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Title: Lattice rules, kernel methods, DNNs, and how to connect them

Lattice rules are my favorite family of quasi-Monte Carlo methods. They are proven to be effective for high dimensional integration and multivariate function approximation in a number of settings. They are extremely easy to implement thanks to their very simple formulation --- all we require is a ``good'' integer vector of length matching the dimensionality of the problem. We know how to construct such good vectors tailored to applications in different areas, e.g., in PDEs with random coefficients, both for computing expected values (integrals) of quantities of interest as well as in obtaining surrogates of the PDE solution using lattice-based kernel interpolants. In recent years there has been a burst of research activities on the application and theory of Deep Neural Networks (DNNs). We explore how lattice rules can be used in the framework of DNNs.

This is based on joint work with Alexander Keller (NVIDIA), Dirk Nuyens (KU Leuven) and Ian H. Sloan (UNSW Sydney).