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Quantum machine learning for universal quantum computation ELIZABETH BEHRMAN, Wichita State Univ — We describe a systematic method, using machine learning, to "program" a large-scale quantum computer. Large-scale quantum computational tasks require that the quantum computer be prepared in states which are multiply entangled; our methods show a way to create GHZ states over hundreds of qubits, and also to tailor the particular entanglement desired for a particular computation. In addition, current algorithmic approaches use a "building block" strategy, in which a procedure is formulated as a sequence of steps from a universal set, e.g., a sequence of CNOT, Hadamard, and phase shift gates. Using quantum learning enables us to perform computations without breaking down an algorithm into its "building blocks", eliminating a difficult step and potentially increasing efficiency by simplifying and reducing unnecessary complexity. Moreover, we demonstrate robustness of quantum learning to noise and to decoherence.

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