

Referee report

Identification of linear response functions from arbitrary perturbation experiments in the presence of noise – Part I. Method development and toy model demonstration

Being a numerical analyst, I am not able to evaluate the application aspect of this manuscript – so I will focus on the methodology and the algorithm.

A large part of the manuscript consists of a review of material that is already well described in the references given by the authors. Since this is not a review paper, I wonder why so much space is devoted to review? I find that due to this lengthy presentation and all the details, it is difficult “to see the forest for all the trees.” Specifically, I find it hard to identify precisely what is the new contribution of this work.

The new algorithm is called the “RFI (Response Function Identification) method.” This is a very generic name since the goal is, indeed, to solve the deconvolution problem in Eq. (1) – it says nothing about the particular approach taken, and any deconvolution method could go by that name.

The RFI method is summarized in Figure 1, which shows that this is nothing but “plain vanilla” Tikhonov regularization using the discrepancy principle for choosing the regularization parameter. The only novelty seems to be the choice of δ in the discrepancy principle. This could be described much, much shorter.

I honestly do not understand the rationale behind the choice of δ . I can see that δ is the norm of a scaled noise vector, and the scaling depends on an index i_{\max} that is “the last index i before the plateau $\sigma_i \approx 0$ ” [σ_i being the singular values of the system matrix]. This means that i_{\max} is the number of singular values that are not dominated by rounding errors (and perhaps approximation errors in the discretization). This has nothing to do with the noise in the data, which is the ingredient in the discrepancy principle. That is why I don’t understand what is going on here.

Due to the excessive amount of review material, the minimal amount of novelty, and the failure to motivate and explain how δ is computed, I recommend rejection of the manuscript. A much shorter and precise manuscript might be considered for publication.