## References

- S. Aaronson and D. Gottesman. Improved simulation of stabilizer circuits. *Physical Review A*, 70(5), 2004. doi: 10.1103/physreva.70.052328.
- J. Abhijith, A. Adetokunbo, J. Ambrosiano, et al. Quantum algorithm implementations for beginners, 2020. arXiv:1804.03719v2 [cs.ET].
- T. Altenkirch and A. Green. The quantum IO monad. *Semantic Techniques in Quantum Computation*, 2013. doi: 10.1017/CBO9781139193313.006.
- E. Altman, K. R. Brown, G. Carleo, et al. Quantum simulators: Architectures and opportunities. *PRX Quantum*, 2(1), 2021. doi: 10.1103/prxquantum.2.017003.
- S. Anders and H. J. Briegel. Fast simulation of stabilizer circuits using a graph-state representation. *Physical Review A*, 73(2), 2006. doi: 10.1103/physreva.73.022334.
- D. L. Applegate, R. E. Bixby, V. Chvátal, and W. J. Cook. The Traveling Salesman Problem: A Computational Study. Princeton University Press, 2006. URL www.jstor.org/stable/j.ctt7s8xg.
- F. Arute, K. Arya, R. Babbush, et al. Quantum supremacy using a programmable superconducting processor. *Nature*, 574(7779):505–510, 2019. doi: 10.1038/s41586-019-1666-5.
- F. Arute, K. Arya, R, Babbush, et al. Supplementary information: Quantum supremacy using a programmable superconducting processor. https://arxiv.org/pdf/1910.11333.pdf, 2020.
- A. Barenco, C. H. Bennett, R. Cleve, et al. Elementary gates for quantum computation. *Physical Review A*, 52(5):3457–3467, 1995. doi: 10.1103/physreva.52.3457.
- S. Beauregard. Circuit for Shor's algorithm using 2n+3 qubits. *Quantum Information and Computation*, 3(2):175–185, 2003.
- J. S. Bell. On the Einstein Podolsky Rosen paradox. *Physics Physique Fizika*, 1:195–200, 1964. doi: 10.1103/PhysicsPhysiqueFizika.1.195.
- C. H. Bennett. Logical reversibility of computation. *IBM Journal of Research and Development*, 17(6):525–532, 1973. doi: 10.1147/rd.176.0525.
- C. H. Bennett, G. Brassard, C. Crépeau, R. Jozsa, A. Peres, and W. K. Wootters. Teleporting an unknown quantum state via dual classical and Einstein–Podolsky–Rosen channels. *Physical Review Letters*, 70:1895–1899, 1993. doi: 10.1103/PhysRevLett.70.1895.
- D. W. Berry and B. C. Sanders. Quantum teleportation and entanglement swapping for systems of arbitrary spin. In 2002 Summaries of Papers Presented at the Quantum Electronics and Laser Science Conference, pp. 265–, 2002. doi: 10.1109/QELS.2002.1031404.
- S. Bettelli, T. Calarco, and L. Serafini. Toward an architecture for quantum programming. *The European Physical Journal D Atomic, Molecular and Optical Physics*, 25(2):181–200, 2003. doi: 10.1140/epjd/e2003-00242-2.
- B. Bichsel, M. Baader, T. Gehr, and M. T. Vechev. Silq: a high-level quantum language with safe uncomputation and intuitive semantics. In A. F. Donaldson and E. Torlak, eds., *Proceedings*

- of the 41st ACM SIGPLAN International Conference on Programming Language Design and Implementation, PLDI 2020, London, UK, June 15–20, 2020, pp. 286–300. ACM, 2020. doi: 10.1145/3385412.3386007.
- S. Boixo, S. V. Isakov, V. N. Smelyanskiy, et al. Characterizing quantum supremacy in near-term devices. *Nature Physics*, 14(6):595–600, 2018. doi: 10.1038/s41567-018-0124-x.
- G. Brassard, P. Høyer, M. Mosca, and A. Tapp. Quantum amplitude amplification and estimation. *Quantum Computation and Information*, pp. 53–74, 2002. doi: 10.1090/conm/305/05215.
