Intrusion Detection Performance in Cloud Network Environment: A Hybrid of Deep Belief Network and Multilayer Perceptron

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Certification

This is to certify that Simon Olufikayo AWODELE with matriculation number LCU/PG/001505 carried out this research work titled "Intrusion Detection Performance in Cloud Network Environment: A Hybrid of Deep Belief Network and Multilayer Perceptron" in the Department of Computer Science, Faculty of Natural and Applied Sciences, Lead City University, Ibadan, Oyo State, for the award Doctor of Philosophy Degree (PhD)in Computer Science and that this has not been previously submitted.

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Dr. Wilson Sakpere Date
(Supervisor)

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Dr. Wilson Sakpere Date
(Head of Department)

Dedication

This research is dedicated to God Almighty for His guidance and protection.

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Abstract

It is nearly impossible in the world of today to ponder the digital evolution of businesses, entertainment, organizations, and government without cloud computing. It is therefore not a surprise that many organizations and companies are increasing their investments in cybersecurity. Malicious attackers are increasingly focusing on unprotected web apps and systems connected to the Internet. This makes IT networks, systems, and the data they contain, more vulnerable to threats. attacks and intrusions that can harm business operations, inflict substantial costs, and damage a company's reputation. As a result, the cloud network security systems are essential, significant, and must not be compromised. Therefore, it is necessary to develop a network intrusion detection system using an anomaly detection approach for a cloud computing network that can identify as many intrusions as possible with better detection accuracy and reduce the false positive rate. In this research, a hybrid model has been developed for intrusion detection in a cloud network environment based on the use of UNSW-NB15 detection datasets. Multilayer Perceptron (MLP) and Deep Belief Network (DBN) algorithm techniques were used in a parallel integration pattern to form a single optimal model through the use of the voting classifier to achieve higher precision, lower inaccuracy, increased consistency, and reduce bias The experimental result showed that the hybrid model achieved a lower false positive rate, which makes it more promising for intrusion detection in cloud network environments while the MLP model, which is a conventional method, achieved better performance in terms of accuracy, recall, precision, and F1-score, furthermore the DBN model which is also a conventional model showed a lower performance in all categories of Implementation results.

Keywords: Intrusion detection, Cloud computing, Deep learning, Voting Classifier, UNSW-NB15

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