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Nota di contenuto	Introduction -- Beam feedback control -- Beam optimizations -- Machine learning for beam control.
Sommario/riassunto	This book systematically discusses the algorithms and principles for achieving stable and optimal beam (or products of the beam) parameters in particle accelerators. A four-layer beam control strategy is introduced to structure the subsystems related to beam controls, such as beam device control, beam feedback, and beam optimization. This book focuses on the global control and optimization layers. As a basis of global control, the beam feedback system regulates the beam parameters against disturbances and stabilizes them around the setpoints. The global optimization algorithms, such as the robust conjugate direction search algorithm, genetic algorithm, and particle swarm optimization algorithm, are at the top layer, determining the feedback setpoints for optimal beam qualities. In addition, the authors

also introduce the applications of machine learning for beam controls. Selected machine learning algorithms, such as supervised learning based on artificial neural networks and Gaussian processes, and reinforcement learning, are discussed. They are applied to configure feedback loops, accelerate global optimizations, and directly synthesize optimal controllers. Authors also demonstrate the effectiveness of these algorithms using either simulation or tests at the SwissFEL. With this book, the readers gain systematic knowledge of intelligent beam controls and learn the layered architecture guiding the design of practical beam control systems.