Subject: Solving a non-linear equation
Posted by Reetsspacey on Wed, 02 Apr 2014 14:33:43 GMT
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Hi,

My problem is this: I have a non-linear equation, of the form y = exp(x)+x. I have a large matrix of Y values, and for each cell (Y-value) I would like to calculate a best-fit X. How can I do this???

I have tried defining a function (exp(x)+x), which I could then get the root of by a number of methods. However I would need to first subtract my Y, before I found the root. The problem then becomes, how can I tell IDL to find the root of exp(x)+x-Y, for a range of Y values?

Eeek my brain!

Subject: Re: Solving a non-linear equation
Posted by Craig Markwardt on Wed, 02 Apr 2014 15:36:15 GMT
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On Wednesday, April 2, 2014 10:33:43 AM UTC-4, Reetsspacey wrote:
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The easiest way is to use Newton's method.

If you're trying to find the root of f(x), given a trial solution of x0, the next best solution is,
  x = x0 - f(x0) / f'(x0)
where f'(x0) is the derivative of the function. Now you have a new x0 and can try again for multiple iterations.

For you, this would be, in IDL language,
```
for i = 0, n_iter-1 do begin
  x = x0 - (x + exp(x) - y)/(1 + exp(x))
  x0 = x
endfor
```

Your function is very well behaved (no extrema) so you should be able to pick x0=0 as your starting point and then keep iterating until you achieve the desired precision.

Craig

Subject: Re: Solving a non-linear equation
Posted by Reetsspacey on Wed, 02 Apr 2014 17:45:05 GMT
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On Wednesday, 2 April 2014 11:36:15 UTC-4, Craig Markwardt wrote:
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>
>
> Craig

Brilliant, that makes sense! Thank you!