XAI-Driven Cybersecurity

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PREFACE

The rapid growth of digital technologies, cloud computing, artificial intelligence (AI), and interconnected systems has transformed the modern cybersecurity landscape. Organizations today face increasingly sophisticated cyber threats such as ransomware, phishing attacks, malware, insider threats, and AI-powered cybercrime. Traditional cybersecurity methods are often insufficient to address these evolving threats, leading to the adoption of AI and Machine Learning (ML) technologies for intelligent threat detection, anomaly analysis, and automated defense mechanisms.

While AI significantly improves cybersecurity capabilities, many advanced AI systems operate as black-box models, making their decision-making processes difficult to understand. This lack of transparency creates concerns related to trust, accountability, ethics, bias, and regulatory compliance. Explainable Artificial Intelligence (XAI) addresses these challenges by providing understandable explanations for AI-driven security decisions, enabling cybersecurity professionals to interpret and validate automated actions more effectively.

This book, XAI-Driven Cybersecurity: Transparent AI for Intelligent Threat Detection and Defense*, explores the integration of Explainable AI into modern cybersecurity systems. The book covers the foundations of AI, machine learning, and XAI, along with their applications in intrusion detection, malware analysis, phishing prevention, cloud security, IoT security, Security Operations Centers (SOCs), and autonomous cyber defense systems. It also discusses important topics such as adversarial AI attacks, privacy protection, ethical AI governance, bias mitigation, and regulatory compliance.*

Designed for students, researchers, cybersecurity professionals, and technology enthusiasts, this book provides both theoretical understanding and practical insights into the growing role of explainability in cybersecurity. As digital ecosystems continue to evolve, transparent and trustworthy AI-driven security systems will become increasingly essential for protecting critical infrastructures and sensitive information. This book aims to contribute to the development of responsible, secure, and intelligent cybersecurity solutions for the future.

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