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Optimization of IoT Network Security Using Metaheuristic Algorithms in Smart Cities Applications

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Abstract:

With the rapid deployment of Internet of Things (IoT) technologies in smart city environments, ensuring robust and scalable network security has become a critical challenge. Traditional security mechanisms often struggle to adapt to the heterogeneous, dynamic, and resource-constrained nature of IoT systems. This study explores the application of metaheuristic algorithms—such as Genetic Algorithms (GA), Particle Swarm Optimization (PSO), and Ant Colony Optimization (ACO)—to enhance the security of IoT networks in smart city applications. The proposed approach aims to optimize key security parameters, including intrusion detection, data encryption, and authentication protocols, while maintaining computational efficiency. Simulation results demonstrate the effectiveness of metaheuristic-based models in identifying security threats, minimizing attack surfaces, and adapting to evolving cyber threats in complex urban IoT ecosystems.

Keywords:

IoT security, smart cities, metaheuristic algorithms, network optimization, intrusion detection, cyber-physical systems

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