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CONVERGENCE: ARTIFICIAL INTELLIGENCE AND QUANTUM COMPUTING: SOCIAL, ECONOMIC, AND POLICY IMPACTS

Greg Viggiano (Ed.)

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In “Convergence: Artificial Intelligence and Quantum Computing: Social, Economic, and Policy Impacts”, edited by Greg Viggiano and published by Wiley in 2022, readers are introduced to the imminent merger of artificial intelligence and quantum computing. This anthology, featuring essays from 20 distinguished contributors spanning industry, academia, and government, provides a multifaceted perspective on this pivotal technological evolution. The book suggests that society stands on the brink of witnessing the realisation of concepts once relegated to science fiction. Such advancements threaten to reshape the prevailing social structures, the global economic landscape, and the established geopolitical hierarchy. Accompanied by a compelling foreword from award-winning author David Brin, the volume delves into the accelerating trajectory of technological progress, the potential for unexpected and groundbreaking discoveries shortly, and guidelines to traverse the challenges posed by the fusion of AI and quantum computing.

In an era where the lines between science fiction and reality blur, the world stands at the precipice of technological marvels that challenge our understanding of the future. The rapid pace of technological advancement makes it challenging to predict what lies ahead, yet it is crucial to prepare for the unforeseen. Drawing par-

allels to the transformative impact of the telegraph in the mid-19th century, the book underscores the impending convergence of artificial intelligence and quantum computing. This union promises to bring about changes as profound as the discovery of fire.

While the trajectory of artificial intelligence and machine learning seems more defined, quantum computing’s path remains vague. However, as classical computing evolves, using advanced machine learning to enhance quantum computing designs, exponential growth in technology is anticipated. This could lead to these combined technologies self-improvement, pre-emptively solving problems we have yet to comprehend fully.

Opinions on the current state and definition of quantum computing vary among experts. This anthology offers a spectrum of views, aiming to provide a comprehensive analysis of this looming technological revolution. Already, glimpses of this revolution are evident in emerging technologies across various sectors, from autonomous vehicles to medical research. The ubiquity of quantum-enabled AI systems might soon mirror the omnipresence of electricity in the 19th century.

This collection needs to delve deeper into the theoretical intricacies of quantum computing or artificial intelligence. Instead, its primary goal is to heighten awareness of this silent upheaval. For readers seeking a foundational understanding, appendices on quantum computing and artificial intelligence are included, complemented by a glossary and an index for clarity and easy reference.

Amid the swift evolution of artificial intelligence and quantum computing, this anthology grapples with a pivotal question: How will the fusion of these technologies reshape civilisation? To delve into

this query, 26 international authors, chosen for their diverse backgrounds spanning geography, gender, ethnicity, profession, and perspective, offer their insights. Their collective expertise illuminates the socio-economic and political-regulatory ramifications, depicting unforeseen societal transformations and potential futures for humanity.

The anthology is structured into three distinct sections, each delving into the global repercussions on political, policy, and regulatory landscapes, economic dynamics, and the societal fabric. While the topics might intertwine across sections and essays, the authors' stances are crafted to stimulate reflection and ponder potential outcomes.

Structure of the book

The book "Convergence: Artificial Intelligence and Quantum Computing: Social, Economic, and Policy Impacts" begins with a Preface followed by a Foreword. Throughout history, cultures have imagined human-made entities, evolving their visions based on the technology of their era, from clay beings to today's advanced cybernetic minds. While technologically varied, these narratives consistently reflected human anxieties similar to parental concerns for their offspring: Will these creations be ethical, responsible, and kind? As the dawn of artificial intelligence (AI) approaches, society grapples with these questions, pondering the ethical implications and potential consequences. The pathways to AI are diverse, and the characteristics of these emerging synthetic minds could vary significantly, especially in their alignment with human values. The secrecy surrounding some AI developments is particularly concerning. The debate on AI's impact ranges from optimistic views of human advancement to

warnings of potential existential threats. Some, like Elon Musk, advocate for open-source AI research to ensure transparency and accountability. Ultimately, the trajectory of AI's evolution may hinge on which developmental path proves most fruitful, emphasising the need for foresight and proactive measures to ensure a favourable outcome for humanity, as underlined in the Foreword of the book.

