Quantum Computing and Machine Learning: Transforming Network Security

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Abstract: *Quantum computing and machine learning represent two cutting-edge technologies with the potential to revolutionize network security. This paper explores the integration of quantum computing and machine learning techniques to develop advanced network security systems capable of addressing the challenges posed by evolving cyber threats. We begin by reviewing recent advancements in quantum computing, machine learning, and their applications in network security. We then propose a novel Quantum-Enhanced Machine Learning Security System (QEMLSS), which combines post-quantum cryptographic algorithms, quantum-enhanced machine learning models, and adaptive security protocols. A comparative analysis demonstrates the superiority of the QEMLSS over traditional network security systems in terms of detection accuracy, response time, and adaptability. Finally, we discuss future enhancements and provide recent references from 2020 to 2023 to guide further research in this field.*

Keywords: Quantum Computing, Machine Learning, Network Security, Post-Quantum Cryptography, Quantum-Enhanced Machine Learning, Cyber Threats