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Prospects for Lattice QFTs on Curved Riemann Manifolds

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Conformal or near conformal QFTs would benefit from
a rigorous non-perturbative lattice formulation beyond the flat
Euclidean space, $\mathbb{R}^d$. Although all UV complete QFT are
known to be also perturbatively renormalizable on any smooth Riemann
manifold, non-perturbative realization on simplicial lattices (triangulations) encounter difficulties as the UV cut-off isremoved. We review the Quantum Finite Element (QFE) method that combines classical Finite Element and Regge Geometry with new quantum
counter terms designed to address this. The construction for maximally symmetric spaces ($\mathbb{S}^d, \mathbb{R} \times \mathbb{S}^{d-1}$ and $\mathbb{A}d\mathbb{S}^{d+1}$) is outlined with numerical tests on $\mathbb{S}^2$ and a description of theoretical
and algorithmic challenges for $d = 3, 4$ QFTs.

Primary author: Prof. BROWER, Richard C. (Boston University)

Presenter: Prof. BROWER, Richard C. (Boston University)

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