The main content is divided into three distinct parts. "Part I: Policy and Regulatory Impacts" starts on page 1 and encompasses six chapters. It starts with "Quantum Inflection Points" by Jim Gable, followed by "Quantum Delegation" by Mandy Sweeney and Chris Gauthier. Patrick Thaddeus Jackson then delves into "The Problem of Machine Actorhood". Sarah Pearce discusses "Data Privacy, Security, and Ethical Governance under Quantum AI", Philip Johnson addresses "The Challenge of Quantum Noise". The section concludes with "A New Kind of Knowledge Discovery" by Ramin Ayanzadeh and Milton Halem.

"Part II: Economic Impacts" begins on page 61. It opens with Alexander W. Butler's "Quantum Tuesday: How the U.S. Economy Will Fall, and How to Stop It". Mason Peck then explores "Quantum-AI Space Communications", followed by Philip L. Frana's "Quantum Planet Hacking". Benjamin Crawford considers the "Ethics and Quantum AI for Future Public Transit Systems", and the section wraps up with "The Road to a Better Future" by Denise Ruffner and André M. König.

The third segment, "Part III: Social Impacts," starts on page 127. Roald Hoffmann and Jean-Paul Malrieu ponder whether "The Best Numbers Are in Sight. But, Understanding?" Kate Jeffery discusses "The Advancement of Intelligence or the End of It?" and Colin Allen and Brett Karlan present a "Quantum of

Wisdom”. Erik Viirre reflects on “Human Imagination and HAL”, Joseph N. Pelton considers “A Critical Crossroad” and Philippe Beaudoin and Alexander W. Butler delve into “Empathetic AI and Personalization Algorithms”. J. M. Taylor asks, “Should We Let the Machine Decide What Is Meaningful?”, Stephen R. Waite discusses “The Ascent of Quantum Intelligence in Steiner’s Age of the Consciousness Soul,” and Christopher Savoie concludes with “Quantum Computing’s Beautiful Accidents.”

The book also contains two appendices: “What Is Quantum Computing?” and “What Is Artificial Intelligence?” both authored by Philip L. Frana. This is followed by a Glossary on page 247, References on page 251, an Index on page 259, and a section “About the Editor” on page 271.

This structure provides readers with a comprehensive understanding of the convergence of artificial intelligence and quantum computing, segmented into policy and regulatory, economic, and social impacts.

Importance of the book

The anthology explores the intersection of artificial intelligence and quantum computing, posing the question: How will this technological convergence reshape society? To address this, 26 diverse international authors share their insights, shedding light on potential socio-economic and political-regulatory impacts. The anthology is segmented into three sections, focusing on global effects on policy, economy, and society.

Mastering new technologies has historically been vital to commercial and geopolitical arena dominance. Quantum computing, especially when integrated with AI, is seen as the next frontier. This combination could address complex challenges, from

resource management to global issues like climate change. However, there is also the potential for militaristic applications, such as decrypting secure data or accessing military systems.

The commercial sector is already feeling the ripples of these technological advancements, particularly in employment. The rise of AI threatens to replace many human jobs with automated systems. While the immediate repercussions of AI on the workforce are clear, the anthology promises a deeper dive into the effects of its union with quantum computing in a subsequent volume.

Moreover, the global financial landscape is on the brink of a significant change. While AI’s influence is already evident, the fusion of AI and quantum computing promises even more transformative shifts, especially concerning information security. This evolution might even catalyse a new arms race, leading to the anthology’s final section on global policy and regulatory challenges. The global financial system and market trading are poised for transformation. Even as classical AI plays a significant role in these sectors, the amalgamation of AI and quantum computing is set to usher in profound shifts, especially in information security. This could spark a new kind of arms race, segueing into the anthology’s third section, which delves into global policy and regulatory dynamics.