- I. Buck, T. Foley, D. Horn, et al. Brook for GPUs: Stream computing on graphics hardware. *ACM Transactions on Graphics*, 23:777–786, 2004. doi: 10.1145/1186562.1015800.
- H. Buhrman, R. Cleve, J. Watrous, and R. de Wolf. Quantum fingerprinting. *Physical Review Letters*, 87(16), 2001. doi: 10.1103/physrevlett.87.167902.
- H. Buhrman, C. Dürr, M. Heiligman, et al. Quantum algorithms for element distinctness. *SIAM Journal on Computing*, 34(6):1324–1330, 2005. doi: 10.1137/s0097539702402780.
- B. Butscher and H. Weimer. libquantum. www.libquantum.de/, 2013. Accessed: 2021-02-10.
- A. M. Childs, R. Cleve, E. Deotto, E. Farhi, S. Gutmann, and D. A. Spielman. Exponential algorithmic speedup by a quantum walk. *Proceedings of the Thirty-Fifth ACM Symposium on Theory of Computing STOC '03*, 2003. doi: 10.1145/780542.780552.
- A.M. Childs, R. Cleve, S. P. Jordan, and D. Yonge-Mallo. Discrete-query quantum algorithm for nand trees. *Theory of Computing*, 5(1):119–123, 2009. doi: 10.4086/toc.2009.v005a005.
- F. T. Chong, D. Franklin, and M. Martonosi. Programming languages and compiler design for realistic quantum hardware. *Nature*, 549(7671):180–187, 2017. doi: 10.1038/nature23459.
- D. Coppersmith. An approximate Fourier transform useful in quantum factoring. *arXiv e-prints*, art. quant-ph/0201067, Jan. 2002.
- D. G. Cory, M. D. Price, W. Maas, et al. Experimental quantum error correction. *Physical Review Letters*, 81(10):2152–2155, 1998. doi: 10.1103/physrevlett.81.2152.
- A. W. Cross, L. S. Bishop, J. A. Smolin, and J. M. Gambetta. Open quantum assembly language, 2017. arXiv:1707.03429.
- C. M. Dawson and M. A. Nielsen. The Solovay–Kitaev algorithm. *Quantum Information and Computation*, 6(1):81–95, 2006.
- H. De Raedt, F. Jin, D. Willsch, et al. Massively parallel quantum computer simulator, eleven years later. *Computer Physics Communications*, 237:47–61, 2019. doi: 10.1016/j.cpc.2018. 11.005.
- W. Dean. Computational complexity theory. In E. N. Zalta, ed., *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University, 2016.
- D. Deutsch. Quantum theory, the Church–Turing principle and the universal quantum computer. *Proceedings of the Royal Society of London Series A*, 400(1818):97–117, 1985. doi: 10.1098/rspa.1985.0070.
- D. Deutsch and R. Jozsa. Rapid solution of problems by quantum computation. *Proceedings of the Royal Society of London. Series A*, 439(1907):553–558, 1992. doi: 10.1098/rspa.1992. 0167.
- S. J. Devitt, W. J. Munro, and K. Nemoto. Quantum error correction for beginners. *Reports on Progress in Physics*, 76(7):076001, 2013. doi: 10.1088/0034-4885/76/7/076001.
- Y. Ding and F. T. Chong. Quantum computer systems: Research for noisy intermediate-scale quantum computers. Synthesis Lectures on Computer Architecture, 15(2):1–227, 2020. doi: 10.2200/S01014ED1V01Y202005CAC051.

- Y. Ding, A. Holmes, A. Javadi-Abhari, D. Franklin, M. Martonosi, and F. Chong. Magic-state functional units: Mapping and scheduling multi-level distillation circuits for fault-tolerant quantum architectures. 2018 51st Annual IEEE/ACM International Symposium on Microarchitecture (MICRO), 2018. doi: 10.1109/micro.2018.00072.
- Y. Ding, X.-C. Wu, A. Holmes, A. Wiseth, D. Franklin, M. Martonosi, and F. T. Chong. Square: Strategic quantum ancilla reuse for modular quantum programs via cost-effective uncomputation. 2020 ACM/IEEE 47th Annual International Symposium on Computer Architecture (ISCA), 2020. doi: 10.1109/isca45697.2020.00054.
