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Topological Data Analysis of Monopoles in U(1) Lattice Gauge Theory

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"It has been widely argued that non-trivial topological features of the Yang-Mills vacuum are responsible for colour confinement. However, both analytical and numerical progress have been limited by the lack of understanding of the nature of relevant topological excitations in the full quantum description of the model. Recently, Topological Data Analysis (TDA) has emerged as a widely applicable methodology in data science that enables us to extract topological features from data. We explain how TDA paired with machine learning may be used to quantitatively analyse the deconfinement phase transition in 4d compact U(1) lattice gauge theory by constructing observables built from topological invariants of monopole current networks."

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