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Swinging for the Fence in a League Where Everyone Bunts

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I enjoyed this paper *very* much though sometimes it felt too rich, like eating an entire sheet of fudge. Many aspects of it deserve comment; I will discuss this paper as an example of the value of system building and then note what seems to be a missed opportunity.

1. THE VALUE OF SYSTEM-BUILDING

I congratulate the authors especially for building a system instead of devising yet another salami slice. Statistics does not have enough system-building and I do not mean theory-for-theory's-sake systems, like decision theory came to be, but rather systems built for practical purposes. The only recent examples that come to mind are computing systems like R, WinBUGS, JAGS and the authors' own INLA. To use a baseball analogy, it is refreshing to see the authors swing for the fence in an academic incentive system that almost forces people to bunt.[1]

An important virtue of system-building is that it bears fruit beyond the immediate products, which in this case are prior distributions. To build a system, you assemble tentative principles based on examples and what seems like good sense, then refine the system by applying it to more examples. After a while, the system merits enough confidence that when something odd happens in an example, it is permissible to question whether the oddity arose from an error in the customary way of thinking rather than from a flaw in the system. At this point, the system has begun to add value for problems besides those that motivated it. The danger, of course, is having too much confidence in your system, becoming an ideologue, and thus a menace. As I will argue below, however, the authors seem to have too little, not too much, confidence.

One example of using the system to challenge customary thinking is Section 5, which reconsiders the Besag–York–Mollié model. Based on Desideratum D2, the authors argue that the spatial and heterogenity components "cannot be seen independently" so that their priors "should . . . not [be] independent as . . . usually assumed." They implement this by re-parameterizing from the usual two parameters, one controlling each component, to a parameter controlling total precision in the prior and a parameter allocating total precision between the spatial and heterogeneity components. The authors are not the first to suggest such a parameterization for spatial models (e.g., Leroux, Lei and Breslow, 2000) or more generally (e.g., He et al., 2007) but I do think they are the first to show how this provides a convincing rationale for a prior.

In Section 8, the authors tantalize us by suggesting they could do something similar with the negative binomial distribution's over-dispersion parameter, replacing the now-standard parameterization (which I find uninterpretable) with the mean and variance-to-mean ratio. I encourage them to pursue this.

It does seem that the authors' confidence failed them for the sparsity priors example (Section 4.5), and I think they have done themselves an injustice. They begin by noting that the spike-and-slab prior has computing problems, then switch to "a more pleasant computational option [that] builds a prior on the scaling parameter of the individual model components," and treats them as independent. After some development, they say "does . . . the PC prior [for the independent-components formulation] make a good variable selection prior? . . . the answer is no. The problem with the basic PC prior . . . is that the base model has been incorrectly specified. The base model that a p-dimensional vector is sparse is not the same as the base model that each of the p components is independently zero, and hence the prior encodes the wrong information. A more correct application of [the authors'] principles . . . lead[s] to a PC prior that first selects the number of

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[1]For those unfamiliar with baseball, to swing for the fence (i.e., try to hit a home run) is to try to accomplish much with one stroke, while a bunt is the minimum unit of aspiration. Although bunts have their place, a match consisting entirely of bunts would be, among other things, stupefyingly dull even by baseball's leisurely standard.