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A Lightweight Pretrained Encrypted Traffic Classification Method with Squeeze-and-Excitation Block and Sharpness-Aware Optimization

Authors : Zhiyan Meng, Dan Liu, Jintao Meng

Abstract : Dependable encrypted traffic classification is crucial for improving cybersecurity and handling the growing amount of data. Large language models have shown that learning from large datasets can be effective, making pre-trained methods for encrypted traffic classification popular. However, attention-based pre-trained methods face two main issues: their large neural parameters are not suitable for low-computation environments like mobile devices and real-time applications, and they often overfit by getting stuck in local minima. To address these issues, we developed a lightweight transformer model, which reduces the computational parameters through lightweight vocabulary construction and Squeeze-and-Excitation Block. We use sharpness-aware optimization to avoid local minima during pre-training and capture temporal features with relative positional embeddings. Our approach keeps the model's classification accuracy high for downstream tasks. We conducted experiments on four datasets -USTC-TFC2016, VPN 2016, Tor 2016, and CICIOT 2022. Even with fewer than 18 million parameters, our method achieves classification results similar to methods with ten times as many parameters.

Keywords : sharpness-aware optimization, encrypted traffic classification, squeeze-and-excitation block, pretrained model
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