

ABSTRACT

Cryptography, the science of securing communication and data, plays a crucial role in modern information security. This paper explores the fundamental principles of cryptography, including encryption, decryption, key management, and cryptographic protocols. It delves into various cryptographic techniques such as symmetric and asymmetric encryption, hash functions, digital signatures, and cryptographic algorithms. Additionally, it discusses the applications of cryptography in securing data transmission over networks, protecting sensitive information in storage, ensuring authentication and integrity, and enabling secure communication in diverse fields including finance, healthcare, and government. Moreover, the paper examines the challenges and advancements in cryptography, such as quantum computing threats and post-quantum cryptography solutions. Understanding the principles and applications of cryptography is essential for developing robust security measures to safeguard data and privacy in today's digital age.