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## **Anomaly Detection in Network Traffic Using Machine Learning for Enhanced Cyber Security**

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Abstract: As cyber threats continue to grow in complexity and frequency, the need for intelligent and adaptive security solutions has become more critical than ever. Traditional intrusion detection systems (IDS) often fail to recognize novel or evolving attack patterns due to their reliance on predefined rules or signatures. This paper investigates the use of machine learning techniques for anomaly detection in network traffic as a means to enhance cybersecurity. By analyzing patterns and behaviors within network data, machine learning models can identify deviations that may indicate malicious activity. Various algorithms such as Decision Trees, Support Vector Machines (SVM), and Neural Networks are evaluated for their effectiveness in detecting anomalies. The study utilizes benchmark datasets to train and test the models, assessing their performance based on accuracy, precision, recall, and false-positive rates. The results demonstrate that machine learning offers a promising approach to real-time, scalable, and adaptive anomaly detection, significantly improving the ability to detect and mitigate cyber threats. This research highlights the potential of integrating intelligent systems into cybersecurity frameworks for more proactive and robust defe applications.

Keywords: Anomaly Detection, machine learning Cyber Security, Network Security, Traffic detection



