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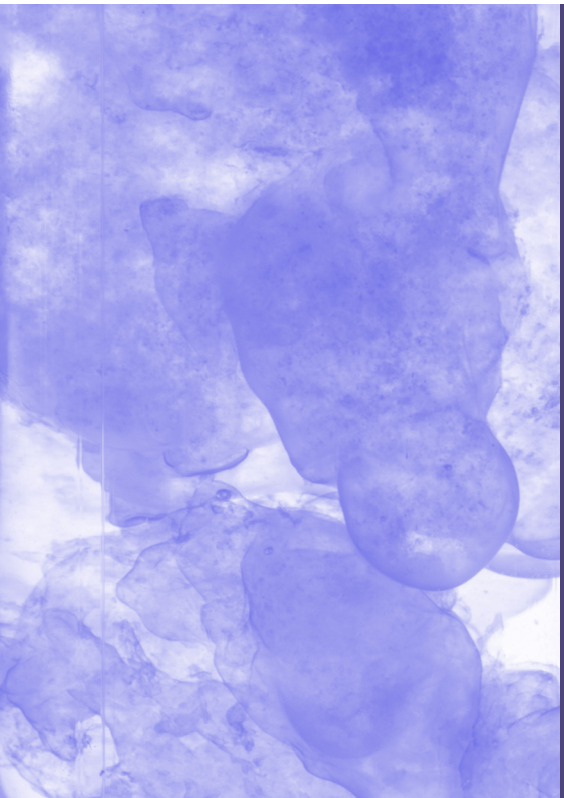

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Selected Papers

Automated System-Level Malware Detection Using Machine Learning: A Comprehensive Review

Authors: Nana Kwame Gyamfi, Nikolaj Goranin, Dainius Ceponis and Habil Antanas Čenys

Abstract: Malware poses a significant threat to computer systems and networks. This necessitates the development of effective detection mechanisms. Detection mechanisms dependent on signatures for attack detection perform poorly due to high false negatives. This limitation is attributed to the inability to detect zero-day attacks, polymorphic malware, increasing signature base, and detection speed. To achieve rapid detection, automated system-level malware detection using machine learning approaches, leveraging the power of artificial intelligence to identify and mitigate malware attacks, has emerged as a promising solution. This comprehensive review aims to provides a detailed analysis of the status quo in malware detection by exploring the fundamentals of machine learning techniques for malware detection. The review is largely based on the PRISMA approach for article search methods and selection from four databases. Keywords were identified together with inclusion and exclusion criteria. The review seeks feature extraction and selection methods that enhance the accuracy and precision of detection algorithms. Evaluation metrics and common datasets were used to assess the performance of the system-level malware detection techniques. A comparative analysis of different machine learning approaches, emphasizing their strengths, weaknesses, and performance in detecting system-level malware is presented together with the limitations of the detection techniques. The paper concludes with future research opportunities, particularly in applying artificial intelligence, and provides a resource for researchers and cybersecurity professionals seeking to understand and advance automated system-level malware detection using machine learning.

https://doi.org/10.3390/app132111908

Artificial Intelligence Applications in Electric Distribution Systems: Post-Pandemic Progress and Prospect

Authors: Sungjoo Chung and Ying Zhang

Abstract: Advances in machine learning and artificial intelligence (AI) techniques bring new opportunities to numerous intractable tasks for operation and control in modern electric distribution systems. Nevertheless, AI applications for such grids as cyber-physical systems encounter multifaceted challenges, e.g., high requirements for the quality and quantity of training data, data efficiency, physical inconsistency, interpretability, and privacy concerns. This paper provides a systematic overview of the state-of-the-art AI methodologies in the post-pandemic era, represented by transfer learning, deep attention mechanism, graph learning, and their combination with reinforcement learning and physics-guided neural networks. Dedicated research efforts on harnessing such recent advances, including power flow, state estimation, voltage control, topology identification, and line parameter calibration, are categorized and investigated in detail. Revolving around the characteristics of distribution system operation and integration of distributed energy resources, this paper also illuminates prospects and challenges typified by the privacy, explainability, and interpretability of such AI applications in smart grids. Finally, this paper attempts to shed light on the deeper and broader prospects in the realm of smart distribution grids by interoperating them with smart building and transportation electrification.

https://doi.org/10.3390/app13126937

Power Allocation and User Grouping for NOMA Downlink Systems

Authors: Jun Li, Tong Gao, Bo He, Wenjing Zheng and Fei Lin

Abstract: Non-orthogonal multiple access (NOMA) technology allows multiple users to use the same time-frequency resource to send signals, which can improve spectral efficiency and throughput. We study the problems of user grouping and power allocation in the downlink of a multi-carrier NOMA system. The sum rate is the optimization goal. A step-by-step optimization is adopted. Users are grouped first and then power is allocated. For user grouping, the user grouping method based on the maximum channel gain difference is improved to prevent users with similar channel gains from being grouped together. For power allocation, the deep learning power allocation algorithm is used among subcarriers. Then, the closed-form expressions of power allocation between multiplexed users are derived according to the minimum transmission rate constraint. The simulation results show that compared with the fractional transmit power allocation method and fixed power allocation method, the deep learning power allocation method improves the system sum rate by about 2.2% and 19%, respectively. The power allocation methods we propose improve the system sum rate by about 10% compared to the fractional transmit power allocation method used among subcarriers and between multiplexed users.

https://doi.org/10.3390/app13042452

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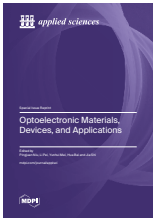

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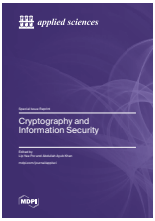

Cryptography and Information Security

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