Re: Nonlinear Least−Squares curve−fitting

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- *From*: "Reef Fish" <Large_Nassau_Gr0uper@xxxxxxxxx>

- *Date*: 27 Sep 2006 10:24:34 −0700

cafeinst@xxxxxxx wrote:

> Old Mac User wrote:
>
>> Cafei...
>>
>> If you are finding approximately the same residual sum of squares for various combinations of the fitting parameters, then you have very poor estimates of those parameters. In other words, the confidence intervals on the parameters are very wide.
>>
>> It always goes back to the "design of the experiments" that spawned the data. Attempting to fit a "complex" nonlinear model to just any old set of accumulated data is a gross waste of time. Estimating parameters in a linear model can be a loser game if the "independent variables" are poorly arranged in their space. Attempting to do this with a "complex" nonlinear model is many times worse. Worse in the sense of wasting time and effort.
>>
>> Multiple minima... or what seem to be multiple minima... many of which have approx. the same residual sum of squares... suggests your data is poorly conditioned for the model you are attempting to fit.
>
> You may be right. Let me describe what I did in more detail, so that perhaps you can explain why this happened:
>
> The data that I got came from physics experiments. The functions to fit the data came from standard physics equations. The parameters in these equations were actually real physics quantities which could be experimentally measured. When I applied the algorithm which I described of gradually adding data points, the parameters that the algorithm output were much closer to the experimentally observed values for the parameters than when I did not do it gradually.

I'll let Old Mac User answer your question to him.

Meanwhile, my comment to your preceding paragraph is this:

Why didn't you both playing with nonlinear estimation algorithms when you know nothing about nonlinear models and nonlinear estimation methods?

Why didn't you just EXPERIMENTALLY MEAFURE those parameters?

You last two lines certainly SUGGEST that you think it's a good thing for the numerical algorithm to come close to the physically measurable estimates of the same parameters, which in turn suggest that you think the "experimentally observed values for the parameters" are more accurate or reliable than the ones you staistically estimated via your nonlinear estimation model.

But HOW do you know which one is more reliable or accurate?

When I co−authored the textbook "Conversational Statistics" with Harry Roberts, he had an anecdotal tale that according a sampling God (sorry I can't remember his name), whose belief coincided with Harry's, that modern sampling methods for a population can be more accurate than a CENSUS (counting everyone) of the same population.

Imbedded in Harry's belief is of course the well−known fact that for the US census done every 10 years, there has NEVER been a true census because people move around all the time, and nobody can catch all the street people (living off grocery carts and cardboard boxes), so the CENSUS is never a TRUE CENSUS.

So this was what Harry and the sampling God believed:

There is an unknown parameter p about the US population.

We can get an estimate of p by counting everyone, as in a census. Call that pc−hat. We can also estimate the same p by counting only a small portion of the population, via finely stratified samples and with all the statistical gadgets to fill the void, and call that estimate ps−hat.

Conjecture: | p − ps−hat | < | p − pc−hat |.

Before exercising my veto−power <G>, I asked Harry the following question: If we DON'T know what p is, then HOW do we know which of the estimates, pc or ps , is closer to the unknown p ?

Perhaps Harry was too busy to argue, he graciously withdrew
that anecdotal tale from the manuscript without any dissent, and
I had not heard him mentionng that anecdotal "urban legend"
ever since. :−)

So, that would be the same question I have for teh OP. If you
DON'T know what the parameter values are, in the physics
problem, where it can be physically measure or statistically
estimated from a nonlinear model, how do you know which one
is a "better" estimate?

−− Reef Fish Bob.

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