



[Conference on Computer Science and Information Technologies](https://link.springer.com/conference/csit)

CSIT 2020: [**Advances in Intelligent Systems and Computing V**](https://link.springer.com/book/10.1007/978-3-030-63270-0) pp 1101–1115[Cite as](https://link.springer.com/chapter/10.1007/978-3-030-63270-0_74#citeas)

Application of Neural Networks in Intrusion Monitoring Systems for Wireless Sensor Networks

* [Olexander Belej](https://link.springer.com/chapter/10.1007/978-3-030-63270-0_74#auth-Olexander-Belej),
* [Kostiantyn Kolesnyk](https://link.springer.com/chapter/10.1007/978-3-030-63270-0_74#auth-Kostiantyn-Kolesnyk) &
* [Orest Polotai](https://link.springer.com/chapter/10.1007/978-3-030-63270-0_74#auth-Orest-Polotai)
* Conference paper
* [First Online: 23 December 2020](https://link.springer.com/chapter/10.1007/978-3-030-63270-0_74#chapter-info)
* **254**Accesses

Part of the [Advances in Intelligent Systems and Computing](https://link.springer.com/bookseries/11156) book series (AISC,volume 1293)

Abstract

This article has shown the current state of the intrusion detection area and the main areas of research. Network attack detection is currently one of the most significant network technology issues. In addition to active means of repelling attacks, they use network-based intrusion detection systems that scan all network traffic and signal this if any deviations are detected in it. The main problem of network intrusion detection systems is the low detection efficiency of fundamentally new types of intrusions that have not yet been studied and entered into the signature database. To solve the problem of false positives in intrusion detection systems, the authors propose using Bayesian inference algorithms to make decisions about intrusions. In the study, the authors proposed an intrusion detection system model to increase the reliability of intrusion detection using the dynamic Bayesian network model and increase the battery life of the system. The experiments showed a greater efficiency of the proposed system compared to the Snort system for the investigated types of attacks in terms of the ability to detect new intrusions and reduce errors of the first and second kinds.

## eferences

1. Payal, A., Rai, C.S., Reddy, B.V.R.: Artificial neural networks for developing localization framework in wireless sensor networks. In: 2014 International Conference on Data Mining and Intelligent Computing (ICDMIC), New Delhi, pp. 1–6 (2014)

[**Google Scholar**](https://scholar.google.com/scholar?&q=Payal%2C%20A.%2C%20Rai%2C%20C.S.%2C%20Reddy%2C%20B.V.R.%3A%20Artificial%20neural%20networks%20for%20developing%20localization%20framework%20in%20wireless%20sensor%20networks.%20In%3A%202014%20International%20Conference%20on%20Data%20Mining%20and%20Intelligent%20Computing%20%28ICDMIC%29%2C%20New%20Delhi%2C%20pp.%201%E2%80%936%20%282014%29)

1. Gutiérrez, S., Ponce, H.: An intelligent failure detection on a wireless sensor network for indoor climate conditions. Sensors **19**, 8–14 (2019)

[**Google Scholar**](https://scholar.google.com/scholar_lookup?&title=An%20intelligent%20failure%20detection%20on%20a%20wireless%20sensor%20network%20for%20indoor%20climate%20conditions&journal=Sensors&volume=19&pages=8-14&publication_year=2019&author=Guti%C3%A9rrez%2CS&author=Ponce%2CH)

1. Zidi, S., Moulahi, T., Alaya, B.: Fault detection in wireless sensor networks through SVM classifier. IEEE Sens. J. **18**, 340–347 (2018)

[**CrossRef**](https://doi.org/10.1109/JSEN.2017.2771226)[**Google Scholar**](https://scholar.google.com/scholar_lookup?&title=Fault%20detection%20in%20wireless%20sensor%20networks%20through%20SVM%20classifier&journal=IEEE%20Sens.%20J.&volume=18&pages=340-347&publication_year=2018&author=Zidi%2CS&author=Moulahi%2CT&author=Alaya%2CB)

1. Agarajan, S., Kayalvizhi, S., Karthikeyan, B.: Neural network-based intelligent sensor fault detection in a three tanks interacting level process. In: Proceedings of the International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT), Chennai, India, pp. 2429–2434 (2016)

[**Google Scholar**](https://scholar.google.com/scholar?&q=Agarajan%2C%20S.%2C%20Kayalvizhi%2C%20S.%2C%20Karthikeyan%2C%20B.%3A%20Neural%20network-based%20intelligent%20sensor%20fault%20detection%20in%20a%20three%20tanks%20interacting%20level%20process.%20In%3A%20Proceedings%20of%20the%20International%20Conference%20on%20Electrical%2C%20Electronics%2C%20and%20Optimization%20Techniques%20%28ICEEOT%29%2C%20Chennai%2C%20India%2C%20pp.%202429%E2%80%932434%20%282016%29)

