

# Methods for Computationally Expensive Large Scale Black Box Simulation Optimization

## Scientific Achievement

Integration of sensitivity analysis methods in adaptive surrogate model algorithm for solving high-dimensional simulation optimization problems

## Significance and Impact

Methodology will enable us to solve large scale optimization problems efficiently and effectively; applicability to a wide range of science problems, e.g. physics event generator tuning, smart building design

## Research Details

- Iterative, adaptive method (see Fig. 1)
- Use sensitivity analysis to determine parameter importance
- Use a stepwise radial basis function (RBF) method to select only the most important parameters for the low-dimensional model fit
- Use the low-dimensional model to select a new sample point

Fig. 2: Convergence plot for 20-d problem: lower graphs are better.  
"saizo" = new method; "old" = off-the-shelf surrogate optimizer;  
"2stage" = first sensitivity analysis, then optimization on low-dim space

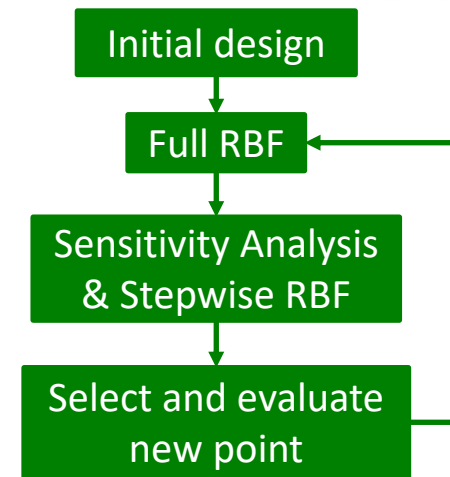


Fig. 1: Flowchart of the algorithm

