us now examine various ways we can use Matlab's 'fminsearch' to find local minima for unconstrained problems such as this (go to Matlab).