

Quantum computing: From the basics to applications

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Widespread knowledge of quantum physics often describes it as unpredictable, powerful, and almost existentially strange. Quantum computing condenses the realization of many of these seemingly odd concepts to manipulate quantum information encoded in its most fundamental piece, a qubit. In this talk, I will introduce the basic aspects of quantum computing, later addressing two facets of the quantum computation paradigm: quantum communication [1] and quantum memory [2, 3], with demonstrated applications on existing superconducting quantum circuits. These involve a classical-quantum back and forth, including optimization and benchmarking, that brings about not only a push towards technological innovation but have the potential to solve current challenging questions for the largest existing supercomputers.

[1] Q. Guo, **RM***, R. Scalettar*, H. Wang*, (in preparation)

[2] Q. Guo, C.Cheng, Z-H. Sun, Z. Song, H. Li, Zhen Wang, W. Ren, H. Dong, D. Zheng, Y.-R. Zhan, **RM***, H. Fan*, H.Wang*, Nature Physics 17, 234 (2021)

[3] Q. Guo, C. Cheng, H. Li, S. Xu, P. Zhang, Z. Wang, C. Song, W. Liu, W. Ren, H. Dong, **RM***, H. Wang*, Phys. Rev. Lett. 127, 240502 (2021)