Comprehensive AI Strategies for Cybersecurity for Innovations, Applications, and Future Directions

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Abstract*: This chapter explores the transformative role of Artificial Intelligence (AI) in revolutionizing cybersecurity practices. It highlights AI's applications in threat detection, predictive analytics, and defense strategies across critical domains such as digital forensics, IoT, cloud security, and cryptography. Emphasis is placed on the integration of machine learning (ML) and deep learning (DL) for intrusion detection, anomaly detection, and predictive modeling, enabling proactive responses to emerging threats. The chapter further examines AI's role in securing critical infrastructures, mitigating quantum computing threats, and enhancing IoT and edge security through lightweight AI solutions. Ethical and operational challenges, including bias, data privacy, and legal implications, are addressed to ensure responsible AI adoption. Looking forward, it discusses innovations such as hybrid defense models, quantum security, and AI-driven autonomous systems, shaping the future of cybersecurity in an increasingly complex threat landscape.*

Keywords: Artificial Intelligence (AI), Cybersecurity, Threat Detection, Machine Learning (ML), Deep Learning (DL), Intrusion Detection Systems (IDS), Anomaly Detection, Predictive Modeling, Big Data Analytics

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