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Machine-learning techniques as noise reduction strategies in lattice calculations of the muon $g-2$

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Lattice calculations of the hadronic contributions to the muon anomalous magnetic moment are numerically highly demanding due to the necessity of reaching total errors at the sub-percent level. Noise-reduction techniques such as low-mode averaging have been applied successfully to determine the vector-vector correlator with high statistical precision in the long-distance regime, but display an unfavourable scaling in terms of numerical cost. This is particularly true for the mixed ("high-low") contribution in which one of the two quark propagators is described in terms of low modes. Here we report on an ongoing project that employs machine learning as a cost-effective tool to produce approximate estimates of the mixed contribution, which are then bias-corrected to produce an exact result. A second example concerns the determination of electromagnetic isospin-breaking corrections by combining the predictions from a trained model with a bias correction.

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