

Erratum: Provably Trainable Rotationally Equivariant Quantum Machine Learning [PRX Quantum 5, 030320 (2024)]

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This Erratum addresses an error in our paper [1], which describes the construction of a family of rotationally equivariant quantum machine-learning models. In Proposition 1 and Corollary 1 we analytically study a member of this family, which we mistakenly identify as the model whose action on the angular register consists of a chain of nearest-neighbor controlled-Z gates. The model that is described in Proposition 1 and Corollary 1 actually acts on the angular register as a chain of nearest-neighbor controlled-Z rotations by *arbitrary* angles. The conclusions that we draw based on Proposition 1 and Corollary 1, therefore, apply to this slightly generalized model, and not to the model restricted only to controlled-Z gates that we apply in our numerics. This more general model encompasses the previous architecture, and is still rotationally equivariant, and modulo this correction the conclusions of our paper remain unchanged. We thank the authors of the Comment [2] for bringing this to our attention.

Specifically, the statement of Proposition 1 should begin “The dynamical Lie algebra $\mathfrak{g}$ of the rotationally equivariant model given by arbitrary single-qubit rotations on the radial register combined with a chain of controlled-Z rotations has a decomposition...” with the text following “decomposition” identical to the corresponding text in the original paper. Similarly, the statement of Corollary 1 should begin “The rotationally equivariant models given by arbitrary single-qubit rotations on the radial register combined with a chain of controlled-Z rotations are...” with the text following “are” identical to the corresponding text in the original paper. Additionally, the (unnumbered) equation following Eq. (A3) should read

$$CZ_{1,2}(\theta) = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & e^{i\theta} \end{pmatrix} = \exp \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & i\theta \end{pmatrix} = \exp -i\theta(cz_{1,2}).$$

More generally all occurrences of “CZ” throughout the proof of Proposition 1 should read “CZ(θ)”, referring not to controlled-Z gates, but rather arbitrary controlled-Z rotations; finally the equation $\exp -i\theta(cz_{i,i+1}) = CZ_{i,i+1}$ should read $\exp -i\theta(cz_{i,i+1}) = CZ_{i,i+1}(\theta)$.

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- [1] M. T. West, J. Heredge, M. Sevier, and M. Usman, Provably trainable rotationally equivariant quantum machine learning, [PRX Quantum 5, 030320 \(2024\)](#).
 [2] Z. Xiao and T. Li, Comment on “Provably trainable rotationally equivariant quantum machine learning”, [arXiv:2504.16950](#).

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