- B. L. Douglas and J. B. Wang. Efficient quantum circuit implementation of quantum walks, *Physical Review A*, 79:1050–2947, 2009. doi: 10.1103/PHYSREVA.79.052335.
- T. G. Draper. Addition on a quantum computer. arXiv e-prints, art. quant-ph/0008033, 2000.
- A. Einstein, B. Podolsky, and N. Rosen. Can quantum-mechanical description of physical reality be considered complete? *Physical Review*, 47:777–780, 1935. doi: 10.1103/PhysRev.47.777.
- E. Farhi, J. Goldstone, and S. Gutmann. A quantum approximate optimization algorithm, 2014. URL https://arxiv.org/abs/1411.4028.
- J. Faye. Copenhagen interpretation of quantum mechanics. In E. N. Zalta, ed., *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University, 2019.
- R. Feynman. The Character of Physical Law. MIT Press, 1965.
- D. A. Fleisch. A Student's Guide to the Schroedinger Equation. Cambridge University Press, 2020.
- M. P. Frank, U. H. Meyer-Baese, I. Chiorescu, L. Oniciuc, and R. A. van Engelen. Space-efficient simulation of quantum computers. *Proceedings of the 47th Annual Southeast Regional Conference on ACM-SE 47*, 2009. doi: 10.1145/1566445.1566554.
- P. Fu, K. Kishida, N. J. Ross, and P. Selinger. A tutorial introduction to quantum circuit programming in dependently typed Proto-Quipper, 2020. URL https://arxiv.org/abs/2005. 08396.
- J. Gambetta, D. M. Rodríguez, A. Javadi-Abhari, et al. Qiskit/qiskit-terra: Qiskit Terra 0.7.2, 2019. URL https://doi.org/10.5281/zenodo.2656592.
- J. C. Garcia-Escartin and P. Chamorro-Posada. Equivalent quantum circuits, 2011. https://arxiv.org/abs/1110.2998.
- S. Garhwal, M. Ghorani, and A. Ahmad. Quantum programming language: A systematic review of research topic and top cited languages. *Archives of Computational Methods in Engineering*, 28(2):289–310, 2021. doi: 10.1007/s11831-019-09372-6.
- G. Ghirardi and A. Bassi. Collapse theories. In E. N. Zalta, ed., *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University, 2020.
- C. Gidney. Asymptotically Efficient Quantum Karatsuba Multiplication, 2019. https://arxiv.org/abs/1904.07356.
- C. Gidney. Quirk online quantum simulator. https://algassert.com/quirk, 2021a. Accessed: 2021-02-10.
- C. Gidney. Breaking down the quantum swap. https://algassert.com/post/1717, 2021b. Accessed: 2021-02-10.
- P. Gokhale, A. Javadi-Abhari, N. Earnest, Y. Shi, and F. T. Chong. Optimized quantum compilation for near-term algorithms with OpenPulse. In 2020 53rd Annual IEEE/ACM International Symposium on Microarchitecture (MICRO), pp. 186–200, 2020. doi: 10.1109/MICRO50266.2020.00027.

- Google. Quantum supremacy using a programmable superconducting processor. https://ai .googleblog.com/2019/10/quantum-supremacy-using-programmable.html, 2019. Accessed: 2021-02-10.
- Google. C++ style guide. http://google.github.io/styleguide/cppguide.html, 2021a. Accessed: 2021-02-10.
- Google. Python style guide. http://google.github.io/styleguide/pyguide.html, 2021b. Accessed: 2021-02-10.
- Google. Cirq. https://cirq.readthedocs.io/en/stable/, 2021c. Accessed: 2021-02-10.
- Google. qsim and qsimh. https://quantumai.google/qsim, 2021d. Accessed: 2021-02-10.

Graphviz.org. Graphviz, 2021. Accessed: 2021-02-10.

