Lattice rules for integration over $\mathbb{R}^d$

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Abstract

In this talk, we consider numerical integration over $\mathbb{R}^d$ using lattice rules. For integration over the (unit) cube it is known that tent-transformed lattice rules can achieve up to second order convergence in a non-periodic unanchored Sobolev space [1, 2]. We show if it is possible to obtain higher order convergence, including truncation error, in an unanchoresd Sobolev space using lattice rules for integration over $\mathbb{R}^d$. We make use of an orthogonal projection from an unanchored Sobolev space to a Korobov space. Using this projection we can measure/quantify the non-periodicity of a function, and by imposing some decay condition on the integrand we achieve higher order. We also mention some complementary results using this projection.

References

[1] J. Dick, D. Nuyens and F. Pillichshammer: *Lattice rules for nonperiodic smooth integrands*, Numer. Math., 126:259-291, 2014.

[2] T. Goda, K. Suzuki and T. Yoshiki: *Lattice rules in non-periodic subspaces of Sobolev spaces*, Numer. Math., 141:399-427, 2019.