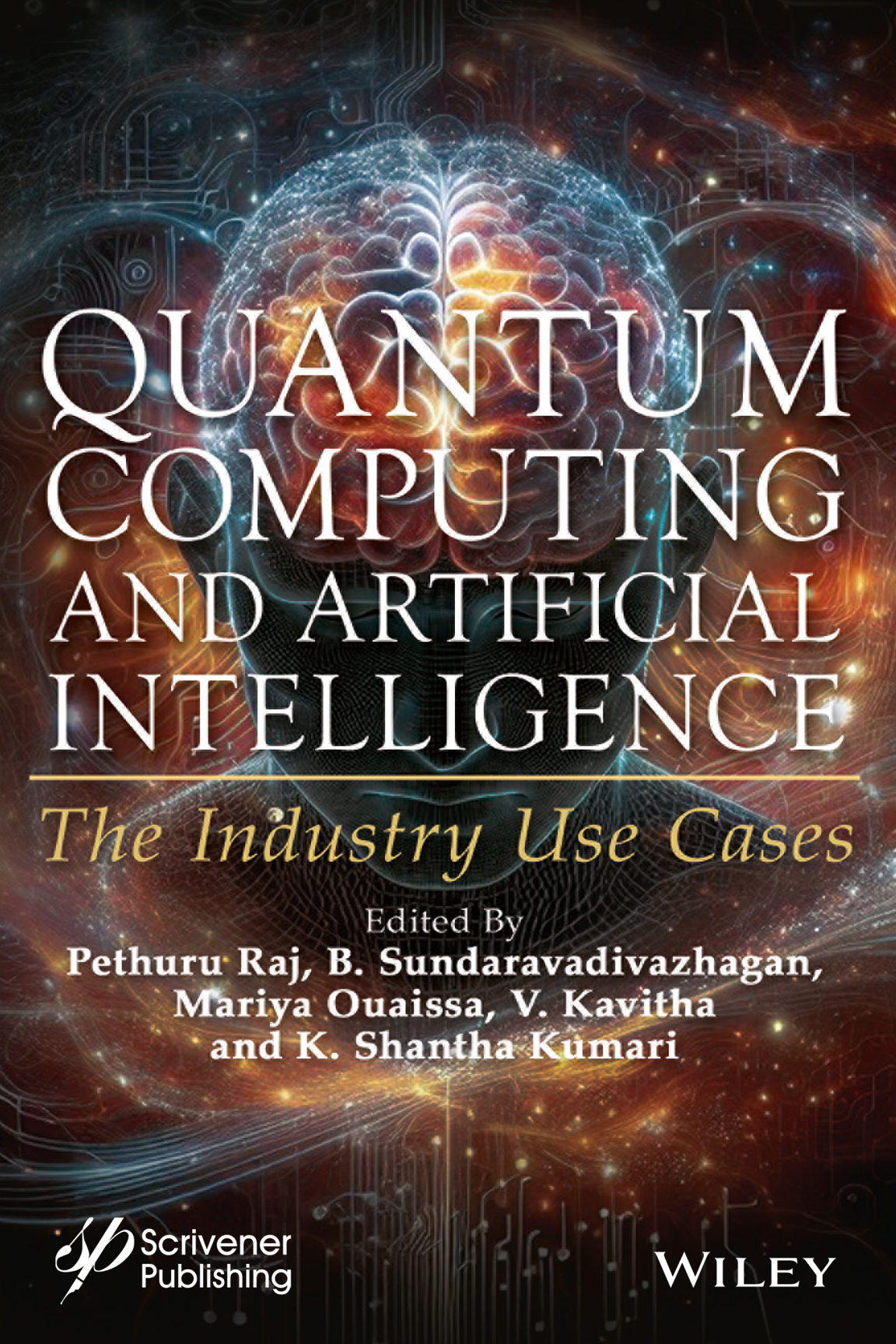
QUANTUM COMPUTING AND ARTIFICIAL INTELLIGENCE
The Industry Use Cases
Edited By
Pethuru Raj, B. Sundaravadivazhagan, Mariya Ouaissa, V. Kavitha and K. Shantha Kumari
Scrivener Publishing
WILEY

