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Efficiency for Quantum Computers: Minimizing the Environmental Footprint -- Chapter:13 Privacy Preserving Protocols: Quantum Security for Federated Environmental Data -- Chapter:14 Climate Change Mitigation Strategies: Quantum and HPC Power for Renewable Energy Solutions -- Chapter:15 A Resilient Future: Adapting to the Changing Environment with Quantum AI powered applications.

Sommario/riassunto

This book ‘Quantum AI-powered and HPC applications for sustainable environment and climate change’ offers an in-depth exploration of how Quantum Artificial Intelligence (AI) -powered and High-Performance Computing (HPC) based technologies can revolutionize our approach to environmental sustainability and climate change mitigation. Through a comprehensive analysis, the book delves into the urgent climate challenges of our era, showcasing the transformative potential of cutting-edge technologies to address these issues effectively. The fundamental chapters provide a foundational understanding of the pressing environmental challenges of the 21st century and the transformative potential of quantum AI-powered and HPC. These chapters explore the power of environmental data analysis, the importance of balancing data security and privacy, and the advancements in federated learning for climate and environmental science. Additionally, they introduce the principles of quantum computing and its revolutionary applications in solving complex environmental problems. The subsequent chapters provide detailed insights into specific applications of quantum AI-powered and HPC in environmental science. Topics include quantum image recognition for precise Earth observation, advancements in extreme weather forecasting, and quantum-enhanced sensing technologies for detecting environmental contaminants. These chapters also cover the optimization of natural resource management, advanced climate modeling powered by quantum computing and HPC, and the importance of explainable AI for building trust and transparency in environmental solutions. The final chapters deal with the broader implications and future directions of quantum AI-powered and HPC applications in promoting environmental sustainability. They examine strategies for improving energy efficiency in quantum computing, ensuring data privacy and security in federated environmental systems, and leveraging quantum and HPC technologies for innovative renewable energy solutions. The book concludes with insights into building a resilient future by adapting to environmental changes and promoting sustainable development through advanced technologies. The book also delves with HPC applications that are useful for environmental sustainability and climate modelling. By addressing these topics, this book aims to bridge the gap between current environmental challenges and the potential of advanced technologies to offer sustainable solutions. It is targeted at researchers, practitioners, policymakers, students, and industry professionals in the fields of environmental science, computer science, and quantum computing, as well as anyone interested in the intersection of technology and environmental sustainability.