1. Hussain, S., Mokhtar, M., Howe, J.M.: Sensor failure detection, identification, and accommodation using fully connected cascade neural network. IEEE Trans. Indus. Electron. **62**(3), 1683–1692 (2015)

[**CrossRef**](https://doi.org/10.1109/TIE.2014.2361600)[**Google Scholar**](https://scholar.google.com/scholar_lookup?&title=Sensor%20failure%20detection%2C%20identification%2C%20and%20accommodation%20using%20fully%20connected%20cascade%20neural%20network&journal=IEEE%20Trans.%20Indus.%20Electron.&volume=62&issue=3&pages=1683-1692&publication_year=2015&author=Hussain%2CS&author=Mokhtar%2CM&author=Howe%2CJM)

1. Shah, J., Mishra, B.: IoT enabled environmental monitoring system for smart cities. In: 2016 International Conference on Internet of Things and Applications (IOTA), Pune, pp. 383–388 (2016)

[**Google Scholar**](https://scholar.google.com/scholar?&q=Shah%2C%20J.%2C%20Mishra%2C%20B.%3A%20IoT%20enabled%20environmental%20monitoring%20system%20for%20smart%20cities.%20In%3A%202016%20International%20Conference%20on%20Internet%20of%20Things%20and%20Applications%20%28IOTA%29%2C%20Pune%2C%20pp.%20383%E2%80%93388%20%282016%29)

1. Guanochanga, B., Cachipuendo, R., Fuertes, W., Salvador, S., Benitez, D., Toulkeridis, T., Torres, J., Villacis, C., Tapia, F., Meneses, F.: Real-time air pollution monitoring systems using wireless sensor networks connected in a cloud-computing, wrapped up web services. In: Proceedings of the Future Technologies Conference (FTC), Vancouver, Canada, Springer, Cham (2018)

[**Google Scholar**](https://scholar.google.com/scholar?&q=Guanochanga%2C%20B.%2C%20Cachipuendo%2C%20R.%2C%20Fuertes%2C%20W.%2C%20Salvador%2C%20S.%2C%20Benitez%2C%20D.%2C%20Toulkeridis%2C%20T.%2C%20Torres%2C%20J.%2C%20Villacis%2C%20C.%2C%20Tapia%2C%20F.%2C%20Meneses%2C%20F.%3A%20Real-time%20air%20pollution%20monitoring%20systems%20using%20wireless%20sensor%20networks%20connected%20in%20a%20cloud-computing%2C%20wrapped%20up%20web%20services.%20In%3A%20Proceedings%20of%20the%20Future%20Technologies%20Conference%20%28FTC%29%2C%20Vancouver%2C%20Canada%2C%20Springer%2C%20Cham%20%282018%29)

1. Lazarescu, M.T.: Design and field test of a WSN platform prototype for long-term environmental monitoring. Sensors **15**, 9481–9518 (2015)

[**CrossRef**](https://doi.org/10.3390/s150409481)[**Google Scholar**](https://scholar.google.com/scholar_lookup?&title=Design%20and%20field%20test%20of%20a%20WSN%20platform%20prototype%20for%20long-term%20environmental%20monitoring&journal=Sensors&volume=15&pages=9481-9518&publication_year=2015&author=Lazarescu%2CMT)

1. Ferdoush, S., Li, X.: Wireless sensor network system design using Raspberry Pi and Arduino for environmental monitoring applications. Procedia Comput. Sci. **34**, 103–110 (2014)

[**CrossRef**](https://doi.org/10.1016/j.procs.2014.07.059)[**Google Scholar**](https://scholar.google.com/scholar_lookup?&title=Wireless%20sensor%20network%20system%20design%20using%20Raspberry%20Pi%20and%20Arduino%20for%20environmental%20monitoring%20applications&journal=Procedia%20Comput.%20Sci.&volume=34&pages=103-110&publication_year=2014&author=Ferdoush%2CS&author=Li%2CX)

1. Lopez-Iturri, P., Celaya-Echarri, M., Azpilicueta, L., Aguirre, E., Astrain, J., Villadangos, J., Falcone, F.: Integration of autonomous wireless sensor networks in academic school gardens. Sensors **18**, 3621 (2018)

[**CrossRef**](https://doi.org/10.3390/s18113621)[**Google Scholar**](https://scholar.google.com/scholar_lookup?&title=Integration%20of%20autonomous%20wireless%20sensor%20networks%20in%20academic%20school%20gardens&journal=Sensors&volume=18&publication_year=2018&author=Lopez-Iturri%2CP&author=Celaya-Echarri%2CM&author=Azpilicueta%2CL&author=Aguirre%2CE&author=Astrain%2CJ&author=Villadangos%2CJ&author=Falcone%2CF)

