Integration w.r.t. the Standard Gaussian Measure on the Sequence Space

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We consider a quadrature problem on the sequence space $\mathbb{R}^{\mathbb{N}}$, where the underlying measure $\mu = N(0,1)^{\mathbb{N}}$ is given by the countable product of standard normal distributions and the integrands $f : \mathbb{R}^{\mathbb{N}} \to \mathbb{R}$ belong to a unit ball of a reproducing kernel Hilbert space. This space has tensor product form, and the building blocks are weighted Sobolev spaces of once differentiable functions where the function itself and the derivative have bounded L^2-norm with respect to the centered normal distribution $N(0, \sigma^2)$ with variance σ^2.

We consider deterministic algorithms in the worst-case-setting, where the cost of evaluating a function at a point is the index of the highest nonzero component. Upper and lower bounds for the complexity are derived.