Chapter 15
Role of Quantum Computing in Government and the Defence Sector

Vivek Topno
Amity University, India

Tannisha Kundu
Amity University, India

Mohan Kumar Dehury
Amity University, India

ABSTRACT

Quantum computing is a revolutionary technology that has the potential to transform various industries, including government operations, defence strategies, and national security. The chapter discusses its fundamental principles, advantages, limitations, and applications in cryptography, optimization, resource allocation, quantum sensing, and metrology. It highlights the need for quantum-resistant cryptography and post-quantum cryptographic algorithms to safeguard sensitive information. Quantum algorithms can improve decision-making processes, enhance efficiency, and address logistical challenges in defense strategy planning and disaster management. Quantum communication and secure networks are crucial for secure communication among government agencies, military units, and allied nations. Challenges include high costs, skilled personnel, and ethical and legal implications. The chapter concludes with a discussion on the future outlook of quantum computing in these sectors, emphasizing the need for continued research and investment.

INTRODUCTION

Quantum Computing in Government and Defense

In the ever-evolving realm of technology, quantum computing stands out as a groundbreaking field poised to bring about substantial transformations across numerous sectors, including government and

defence (Couteau et al., 2023). The established norms of computing face profound challenges from the distinctive attributes of quantum mechanics, such as superposition and entanglement, which quantum computers harness to execute intricate computations at unparalleled velocities. This study delves into the captivating domain of quantum computing, with a particular emphasis on its utilization within the contexts of government and defense.

Problem Domain

As computational demands continue to escalate, classical computers face limitations in solving complex problems efficiently. This prompts a need for alternative computing paradigms that can outpace classical computers in tackling intricate tasks. Quantum computing harnesses the principles of quantum mechanics to process information in a fundamentally different manner, enabling it to address challenges that were previously insurmountable using classical methods.

Statement

The central thesis of this research paper is to explore how quantum computing intersects with the domains of government and defense, uncovering the potential applications, challenges, and ethical considerations associated with its integration. By understanding the implications of quantum computing in these sectors, we aim to provide insights into the transformative power it holds for shaping the future of national security and strategic planning.

Objectives

- To elucidate the foundational principles of quantum computing and their departure from classical computing
- To analyse key quantum computing technologies and their relevance to government and defense applications.
- To examine quantum computing algorithms that have the potential to impact cryptography, optimization, and simulation.
- To investigate the role of quantum communication in ensuring secure information exchange within governmental and military contexts.
- To evaluate the potential applications of quantum computing in enhancing defense strategies, resource allocation, and logistics.
- To discuss ethical and security considerations arising from the integration of quantum computing in sensitive sectors.
- To highlight ongoing government initiatives and collaborations aimed at advancing quantum computing research and development.

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