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A Unified Hybrid Learner for Network traffic attack classification

Communication Info

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- (1) Imbalanced Data
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Abstract

In network traffic classification, imbalanced datasets severely hinder model performance. Normal traffic vastly outnumbers rare events. This leads to poor detection of minority classes [1]. To tackle this challenge, we present the Local Interpretable hybrid meta-learner (LI-HML) [2], an enhanced version of the HML framework [3] that incorporates Local Interpretable Model-Agnostic Explanations (LIME) [4] for improved accuracy and interpretability in traffic analysis. By integrating LIME at both the ensemble and meta-learner levels, the proposed method provides dual-level interpretability, offering granular insights into individual ensemble decisions and explanations of aggregated predictions. Key innovations include feature clustering for enhanced diversity, robust handling of imbalanced datasets through bootstrap sampling, and pre and post majority voting explanations. Experimental results show that the proposed framework outperforms state-of-the-art methods in detecting a variety of attacks and anomalies.

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