- A. S. Green, P. L. Lumsdaine, N. J. Ross, P. Selinger, and B. Valiron. Quipper: A scalable quantum programming language. In *Proceedings of the 34th ACM SIGPLAN Conference on Programming Language Design and Implementation*, p. 333–342, Seattle, Washington, USA, 2013. Association for Computing Machinery. doi: 10.1145/2491956.2462177.
- D. M. Greenberger, M. A. Horne, and A. Zeilinger. Going beyond Bell's theorem, 2008. doi: 10.1007/978-94-017-0849-4 10.
- L. K. Grover. A fast quantum mechanical algorithm for database search. In *Proceedings of the Twenty-Eighth Annual ACM Symposium on Theory of Computing*, STOC '96, pp. 212–219, New York, NY, 1996. Association for Computing Machinery. doi: 10.1145/237814.237866.
- G. G. Guerreschi, J. Hogaboam, F. Baruffa, and N. P. D. Sawaya. Intel quantum simulator: A cloud-ready high-performance simulator of quantum circuits. *Quantum Science and Technology*, 5(3):034007, 2020. doi: 10.1088/2058-9565/ab8505.
- T. Häner and D. S. Steiger. 0.5 petabyte simulation of a 45-qubit quantum circuit. *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, Nov 2017. doi: 10.1145/3126908.3126947.
- S. Haroche and J.-M. Raimond. Quantum computing: Dream or nightmare? *Physics Today*, 49:51–52, 1996.
- M. P. Harrigan, K. J. Sung, M. Neeley, et al. Quantum approximate optimization of non-planar graph problems on a planar superconducting processor. *Nature Physics*, 17(3):332–336, 2021. doi: 10.1038/s41567-020-01105-y.
- A. W. Harrow and A. Montanaro. Quantum computational supremacy. *Nature*, 549(7671): 203–209, 2017. doi: 10.1038/nature23458.
- R. Hundt, S. Mannarswamy, and D. Chakrabarti. Practical structure layout optimization and advice. In *International Symposium on Code Generation and Optimization, CGO 2006*, 2006. doi: 10.1109/CGO.2006.29.
- IARPA. Quantum Computer Science (QCS) Program Broad Agency Announcement (BAA). https://beta.sam.gov/opp/637e87ac1274d030ce2ab69339ccf93c/view, 2010. Accessed: 2021-02-10.
- IBM. IBM Q 16 Rueschlikon V1.x.x. https://github.com/Qiskit/ibmq-device-information/tree/master/backends/rueschlikon/V1, 2021a. Accessed: 2021-02-10.
- IBM. Quantum Computation Center. www.ibm.com/blogs/research/2019/09/quantum-computation-center/, 2021b. Accessed: 2021-02-10.
- Intel. Intel quantum simulator. https://github.com/iqusoft/intel-qs, 2021. Accessed: 2021-02-10.
- A. Javadi-Abhari, S. Patil, D. Kudrow, et al. ScaffCC: A framework for compilation and analysis of quantum computing programs. In *Proceedings of the 11th ACM Conference on Computing Frontiers*, CF '14, New York, NY, 2014. Association for Computing Machinery. doi: 10. 1145/2597917.2597939.

- T. Jones and S. Benjamin. QuESTlink—Mathematica embiggened by a hardware-optimised quantum emulator. *Quantum Science and Technology*, 5(3):034012, 2020. doi: 10.1088/2058-9565/ab8506.
- T. Jones, A. Brown, I. Bush, and S. C. Benjamin. Quest and high performance simulation of quantum computers. *Scientific Reports*, 9(1):10736, 2019. doi: 10.1038/s41598-019-47174-9.
- S. Jordan. Quantum algorithm zoo. https://quantumalgorithmzoo.org/, 2021. Accessed: 2021-02-10.
- P. Kaye, R. Laflamme, and M. Mosca. An Introduction to Quantum Computing. Oxford University Press, Inc., 2007.
- J. Kempe. Quantum random walks: An introductory overview. *Contemporary Physics*, 44(4):307–327, 2003. doi: 10.1080/00107151031000110776.
- N. Khammassi, I. Ashraf, X. Fu, C. G. Almudever, and K. Bertels. QX: A high-performance quantum computer simulation platform. In *Design*, *Automation Test in Europe Conference Exhibition*, 2017, pp. 464–469, 2017. doi: 10.23919/DATE.2017.7927034.
