

LIST OF PUBLICATIONS

Journal Papers from Thesis

- **N. Sharma**, U. Agarwal, S. Shaurya, S. Mishra and O. J. Pandey, “Energy-Efficient and QoS-Aware Data Routing in Node Fault Prediction Based IoT Networks,” in **IEEE Transactions on Network and Service Management**, vol. 20, no. 4, pp. 4585-4599, Dec. 2023, doi: 10.1109/TNSM.2023.3268676.
- **N. Sharma**, V. S. P. Thota, Y. Tankala, S. Tripathi and O. J. Pandey, “Op-tRISQL: Toward Performance Improvement of Time-Varying IoT Networks Using Q-Learning,” in **IEEE Transactions on Network and Service Management**, vol. 21, no. 3, pp. 3008-3020, June 2024, doi: 10.1109/TNSM.2024.3358835.
- **N.Sharma**, U. Agarwal, K. Singh, P. Chanak, O. J. Pandey, “Energy-Aware and QoS-Enhanced Routing with Node Fault Prediction for Consumer IoT Networks Using ML Frameworks,” in **IEEE Transactions on Consumer Electronics**, Accepted, May 2025, doi: 10.1109/TCE.2025.3571207.

Journal Papers Other than Thesis

- S. Reddy Yeduri, **N. Sharma**, O. J. Pandey and L. R. Cenkeramaddi, “Throughput Maximization in Delay-Critical and Energy-Aware SW-UAV-WNs Using Q-Learning,” in **IEEE Open Journal of the Communications Society**, vol. 5, pp. 7228-7243, 2024, doi: 10.1109/OJCOMS.2024.3496740

Patent from Thesis

- O. J. Pandey, **N. Sharma**, U. Agarwal, K.Singh, “A system and method for ameliorating Internet of Things (IoT) network”, Application No.: 202411083524 (filed)

Conferences from Thesis

- **N. Sharma**, A. Gupta, S. Deepak and O. J. Pandey, “Node Fault Prediction Assisted Small-World IoT Networks Using ML Frameworks: Towards Performance Improvement,” 2024 **IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)**, Guwahati, India, 2024, pp. 1-6, doi: 10.1109/ANTS63515.2024.10898632.

Conferences Other than Thesis

- **N. Sharma**, P. Rathore, M. K. Shukla and O. J. Pandey, “Heuristic-based Multicasting Utilizing Network Coding over a Multi-Hop Wireless Mesh Network,” 2024 **IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)**, Guwahati, India, 2024, pp. 1-6, doi: 10.1109/ANTS63515.2024.10898312.

- **N. Sharma**, P. Pandey, Aryan, P. Rathore and O. J. Pandey, “A Novel Routing Protocol over Time-Varying IoT Network Using RTS/CTS Framework,” 2024 **IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)**, Guwahati, India, 2024, pp. 1-6, doi: 10.1109/ANTS63515.2024.10899003.

Bibliography

- [1] N. Sharma, U. Agarwal, K. Singh, P. Chanak, and O. J. Pandey, “Energy-aware and qos-enhanced routing with node fault prediction for consumer iot networks using ml frameworks,” *IEEE Transactions on Consumer Electronics*, Early Access, May 2025, pp. 1–18.
- [2] N. Sharma, U. Agarwal, S. Shaurya, S. Mishra, and O. J. Pandey, “Energy-efficient and qos-aware data routing in node fault prediction based iot networks,” *IEEE Transactions on Network and Service Management*, 2023, vol. 20, no. 4, pp. 4585–4599.
- [3] O. A. Ghasemi, M. C. Amirani, and M. Azghani, “Resource and power allocation for sum-throughput maximization in ris-assisted tdma wireless sensor networks,” *IEEE Internet of Things Journal*, 2024, vol. 11, no. 13, pp. 24 123 – 24 133.
- [4] M. Arif, J. A. Maya, N. Anandan, D. A. Pérez, A. Tonello, H. Zangl, and B. Rinner, “Resource-efficient ubiquitous sensor networks for smart agriculture: A survey,” *IEEE Access*, 2024, vol. 12, pp. 193 332 – 193 364.
- [5] S. Zidi, B. Alaya, T. Moulahi, A. Al-Shargabi, and S. El Khediri, “Fault prediction and recovery using machine learning techniques and the htm algorithm in vehicular network environment,” *IEEE Open Journal of Intelligent Transportation Systems*, 2024, vol. 5, pp. 132–145.
- [6] Q. Li, Y. Wang, J. Dong, C. Zhang, and K. Peng, “Multi-node knowledge graph assisted distributed fault detection for large-scale industrial processes based on graph attention network and bidirectional lstms,” *Neural Networks*, 2024, vol. 173, p. 106210.
- [7] J. Lin, W. Yu, N. Zhang, X. Yang, H. Zhang, and W. Zhao, “A survey on internet of things: Architecture, enabling technologies, security and privacy, and applications,” *IEEE internet of things journal*, 2017, vol. 4, no. 5, pp. 1125–1142.

