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Theorie-Palaver

July 25, 2023 at 2 p.m.
Lorentz room (Staudingerweg 7, 5th floor)

Tin Sulejmanpasic
Durham U.

Abelian Chern-Simons theory on the Lattice

I will introduce a formalism for abelian lattice gauge theories called the Modified Villain Action formalism, which has been popular in recent years for constructing abelian gauge theories with correct symmetries and anomalies of their continuum counterparts. I will then show that this formalism can be used to write down a $U(1)$ Chern-Simons theory on the lattice for even levels. The theory we construct suffers from the peculiar zero modes of the Gaussian differential operator which are infamous in the literature for plaguing the Chern-Simons theory with unphysical modes. I will show that such modes are related to a peculiar subsystem symmetry of a space-time lattice. This symmetry causes almost all Wilson loops to vanish. However Wilson loop-like operators with strip-like topology survive the pernicious symmetry and are topological, exactly like one expects in the continuum. Further the strip-like topology of the loops is a lattice realization of a well known phenomenon in continuum called the framing anomaly. I will further argue, time permitting, that the pernicious symmetry is really a form of gauge symmetry, projecting out certain states from the Hilbert space, and that it is not associated with any physical significance.

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