- N. Khammassi, G. G. Guerreschi, I. Ashraf, et al. cQASM v1.0: Towards a common quantum assembly language, 2018.
- A. Y. Kitaev, A. H. Shen, and M. N. Vyalyi. Classical and Quantum Computation. American Mathematical Society, 2002.
- V. Kliuchnikov, A. Bocharov, M. Roetteler, and J. Yard. A framework for approximating qubit unitaries, 2015. arXiv:1510.03888v1 [quant-ph]
- E. Knill. Conventions for quantum pseudocode, 1996. doi: 10.2172/366453.
- D. E. Knuth. Computer science and its relation to mathematics. *The American Mathematical Monthly*, 81(4):323–343, 1974. doi: 10.1080/00029890.1974.11993556.
- D. Landauer. Wikipedia: Landauer's principle, 1973. URL https://en.wikipedia.org/wiki/Landauer's%27s%95principle. [Online; accessed 09-Jan-2021].
- C. Lattner and V. Adve. LLVM: A compilation framework for lifelong program analysis & transformation. In *Proceedings of the International Symposium on Code Generation and Optimization: Feedback-Directed and Runtime Optimization*, CGO '04, p. 75, 2004. IEEE Computer Society.
- T. Leao. Shor's algorithm in Qiskit. https://github.com/ttlion/ShorAlgQiskit, 2021. Accessed: 2021-02-10.
- J. Liu, L. Bello, and H. Zhou. Relaxed peephole optimization: A novel compiler optimization for quantum circuits. 2021 IEEE/ACM International Symposium on Code Generation and Optimization (CGO), 2021, pp. 301–314, doi: 10.1109/CGO51591.2021.9370310.
- A. Lucas. Ising formulations of many NP problems. Frontiers in Physics, 2, 2014. doi: 10.3389/fphy.2014.00005.
- F. Magniez, M. Santha, and M. Szegedy. Quantum algorithms for the triangle problem. In Proceedings of SODA'05, pp. 1109–1117, 2005.
- I. L. Markov, A. Fatima, S. V. Isakov, and S. Boixo. Quantum supremacy is both closer and farther than it appears, 2018. arXiv:1807.10749v3 [quant-ph]
- W. M. McKeeman. Peephole optimization. Communications of the ACM, 8(7):443–444, 1965. doi: 10.1145/364995.365000.
- Mermin, N. David. What's wrong with this pillow? *Physics Today*, 42(4):9, 1989. doi: 10.1063/1.2810963.
- N. D. Mermin. Quantum Computer Science: An Introduction. Cambridge University Press, 2007. doi: 10.1017/CBO9780511813870.

- Microsoft Q#. Q#. https://docs.microsoft.com/en-us/quantum/, 2021. Accessed: 2021-02-10. Microsoft QDK Simulators. Microsoft QDK Simulators. https://docs.microsoft.com/en-us/
- M. Mosca. Quantum algorithms, 2008. arXiv:0808.0369v1 [quant-ph]

azure/quantum/user-guide/machines/, 2021. Accessed: 2021-02-10.

- P. Murali, N. M. Linke, M. Martonosi, et al. Full-stack, real-system quantum computer studies: Architectural comparisons and design insights, Association for Computing Machinery, New York, NY, USA 2019. doi: 10.1145/3307650.3322273.
- Y. Nam, N. J. Ross, Y. Su, A. M. Childs, and D. Maslov. Automated optimization of large quantum circuits with continuous parameters. *npj Quantum Information*, 4(1), 2018. doi: 10.1038/s41534-018-0072-4.
- J. Nickolls, I. Buck, M. Garland, and K. Skadron. Scalable parallel programming with CUDA: Is CUDA the parallel programming model that application developers have been waiting for? *Queue*, 6(2):40–53, 2008. doi: 10.1145/1365490.1365500.
- M. A. Nielsen and I. L. Chuang. *Quantum Computation and Quantum Information: 10th Anniversary Edition.* Cambridge University Press, 10th edition, 2011.
