

Quantum computing for numerical problems - algorithms and complexity theory

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After a brief introduction into quantum computation we survey some results on the speedup quantum algorithms can reach over classical (i.e. non-quantum) deterministic and randomized algorithms for basic numerical problems. We compare optimal convergence rates in the quantum setting with those in the deterministic and randomized classical setting. Upper bounds are obtained by suitable algorithms and their analysis, lower bounds by using the framework of information-based complexity theory. We discuss summation, integration, and in more detail, approximation problems.