Quantum Computing and Artificial Intelligence

Scrivener Publishing
100 Cummings Center, Suite 541J
Beverly, MA 01915-6106

Publishers at Scrivener
Martin Scrivener (martin@scrivenerpublishing.com)
Phillip Carmical (pcarmical@scrivenerpublishing.com)

Quantum Computing and Artificial Intelligence

The Industry Use Cases

Edited by

Pethuru Raj
Reliance Jio Platforms Ltd, Bangalore, India

B. Sundaravadivazhagan
Dept. of Information Technology, University of Technology and Applied Sciences, Al Mussanah, Sultanate of Oman

Mariya Ouaissa
Cybersecurity and Networks at Cadi Ayyad University, Marrakech, Morocco

V. Kavitha
Dept. of Computer Science with Cognitive Systems, Sri Ramakrishna College of Arts & Science, Coimbatore, India

and

K. Shantha Kumari
Dept. of Data Science and Business Systems, SRM Institute of Science and Technology, Chennai, India

WILEY

This edition first published 2025 by John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, USA and Scrivener Publishing LLC, 100 Cummings Center, Suite 541J, Beverly, MA 01915, USA

For more information about Scrivener publications please visit www.scrivenerpublishing.com.

Wiley Global Headquarters
111 River Street, Hoboken, NJ 07030, USA

For details of our global editorial offices, customer services, and more information about Wiley products visit us at www.wiley.com.

Library of Congress Cataloging-in-Publication Data

ISBN 978-1-394-24236-8

Cover image courtesy of Adobe Firefly
Cover design by Russell Richardson

Set in size of 11pt and Minion Pro by Manila Typesetting Company, Makati, Philippines

Printed in the USA

10 9 8 7 6 5 4 3 2 1

Contents

Preface

Welcome to *Quantum Computing and Artificial Intelligence: The Industry Use Cases*. In this groundbreaking volume, we explore the exciting intersection of quantum computing and artificial intelligence (AI) and their transformative potential across various industries.

Part 1 of this book explores the fundamentals of quantum computing and its practical applications. We begin with an overview of quantum computers, examining their real-world applications and challenges. From there, we explore the emerging field of post-quantum cryptography, investigating methods to ensure data privacy and security in the quantum computing era. We also delve into the synergies between quantum computing and blockchain technology, uncovering revolutionary use cases and innovative data privacy controls.

As we delve deeper, we investigate how quantum computing can revolutionize weather forecasting, leveraging optimization algorithms for long-term accuracy. Furthermore, we explore the symbiotic relationship between AI and quantum computing, uncovering how AI empowers quantum computing to achieve new heights of performance. Additionally, we discuss quantum random number generation and the establishment of quantum networks, laying the foundations for future advancements in the field.

Part 2 focuses on the critical intersection of quantum computing and security. We examine the establishment of secure quantum network communication using advanced cryptography algorithms. Furthermore, we explore the myriad applications and opportunities that quantum computing offers to various industries. We also take a comprehensive look at the transition from classical to quantum networks, highlighting the benefits and expectations associated with this paradigm shift. Additionally, we explore the promise of post-quantum cryptography and its implications for cybersecurity in the quantum computing era.

In Part 3, we turn our attention to quantum computing innovations and future perspectives. We explore the exciting potential of quantum machine learning for Industry 4.0, as well as the applications of quantum computing and AI in the emerging Industry 5.0 landscape. Furthermore, we delve into the paradigm of Quantum Artificial Intelligence (QAI) and its implications for voice-controlled devices. Lastly, we examine the entrepreneurial opportunities that arise from advancements in AI-driven quantum computing, paving the way for future innovation and growth.

We thank everyone who contributed to this volume and, finally, Martin Scrivener and the Scrivener Publishing team for its publication. Throughout this book, we aim to provide readers with a comprehensive understanding of the synergistic relationship between quantum computing and artificial intelligence, as well as their profound implications for various industries. Whether you are a seasoned professional, a researcher, or an entrepreneur, we hope this book inspires you to explore the limitless possibilities at the intersection of quantum computing and artificial intelligence. Enjoy the journey!

December 2024