



UNIVERSITY OF MIAMI
COLLEGE of
ARTS & SCIENCES

Miami Physics Conference 2024

Date: Dec 12-19, 2024
Location: Lago Mar Resort
Affiliation: The Institute of Mathematical Sciences

Partha Mukhopadhyay

A Proposal for a Symmetry Preserving Cutoff

Abstract

We discuss a lattice cutoff that preserves all symmetries of the continuum. This is achieved by first developing a tempered distribution theory on the lattice such that the associated calculus is identical to that of the continuum and then using the same to construct the lattice theories. This allows one to prove Noether's theorems and derive the same symmetry algebra (for both spacetime and internal symmetries) of the continuum. The construction is so far understood for a specific class of curved backgrounds in any dimension. For a scalar field in flat spacetime, we explicitly demonstrate Poincaré algebra and for the bosonic string non-linear sigma model, the Virasoro and spacetime isometry algebras. Time permitting, we also discuss the physical interpretation of the "lattice" and how symmetries are manifest in the perturbative Feynman diagrams.