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Autore	Schuld Maria
Titolo	Supervised Learning with Quantum Computers [[electronic resource] /] / by Maria Schuld, Francesco Petruccione
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2018
ISBN	3-319-96424-0
Edizione	[1st ed. 2018.]
Descrizione fisica	1 online resource (293 pages)
Collana	Quantum Science and Technology, , 2364-9054
Disciplina	530.1201514
Soggetti	Quantum physics Quantum computers Pattern recognition Spintronics Physics Artificial intelligence
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Introduction -- Background -- How quantum computers can classify data -- Organisation of the book -- Machine Learning -- Prediction -- Models -- Training -- Methods in machine learning -- Quantum Information -- Introduction to quantum theory -- Introduction to quantum computing -- An example: The Deutsch-Josza algorithm -- Strategies of information encoding -- Important quantum routines -- Quantum advantages -- Computational complexity of learning -- Sample complexity -- Model complexity -- Information encoding -- Basis encoding -- Amplitude encoding -- Qsample encoding -- Hamiltonian encoding -- Quantum computing for inference -- Linear models -- Kernel methods -- Probabilistic models -- Quantum computing for training -- Quantum blas -- Search and amplitude amplification -- Hybrid training for variational algorithms -- Quantum adiabatic machine learning -- Learning with quantum models -- Quantum extensions of Ising-type models -- Variational classifiers and neural networks -- Other approaches to build quantum models -- Prospects for near-term quantum machine learning -- Small versus big

	data -- Hybrid versus fully coherent approaches -- Qualitative versus quantitative advantages -- What machine learning can do for quantum computing -- References.
Sommario/riassunto	Quantum machine learning investigates how quantum computers can be used for data-driven prediction and decision making. The books summarises and conceptualises ideas of this relatively young discipline for an audience of computer scientists and physicists from a graduate level upwards. It aims at providing a starting point for those new to the field, showcasing a toy example of a quantum machine learning algorithm and providing a detailed introduction of the two parent disciplines. For more advanced readers, the book discusses topics such as data encoding into quantum states, quantum algorithms and routines for inference and optimisation, as well as the construction and analysis of genuine ``quantum learning models''. A special focus lies on supervised learning, and applications for near-term quantum devices.