SHAWN MCADAM, Saskatchewan

Approximating Multivariate Functions with Fast Piecewise Polynomials with Application to Mantle Convection Code

Many programs in scientific computing spend a substantive proportion of total runtime evaluating mathematical functions. Under suitable conditions, such functions may be efficiently approximated with piecewise polynomials (AKA Lookup Tables). One example includes the mantle convection code developed by S.J. Trim et al in their 2023 paper. It contains a mathematical function that performs complex arithmetic, evaluates Jacobi elliptic functions outside their usual domains, and involves deeply nested compositions of functions. This presentation illustrates how one can build multivariate LUTs from univariate ones, and applies this construction to the function in S.J. Trim et al to obtain a roughly 500 times speedup.