- T. Norsen. Foundations of Quantum Mechanics. Springer International Publishing, 2017.
- Oak Ridge National Laboratory. Summit Supercomputer. www.olcf.ornl.gov/summit/, 2021. Accessed: 2021-02-10.
- B. Ömer. QCL A programming language for quantum computers, Unpublished Master's thesis, Technical University of Vienna, 2000. http://tph.tuwien.ac.at/~oemer/doc/quprog.pdf.
- B. Ömer. Classical concepts in quantum programming. *International Journal of Theoretical Physics*, 44(7):943–955, 2005. doi: 10.1007/s10773-005-7071-x.
- A. Paler, R. Wille, and S. J. Devitt. Wire recycling for quantum circuit optimization. *Physical Review A*, 94(4), 2016. doi: 10.1103/physreva.94.042337.
- F. Pan and P. Zhang. Simulating the Sycamore quantum supremacy circuits, 2021. arXiv:2103.03074v1 [quant-ph].
- R. B. Patel, J. Ho, F. Ferreyrol, T. C. Ralph, and G. J. Pryde. A quantum Fredkin gate. *Science Advances*, 2(3), 2016. doi: 10.1126/sciadv.1501531.
- B. Patra, J. P. G. van Dijk, S. Subramanian, et al. A scalable cryo-CMOS 2-to-20GHz digitally intensive controller for 4x32 frequency multiplexed spin qubits/transmons in 22nm FinFET technology for quantum computers. In 2020 IEEE International Solid-State Circuits Conference (ISSCC), pp. 304–306, 2020. doi: 10.1109/ISSCC19947.2020.9063109.
- E. Pednault, J. A. Gunnels, G. Nannicini, L. Horesh, and R. Wisnieff. Leveraging secondary storage to simulate deep 54-qubit Sycamore circuits, 2019. arXiv:1910.09534.
- A. Peruzzo, J. McClean, P. Shadbolt, et al. A variational eigenvalue solver on a photonic quantum processor. *Nature Communications*, 5(1):4213, 2014. doi: 10.1038/ncomms5213.
- J. Preskill. Quantum computing and the entanglement frontier, 2012. arXiv:1203.5813v3 [quant-ph].
- J. Preskill. Quantum computing in the NISQ era and beyond. *Quantum*, 2:79, 2018. doi: 10. 22331/q-2018-08-06-79.
- PSI Online. PSI. http://psilang.org/, 2021. Accessed: 2021-02-10.
- QCL Online. QCL. http://tph.tuwien.ac.at/~oemer/qcl.html, 2021.
- I. Qiskit. IBM qiskit simulators. https://qiskit.org/documentation/tutorials/simulators/1\_aer\_provider.html, 2021. Accessed: 2021-02-10.
- Quantiki. List of simulators. https://quantiki.org/wiki/list-qc-simulators, 2021. Accessed: 2021-02-10.
- Quipper Online. Quipper. www.mathstat.dal.ca/~selinger/quipper/, 2021. Accessed: 2021-02-10.

- F. Rios and P. Selinger. A categorical model for a quantum circuit description language (extended abstract). *Electronic Proceedings in Theoretical Computer Science*, 266:164–178, 2018. doi: 10.4204/eptcs.266.11.
- R. L. Rivest, A. Shamir, and L. Adleman. A method for obtaining digital signatures and public-key cryptosystems. *Communications of the ACM*, 21:120–126, 1978.
- L. Rolf. Is quantum mechanics useful? Philosophical Transactions of the Royal Society of London. Series A: Physical and Engineering Sciences, 353:367–376, 1995. doi: 10.1098/ rsta.1995.0106.
- N. J. Ross. Algebraic and logical methods in quantum computation, 2017. URL https://arxiv.org/abs/1510.02198.
- N. J. Ross and P. Selinger. Optimal ancilla-free Clifford+T approximation of z-rotations. *Quantum Information and Computation*, 11–12:901–953, 2016.
- N. J. Ross and P. Selinger. Exact and approximate synthesis of quantum circuits. www.mathstat.dal.ca/~selinger/newsynth/, 2021. Accessed: 2021-02-10.