Historically, swiftly grasping the competitive edge of a novel tool has been pivotal for commercial and geopolitical dominance, often intertwining with strategic military prowess. In this context, quantum computing emerges as a game-changer. Paired with artificial intelligence, it promises to tackle intricate national challenges, from resource allocation to global issues like climate change. However, this power can be a double-edged sword, with poten-

tial militarisation for decrypting national security data or infiltrating military systems.

The commercial realm is no stranger to the upheavals new technologies can trigger. While innovations often offer competitive leverage and industry disruption, the immediate concern is their impact on human capital and employment. Classical AI's ongoing influence on the job market, with its potential to replace human roles with intelligent systems, is a testament to this. While the immediate effects of AI on employment are evident, the more profound implications of its merger with quantum computing will be explored in the anthology's subsequent volume.

Editor

Dr. Greg Viggiano is an Adjunct Professor in the Physics Department at George Mason University. He specialises in studying new technological applications and their broad societal implications. Having obtained his PhD in Mass Communication from Florida State University in 1998, he generously serves as the Executive Director for the Museum of Science Fiction in Washington, D.C., without compensation.

Professionally, Dr. Viggiano identifies as a social scientist, futurist, and technologist, deeply intrigued by the societal ramifications of emerging technologies. He is particularly drawn to the intersection of multiple technologies due to the heightened potential for unexpected outcomes. He often cites the smartphone as a prime example of technological convergence, offering diverse functionalities. He is penning a series that delves into the merger of artificial intelligence and quantum computing and the anticipated societal shifts this union might usher in.

His research is anchored in exploring new technological applications and their

overarching societal repercussions. Drawing parallels with the spread of viral infections, he uses complexity theory to investigate how societies embrace and integrate new technologies. Dr. Viggiano also mentors undergraduate and graduate students in their research endeavours.

In the academic sphere, he imparts knowledge of the societal consequences of new technologies, emphasising the fusion of AI and quantum computing. He underscores the unforeseen impacts of these technologies, enabling students to probe further into emerging trends and trajectories. He has significantly contributed to technology education with over two decades of teaching and mentoring experience.

Concluding remarks

In the anthology "Convergence: Artificial Intelligence and Quantum Computing: Social, Economic, and Policy Impacts," the imminent fusion of AI and quantum computing is meticulously explored, posing profound questions about the future of civilisation. Drawing from the insights of 26 diverse international authors, the book offers a comprehensive look into the socio-economic, political-regulatory, and societal implications of this technological convergence. Drawing parallels to past technological revolutions, from the telegraph to the smartphone, the anthology underscores such advancements' irreversible and transformative nature. As with any technological evolution, there are potential benefits and challenges, from reshaping the global job market to initiating new arms races in information security. The anthology serves as a timely and thought-provoking guide, urging readers to consider the multifaceted impacts of AI and quantum computing on our world. As we stand on the precipice of this new era,

“Convergence” offers a valuable lens to view and prepare for the coming changes.

When integrated into society, novel technologies often bring benefits and drawbacks. The anthology offers a balanced view, highlighting both hopeful and cautious outlooks on technological advancements. The societal effects of innovations like the smartphone are evident, but their long-term implications still unfold even a quarter-century later. The collection of essays delves into how the fusion of quantum computing and AI might shape humanity’s future, drawing parallels to the smartphone’s evolution. Over time, the influence of such pivotal technologies tends to become irreversible, much like electricity or the internet today. Despite climate change and pandemics, survival hinges on optimism and strategic planning. Science fiction can offer insights into potential technological trajectories,

emphasising caution. The rapid advancements in quantum computing, symbolised by qubits, suggest that the future is approaching faster than anticipated. As with unpredictable games, the thrill lies in the uncertainty of outcomes. The hope presented in this book is that fortune will favour humanity as knowledge about these technologies expands, possibly even in manipulating chance events.

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