

KMI Colloquium

Extra-dimension: is it real, or just a mathematical tool?

- a lattice theorist's view for constructing chiral fermion on the lattice -



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Abstract:

Regularizing chiral fermion has been a challenge in particle physics and field theory. In lattice regularization, the problem manifests itself as mirror fermions (or doublers) as suggested by the Nielsen-Ninomiya's theorem. However, this problem is not a technical but fundamental, since it is also closely related to the existence of anomalies.

On the other hand, we find many examples of chiral fermions in nature. Some of them are realized as the edge-modes which appears at the surface of the of higher dimensional bulk spacetime (topological insulator, cosmic string, ...). The appearance of extra-dimensions in these remarkable examples can give a hint to formulating chiral fermions.

In this talk, I review the study of constructing chiral fermions on the lattice and its partial solutions using extra-dimensions. I also explain our recent work in understanding the anomaly structure realized in higher dimensions.