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Sommario/riassunto

This open access book provides an introduction to the role that Artificial Intelligence (AI) plays in the study of nanosystems—ranging from soft and active materials to optics and quantum condensed matter. This role is twofold: On the one hand, Artificial Intelligence finds many applications in this field and enables researchers to solve problems that were not (easily) solvable before. Very notable examples are the use of machine learning to obtain energy functionals in density functional theory or the design of novel materials. On the other hand, researchers nowadays try to make the nanosystems themselves intelligent. This idea, sometimes referred to as “intelligent matter,” can be realized in a plethora of ways including intelligent microswimmers, optical neuromorphic computing, and machine learning using quantum systems. The book consists of four parts. The first one provides a brief introduction to AI, while the second and third ones introduce applications of AI to nanosystems and implementations of AI in nanosystems, respectively. Here, a broad spectrum of physical systems is covered, ranging from quantum, magnetic, and optical systems to soft and active matter. Finally, the fourth part provides some philosophical perspectives.