- B. Rudiak-Gould. The sum-over-histories formulation of quantum computing. *arXiv e-prints*, art. quant-ph/0607151, 2006.
- V. V. Shende, I. L. Markov, and S. S. Bullock. Minimal universal two-qubit controlled-NOT-based circuits. *Physical Review A*, 69(6):062321, 2004. doi: 10.1103/physreva.69.062321.
- P. W. Shor. Algorithms for quantum computation: Discrete logarithms and factoring. In Proceedings 35th Annual Symposium on Foundations of Computer Science, pp. 124–134, 1994. doi: 10.1109/SFCS.1994.365700.
- P. W. Shor. Scheme for reducing decoherence in quantum computer memory. *Physics Review A*, 52:R2493–R2496, 1995. doi: 10.1103/PhysRevA.52.R2493.
- D. Simon. On the power of quantum computation. In *Proceedings 35th Annual Symposium on Foundations of Computer Science*, pp. 116–123, 1994. doi: 10.1109/SFCS.1994.365701.
- M. Smelyanskiy, N. P. D. Sawaya, and A. Aspuru-Guzik. qHiPSTER: The quantum high performance software testing environment, 2016. arXiv:1601.07195v2 [quant-ph].
- M. Soeken, S. Frehse, R. Wille, and R. Drechsler. RevKit: An open source toolkit for the design of reversible circuits. In *Reversible Computation 2011*, vol. 7165 of *Lecture Notes* in *Computer Science*, pp. 64–76, 2012. RevKit is available at www.revkit.org.
- M. Soeken, H. Riener, W. Haaswijk, et al. The EPFL logic synthesis libraries, 2019. arXiv:1805.05121v2.
- A. Steane. Multiple particle interference and quantum error correction. *Proceedings of the Royal Society of London. Series A: Mathematical, Physical and Engineering Sciences*, 452(1954):2551–2577, 1996. doi: 10.1098/rspa.1996.0136.
- D. S. Steiger, T. Häner, and M. Troyer. ProjectQ: An open source software framework for quantum computing. *Quantum*, 2:49, 2018. doi: 10.22331/q-2018-01-31-49.
- K. M. Svore, A. V. Aho, A. W. Cross, I. Chuang, and I. L. Markov. A layered software architecture for quantum computing design tools. *Computer*, 39(1):74–83, 2006. doi: 10. 1109/MC.2006.4.
- A. van Tonder. A lambda calculus for quantum computation. SIAM Journal on Computing, 33(5):1109–1135, 2004. doi: 10.1137/s0097539703432165.
- J. D. Whitfield, J. Biamonte, and A. Aspuru-Guzik. Simulation of electronic structure Hamiltonians using quantum computers. *Molecular Physics*, 109(5):735–750, 2011. doi: 10.1080/00268976.2011.552441.
- Wikipedia. KD-Trees. https://en.wikipedia.org/wiki/K-d\_tree, 2021a. Accessed: 2021-02-10.

- Wikipedia. ECC, Error correction code memory. https://en.wikipedia.org/wiki/ECC\_memory, 2021b. Accessed: 2021-02-10.
- Wikipedia. Extended Euclidean algorithm. https://en.wikipedia.org/wiki/Extended\_Euclidean\_algorithm, 2021c. Accessed: 2021-02-10.
- Wikipedia. Gradient descent. https://en.wikipedia.org/wiki/Gradient\_descent, 2021d. Accessed: 2021-02-10.
- C. P. Williams. Explorations in Quantum Computing. Springer-Verlag, London, 2011. doi: 10. 1007/978-1-84628-887-6.
- E. Wilson, S. Singh, and F. Mueller. Just-in-time quantum circuit transpilation reduces noise, 2020. DOI: 10.1109/QCE49297.2020.00050.
- W. K. Wootters and W. H. Zurek. A single quantum cannot be cloned. *Nature*, 299(5886):802–803, 1982. doi: 10.1038/299802a0.
- X. Xue, B. Patra, J. P. G. van Dijk, et al. Cmos-based cryogenic control of silicon quantum circuits. *Nature*, 593(7858):205–210, 2021. doi: 10.1038/s41586-021-03469-4.