Sequential Design of Experiments and Some New Space-Filling Designs

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Abstract:
In many data collection scenarios, we have choices about whether to run a single large experiment or a sequence of smaller experiments. Traditionally design of experiments textbooks provide many ideas and samples of good single large experiments, but experimenters frequently do not have the tools they need for determining how to proceed with sequential designs. This talk describes some advantages of collecting data in increments, a sequence of common objectives for early through late sub-experiments, and how to use the results from previous stages to inform design choices for later ones. This approach can help to avoid wasting valuable resources, maximize what can be learned and allow for multiple objectives to be addressed. In addition, several new types of space filling designs to use as building blocks for constructing the right sequence of sub-experiments are presented: (1) Non-uniform Space Filling (NUSF) designs allow for some regions of the input space to be emphasized more than others, and (2) Input-Response Space Filling (IRSF) designs create a Pareto front of choices that vary in how much they emphasize the space filling properties for the input space versus the response space.

Bio:
Christine M. Anderson-Cook recently retired as a Research Scientist in the Statistical Sciences Group at Los Alamos National Laboratory. She was a contributor to more than 80 projects while at LANL and has led projects in the areas of nuclear non-proliferation, sequential design of experiments for carbon capture, cybersecurity, complex system reliability and using data competitions to advance algorithms for detecting radioactive materials. Before joining LANL, she was a faculty member in the statistics department at Virginia Tech. Her research areas include design of experiments, response surface methodology, reliability, multiple criterion optimization and data-centric decision-making.

She is a Fellow of the American Statistics Association and the American Society for Quality. She has served on the Editorial boards of Technometrics, the Journal of Quality Technology, Quality and Reliability Engineering International, Quality Engineering and the Journal of Statistics Education. She is a long time Statistics Spotlight column contributor in Quality Progress. She is the 2021 recipient of the George Box Medal and the Gerald J. Hahn Q&P Achievement Award. She was also the 2018 recipient of the ASQ Shewhart Medal and winner of the ASQ Statistics Division William G. Hunter Award.