International Journal of Computer
Science and Engineering (IJCSE)
ISSN (P): 2278–9960; ISSN (E): 2278–9979
Vol. 13, Issue 2, Jul–Dec 2024; 73–86


International Academy of Science,
Engineering and Technology
Connecting Researchers; Nurturing Innovations

# A COMPARATIVE PERFORMANCE ANALYSIS OF INTRUSION DETECTION AND MALWARE CLASSIFICATION USING 1D-CNN, TRANSFER LEARNING, AND ENSEMBLE TECHNIQUES

***Krishna Kumar & Hardwari Lal Mandoria***

*G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India*

## *ABSTRACT*

*The critical role of network intrusion detection systems (NIDS) and real-time malware analysis is to safeguard the security and stability of networks and sensitive data across diverse industries, including enterprise, government, IoT, and healthcare sectors. It explores the effectiveness of deep learning approaches, specifically 1D CNN, transfer learning, and ensemble techniques, for malware detection and classification. The experimental work demonstrates that visualization-based methods utilizing convolutional neural networks can efficiently analyze malware images. This research underscores the necessity for updated and novel malware datasets to address the detection of emerging malware types. A 1D CNN and ensemble models were employed for the classification of the well-known real-time gray scale image dataset, Malimg. Additionally, a 2D CNN model based on transfer learning and ensemble techniques is used for the classification of a novel malware RGB image dataset. The performance evaluation of various models revealed that the transfer learning and ensemble technique significantly enhanced accuracy, achieving a peak malware detection rate of 98.83%.*

***KEYWORDS:*** *Intrusion Detection System, Ensemble Technique, Transfer Learning, Malware Detection, Malware Classification.*

---

## *Article History*

***Received:*** *04 Sep 2024* | ***Revised:*** *04 Oct 2024* | ***Accepted:*** *08 Oct 2024*

---