1. Mahamuni, C.V.: A military surveillance system based on wireless sensor networks with extended coverage life. In: 2016 International Conference on Global Trends in Signal Processing, Information Computing and Communication (ICGTSPICC), pp. 375–381 (2016)

[**Google Scholar**](https://scholar.google.com/scholar?&q=Mahamuni%2C%20C.V.%3A%20A%20military%20surveillance%20system%20based%20on%20wireless%20sensor%20networks%20with%20extended%20coverage%20life.%20In%3A%202016%20International%20Conference%20on%20Global%20Trends%20in%20Signal%20Processing%2C%20Information%20Computing%20and%20Communication%20%28ICGTSPICC%29%2C%20pp.%20375%E2%80%93381%20%282016%29)

1. Ponce, H., Ponce, P.: Artificial organic networks. In: 2011 IEEE Electronics, Robotics, and Automotive Mechanics Conference, Cuernavaca, Morelos, pp. 29–34 (2011)

[**Google Scholar**](https://scholar.google.com/scholar?&q=Ponce%2C%20H.%2C%20Ponce%2C%20P.%3A%20Artificial%20organic%20networks.%20In%3A%202011%20IEEE%20Electronics%2C%20Robotics%2C%20and%20Automotive%20Mechanics%20Conference%2C%20Cuernavaca%2C%20Morelos%2C%20pp.%2029%E2%80%9334%20%282011%29)

1. Mishra, A., Sudan K., Soliman, H.: Detecting border intrusion using wireless sensor network and artificial neural network. In: 2010 6th IEEE International Conference on Distributed Computing in Sensor Systems Workshops (DCOSSW), Santa Barbara, CA, pp. 1–6 (2010)

[**Google Scholar**](https://scholar.google.com/scholar?&q=Mishra%2C%20A.%2C%20Sudan%20K.%2C%20Soliman%2C%20H.%3A%20Detecting%20border%20intrusion%20using%20wireless%20sensor%20network%20and%20artificial%20neural%20network.%20In%3A%202010%206th%20IEEE%20International%20Conference%20on%20Distributed%20Computing%20in%20Sensor%20Systems%20Workshops%20%28DCOSSW%29%2C%20Santa%20Barbara%2C%20CA%2C%20pp.%201%E2%80%936%20%282010%29)

1. Zhang, W., Jiang, T.: Intrusion detection and classification in forest area using inter-sensor communication signals and SVM. In: 2014 IEEE International Conference on Communication Problem-solving, Beijing, pp. 401–404 (2014)

[**Google Scholar**](https://scholar.google.com/scholar?&q=Zhang%2C%20W.%2C%20Jiang%2C%20T.%3A%20Intrusion%20detection%20and%20classification%20in%20forest%20area%20using%20inter-sensor%20communication%20signals%20and%20SVM.%20In%3A%202014%20IEEE%20International%20Conference%20on%20Communication%20Problem-solving%2C%20Beijing%2C%20pp.%20401%E2%80%93404%20%282014%29)

1. Belej, O., Halkiv, L.: Development of a network attack detection system based on hybrid neuro-fuzzy algorithms. In: Proceedings of the Third International Workshop on Computer Modeling and Intelligent Systems (CMIS-2020), Zaporizhzhia, Ukraine, pp. 926–938 (2020)

[**Google Scholar**](https://scholar.google.com/scholar?&q=Belej%2C%20O.%2C%20Halkiv%2C%20L.%3A%20Development%20of%20a%20network%20attack%20detection%20system%20based%20on%20hybrid%20neuro-fuzzy%20algorithms.%20In%3A%20Proceedings%20of%20the%20Third%20International%20Workshop%20on%20Computer%20Modeling%20and%20Intelligent%20Systems%20%28CMIS-2020%29%2C%20Zaporizhzhia%2C%20Ukraine%2C%20pp.%20926%E2%80%93938%20%282020%29)

1. Belej, O., Staniec, K., Więckowski, T., Lobur, M., Matviykiv, O., Shcherbovskykh, S.: Development of methodology for counteraction to cyber-attacks in wireless sensor networks. In: Zamojski W., Mazurkiewicz J., Sugier J., Walkowiak T., Kacprzyk J. (eds.) Theory and Applications of Dependable Computer Systems. DepCoS-RELCOMEX 2020. Advances in Intelligent Systems and Computing, vol. 1173, pp. 41–50. Springer, Cham (2020)