DeepDetect: Advanced Darknet Traffic Classifier using Machine Learning and Spiking Neural Networks

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The darknet, known for facilitating illegal activities, poses a significant challenge to cybersecurity due to its anonymous nature. Traditional detection methods struggle with identifying malicious traffic in real-time, especially given the high-dimensional and dynamic nature of darknet data. Current solutions, such as signature-based detection and deep learning models, either fail to adapt to new threats or are computationally expensive. The primary issue lies in developing a system capable of effectively classifying and detecting darknet traffic while maintaining efficiency. Existing models like Random Forest and Naive Bayes have shown promise, but they struggle with high-dimensional data, while spiking neural networks (SNNs), although promising for temporal data, remain underutilized. To address these issues, we propose a combined methodology that first applies Principal Component Analysis (PCA) for dimensionality reduction, simplifying the dataset. We then utilize Random Forest for efficient classification, capitalizing on its ability to handle noisy, high-dimensional data. Additionally, we explore Spiking Neural Networks (SNNs) to capture complex, temporal patterns in darknet traffic. The CIC-Darknet2020 dataset is used for evaluation, focusing on accuracy and other performance metrics. Our approach aims to enhance threat detection, improve real-time monitoring, and strengthen cybersecurity defences, ultimately laying the groundwork for more resilient systems in combating evolving cyber threats from the darknet.

References:

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