Reinforcing Cybersecurity with GAN-Enabled Intrusion Detection

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Abstract*: In the realm of cybersecurity, Intrusion Detection Systems (IDS) are essential tools for identifying network attacks. While traditional machine learning algorithms have been widely used in security, they've struggled to keep pace with evolving technology and the challenges of modern cyber threats. This has led to a gradual decline in the effectiveness of machine learning-based intrusion detection systems. However, there's hope on the horizon in the form of Generative Adversarial Networks (GANs). GANs have garnered attention for their ability to effectively detect anomalies in complex, high-dimensional data. By leveraging deep learning techniques, we can address the shortcomings of traditional machine learning algorithms in intrusion detection. This study proposes to explore the use of GANs and their variations for network intrusion detection using real-world datasets. The aim is to demonstrate the feasibility of this approach and provide comparative results to evaluate its effectiveness.*

Keywords: cybersecurity

REFERENCES

[1]. Al-Yaseen, Wathiq & Idrees, Ali, MuDeLA: multi-level deep learning approach for intrusion detection systems. International Journal of Computers and Applications,1-9,2023, http://dx.doi.org/10.1080/1206212X.2023.2275084

[2]. Note, Johan & Ali, Maaruf. Comparative Analysis of Intrusion Detection System Using Machine Learning and Deep Learning Algorithms. Annals of Emerging Technologies in Computing. 6. 19-36, 2022, http://dx.doi.org/10.33166/AETiC.2022.03.003 .

[3]. a K, Meeradevi&Sunagar, Pramod &Kanavalli, Anita. (2022). Intrusion Detection System Using Deep Learning. http://dx.doi.org/10.4018/978-1-7998-8161-2.ch009 .

[4]. P. Shettar, A. V. Kachavimath, M. M. Mulla, N. D. G and G. Hanchinmani, "Intrusion Detection System using MLP and Chaotic Neural Networks," International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India, 2021, pp. 1-4, https://doi.org/10.1109/ICCCI50826.2021.9457024

[5]. B. Budler and R. Ajoodha, "Comparative Analysis of Deep Learning Models for Network Intrusion Detection Systems," 2022 IEEE 2nd Conference on Information Technology and Data Science (CITDS), Debrecen, Hungary, 2022, pp. 45-50, http://dx.doi.org/10.1109/CITDS54976.2022.9914128 .

[6]. Mohammadpour, L.; Ling, T.C.; Liew, C.S.; Aryanfar, A. A Survey of CNN-Based Network Intrusion Detection. Appl. Sci. 2022, 12, 8162. https://doi.org/10.3390/app12168162 .

[7]. Lansky, Jan & Ali, Saqib & Mohammadi, Mokhtar & Majeed, Mohammed & Karim, Sarkhel& Rashidi, Shima & Hosseinzadeh, Mehdi & Rahmani, Amir. Deep Learning-Based Intrusion Detection Systems: A Systematic Review. IEEE Access, 2021, http://dx.doi.org/101574-101599. 10.1109/ACCESS.2021.3097247

[8]. Supriya Shende, Samrat Thorat, 2020, Long Short-Term Memory (LSTM) Deep Learning Method for Intrusion Detection in Network Security, International Journal of Engineering Research & Technology (IJERT) Volume 09, 2020, https://doi.org/10.17577/IJERTV9IS061016 .

[9]. Altaha, Mustafa & Lee, Jae-Myeong & Muhammad, Aslam & Hong, Sugwon, Network Intrusion Detection based on Deep Neural Networks for the SCADA system. Journal of Physics: Conference Series.1585.012038,2020, http://dx.doi.org/10.1088/1742-6596/1585/1/012038 .

[10]. H. Yang, L. Cheng and M. C. Chuah, "Deep-Learning-Based Network Intrusion Detection for SCADA Systems," 2019 IEEE Conference on Communications and Network Security (CNS), Washington, DC, USA, 2019, pp. 1-7, http://dx.doi.org/10.1109/CNS.2019.8802785 .

[11]. Ravi, Vinayakumar&Kp, Soman & Poornachandran, Prabaharan, Evaluation of Recurrent Neural Network and its Variants for Intrusion Detection System (IDS). International Journal of Information System Modeling and Design,43-63,2017, http://dx.doi.org/10.4018/IJISMD.2017070103 .

[12]. Ashfaq Khan, Muhammad & Kim, Yangwoo. Deep Learning-Based Hybrid Intelligent Intrusion Detection System, 2021, http://dx.doi.org/10.32604/cmc.2021.015647 .

[13]. C. Yin, Y. Zhu, J. Fei and X. He, "A Deep Learning Approach for Intrusion Detection Using Recurrent Neural Networks," in IEEE Access, vol. 5, pp. 21954-21961, 2017, http://dx.doi.org/10.1109/ACCESS.2017.2762418 .

[14]. A. H. Halbouni, T. S. Gunawan, M. Halbouni, F. A. A. Assaig, M. R. Effendi and N. Ismail, "CNN-IDS: Convolutional Neural Network for Network Intrusion Detection System," 2022 8th International Conference on Wireless and Telematics (ICWT), Yogyakarta, Indonesia, 2022, pp. 1-4, http://dx.doi.org/10.1109/ICWT55831.2022.9935478 .

[15]. Laghrissi, F., Douzi, S., Douzi, K. et al. Intrusion detection systems using long short-term memory (LSTM). J Big Data 8, 65 (2021). https://doi.org/10.1186/s40537-021-00448-4 .

[16]. Lirim Ashiku, Cihan Dagli, Network Intrusion Detection System using Deep Learning, Procedia Computer Science, Volume 185, 2021, Pages 239-247, ISSN 1877-0509, https://doi.org/10.1016/j.procs.2021.05.025 .

[17]. J. Esmaily, R. Moradinezhad and J. Ghasemi, "Intrusion detection system based on Multi-Layer Perceptron Neural Networks and Decision Tree," 7th Conference on Information and Knowledge Technology (IKT), Urmia, Iran, 2015, pp. 1-5, https://doi.org/10.1109/IKT.2015.7288736 .

[18]. Supriya Shende, Samrat Thorat, 2020, Long Short-Term Memory (LSTM) Deep Learning Method for Intrusion Detection in Network Security, International Journal of Engineering Research & Technology (IJERT) Volume 09, 2020, https://doi.org/10.17577/IJERTV9IS061016 .

[19]. V. K. Navya, J. Adithi, D. Rudrawal, H. Tailor and N. James, "Intrusion Detection System using Deep Neural Networks (DNN)," International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA), Coimbatore, India, 2021, pp. 1-6, https://doi.org/10.1109/ICAECA52838.2021.9675513 .

[20]. Deore, B., Bhosale, S. Intrusion Detection System Based on RNN Classifier for Feature Reduction. SN COMPUT. SCI. 3, 114 (2022). https://doi.org/10.1007/s42979-021-00991-0 .