



NETWORK TRAFFIC CLASSIFICATION USING DEEP LEARNING

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Abstract: With the rapid expansion of the Internet and the rise of online applications, the importance of network traffic classification has grown significantly. Many studies have explored this area, resulting in a variety of approaches. Most of these methods rely on predefined features extracted by experts to classify network traffic. In contrast, our study introduces an innovative deep learning-based approach that seamlessly integrates both feature extraction and classification into a unified system. This approach is designed to handle traffic characterization, which involves categorizing network traffic into major classes, and application identification, which aims to identify end-user applications. To achieve this, our framework utilizes two powerful deep neural networks architectures: Artificial Neural Networks (ANN) and Long Short-Term Memory (LSTM) networks. In our study, we have developed an innovative approach for network traffic classification that effectively addresses two critical tasks: application identification and traffic categorization. In the application identification task, our approach using Artificial Neural Networks (ANN) achieved an impressive accuracy of 97.22%, while the utilization of Long Short-Term Memory (LSTM) networks resulted in an accuracy of 96.81%. For the traffic categorization task, our approach using ANN achieved an accuracy of 96.80%, while the LSTM-based approach reached an accuracy of 97.20%. Notably, our approach can identify encrypted traffic and distinguishing between VPN and non-VPN network traffic, enhancing its versatility. These results demonstrate the effectiveness of our approach in accurately classifying network traffic and highlight the competitive performance of both ANN and LSTM networks in different aspects of the classification process. To the best of our knowledge, our approach outperforms existing classification methods, as evidenced by its superior accuracy on the UNB ISCX VPN-nonVPN dataset.

Keywords: Application identification, Artificial neural networks, Deep learning, Network traffic classification, Long short-term memory, Traffic characterization