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The Holography of Non-Invertible Self-Duality Symmetries

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In recent years a lot of attention has been paid to generalized notions of global symmetries in QFT, and their consequences for the dynamics. In particular, symmetries whose underlying mathematical structure is not described by group theory but by category theory, the so-called non-invertible symmetries, have been discovered to exist also in 4d gauge theories. This raises the important question: how do these symmetries appear from the bulk point of view in theories with a holographic dual? This question is non-trivial since there is no established concept of a gauge field for such symmetries. I will provide a solution to this problem in the case of non-invertible symmetries existing in $4d$ $\mathcal{N} = 4$ theories in certain points of their conformal manifold. I will explain that these points are holographically dual to points in the moduli space of string theory, where there is an emergent gauge field in the supergravity description. This new degree of freedom has an interplay with the other fields, which results in an intricate structure, reproducing the non-invertible symmetry of the boundary theory.

Based on arXiv:2210.09146 and upcoming work.

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