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Quantum approximate optimization on a gate-model superconducting processor WILLIAM ZENG, NICHOLAS RUBIN, MICHAEL CURTIS, ANTHONY POLLORENO, ROBERT SMITH, JOEL ANGELES, BENJAMIN BLOOM, MAXWELL BLOCK, SHANE CALDWELL, WILLIAM O'BRIEN, ALEXANDER PAPAGEORGE, RUSS RENZAS, DAMON RUSSELL, DIEGO SCARABELLI, MICHAEL SCHEER, EYOB SETE, RODNEY SINCLAIR, NIKOLAS TEZAK, MEHRNOOSH VAHIDPOUR, MARIUS VILLIERS, ALEXANDER HUDSON, MICHAEL SELVANAYAGAM, ANDREW BESTWICK, MATTHEW REAGOR, CHAD RIGETTI, Rigetti Quantum Computing — The Quantum Approximate Optimization Algorithm (QAOA) [Farhi et al. arXiv:1411.4028] is a promising application for near-term quantum computing devices and has potential to demonstrate quantum supremacy [Farhi Harrow arXiv:1602.07674]. We compile and run the QAOA algorithm on a programmable superconducting qubit processor, assessing its performance on instances of the MAX-CUT and k-coloring problems. Experimental performance is analyzed to measure the robustness of QAOA to device noise, and we comment on its outlook as a near-term demonstration of quantum supremacy.

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