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Efficient Derivative-Free Optimization PAUL BELITZ, THOMAS BEWLEY, UC San Diego — When optimizing the parameters affecting the evolution of a chaotic system, a peculiar challenge arises. The infinite-time average of the statistic of interest is only approximated by any finite-time simulation, with the truncation errors effectively decorrelated from one simulation to the next. Thus, the optimization surface is nonsmooth, and gradient-based optimization algorithms are ill suited. One of the most efficient derivative-free optimization algorithm available for such problems is the Surrogate Management Framework (SMF), which fits an interpolating function to the available data to identify regions of interest. The SMF is based on an underlying grid structure, with all function evaluations performed on this grid. Once discrete convergence is obtained, the grid is refined and the process repeated. In all previous SMF codes, Cartesian grids have been used. However, Cartesian grids are not nearly as uniform at packing or covering parameter space as various alternatives available from n-dimensional sphere packing theory. In the present talk, we show that, by leveraging such packings, the number of function evaluations required for convergence of the SMF algorithm is substantially reduced.

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