Detection of DSCP-based traffic prioritization manipulations and their impact on network performance

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Abstract Differentiated Services Code Point (DSCP) manipulations can distort bandwidth allocation, expose security risks, and degrade performance, yet they are difficult to detect in dynamic traffic. Dynamic traffic flows and sophisticated evasion strategies make such operations difficult to detect. Rule-based and classical machine learning methods cannot detect DSCP-based traffic modifications properly. This study employs deep learning models, including Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), and Long Short-Term Memory (LSTM), to detect DSCP-based manipulations. A labeled dataset comprising normal and manipulated traffic patterns was used for training and validation. An ensemble approach combining CNN, RNN, and LSTM was implemented to enhance detection accuracy. The model demonstrated the highest detection accuracy, achieving 99.28% accuracy and making it the most effective in distinguishing manipulated traffic from legitimate flows. These findings highlight the potential of deep learning in securing QoS mechanisms and mitigating DSCP-based traffic manipulation risks.

The proposed model can enhance real-time traffic monitoring, ensure fair bandwidth distribution, and prevent malicious exploitation. Future work should focus on real-world deployment, federated learning for cross-network adaptability, and explainable AI for improved interpretability.

Keywords

Author Keywords: Traffic prioritization; Differentiated services; Differentiated services code point (DSCP); IP precedence

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Data availability statement

The datasets generated during the current study are not publicly available; they will be made available from the corresponding author on reasonable request.

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