- [8] F. J. Dian, R. Vahidnia, and A. Rahmati, "Wearables and the internet of things (iot), applications, opportunities, and challenges: A survey," *IEEE access*, 2020, vol. 8, pp. 69 200–69 211.
- [9] L. Catarinucci, D. De Donno, L. Mainetti, L. Palano, L. Patrono, M. L. Stefanizzi, and L. Tarricone, "An iot-aware architecture for smart healthcare systems," *IEEE internet of things journal*, 2015, vol. 2, no. 6, pp. 515–526.
- [10] V. Bianchi, M. Bassoli, G. Lombardo, P. Fornacciari, M. Mordonini, and I. De Munari, "Iot wearable sensor and deep learning: An integrated approach for personalized human activity recognition in a smart home environment," *IEEE Internet of Things Journal*, 2019, vol. 6, no. 5.
- [11] U. Demirbaga and G. S. Aujla, "Mapchain: A blockchain-based verifiable healthcare service management in iot-based big data ecosystem," *IEEE Transactions on Network and Service Management*, 2022, vol. 19, no. 4, pp. 3896–3907.
- [12] M. Adil, M. K. Khan, N. Kumar, M. Attique, A. Farouk, M. Guizani, and Z. Jin, "Healthcare internet of things: Security threats, challenges, and future research directions," *IEEE Internet of Things Journal*, 2024, vol. 11, no. 11, pp. 19 046–19 069.
- [13] H. Dui, S. Zhang, M. Liu, X. Dong, and G. Bai, "Iot-enabled real-time traffic monitoring and control management for intelligent transportation systems," *IEEE Internet of Things Journal*, 2024, vol. 11, no. 9, pp. 15 842–15 854.
- [14] A. Presciuttini, A. Cantini, F. Costa, and A. Portioli-Staudacher, "Machine learning applications on iot data in manufacturing operations and their interpretability implications: A systematic literature review," *Journal of Manufacturing Systems*, 2024, vol. 74, pp. 477–486.
- [15] S. Qazi, B. A. Khawaja, and Q. U. Farooq, "Iot-equipped and ai-enabled next generation smart agriculture: A critical review, current challenges and future trends," *Ieee Access*, 2022, vol. 10, pp. 21 219–21 235.
- [16] E. Effah, O. Thiare, and A. M. Wyglinski, "Hardware evaluation of cluster-based agricultural iot network," *IEEE Access*, 2024, vol. 12, pp. 33 628 – 33 651.
- [17] M. Sharma, A. Tomar, and A. Hazra, "Edge computing for industry 5.0: Fundamental, applications and research challenges," *IEEE Internet of Things Journal*, 2024, vol. 11, pp. 19 070 – 19 093.

- [18] U. S. Rathod, S. A. Thomas, F. S. Maruti, P. B. Kadam, H. L. Jadhav, and M. J. Bdair, "Reinforcement learning for sustainable business model development in social entrepreneurship," in *2024 Second International Conference Computational and Characterization Techniques in Engineering & Sciences (IC3TES)*. IEEE, 2024, pp. 1–5.
- [19] P. Verma, S. K. Sood, H. Kaur, M. Kumar, H. Wu, and S. S. Gill, "Data driven stochastic game network-based smart home monitoring system using iot-enabled edge computing environments," *IEEE Transactions on Consumer Electronics, Early Access*, 2024.
- [20] M. Letsoara, B. Mendu, and B. B. Monchusi, "Application of iot in smart metering: A survey," in *2024 International Conference on Electrical and Computer Engineering Researches (ICECER)*. IEEE, 2024, pp. 1–6.
- [21] M. A. Al Sibahee, Z. A. Abduljabbar, A. Ngueilbaye, C. Luo, J. Li, Y. Huang, J. Zhang, N. Khan, V. O. Nyangaresi, and A. H. Ali, "Blockchain-based authentication schemes in smart environments: A systematic literature review," *IEEE Internet of Things Journal*, 2024, vol. 11, no. 21, pp. 34 774 – 34 796.
- [22] K. Purushothaman, N. Ragavendran, S. Ramesh, V. G. Karthikeyan, G. U. Maheswari, and R. Saravanakumar, "Innovative urban planning for harnessing blockchain and edge artificial intelligence for smart city solutions," in *2024 Second International Conference on Intelligent Cyber Physical Systems and Internet of Things (ICoICI)*. IEEE, 2024, pp. 65–68.
- [23] G. Dhiman and N. S. Alghamdi, "Smose: Artificial intelligence-based smart city framework using multi-objective and iot approach for consumer electronics application," *IEEE Transactions on Consumer Electronics*, 2024, vol. 70, no. 1, pp. 3848–3855.
- [24] E. H. Houssein, M. A. Othman, W. M. Mohamed, and M. Younan, "Internet of things in smart cities: Comprehensive review, open issues and challenges," *IEEE Internet of Things Journal*, 2024, vol. 11, no. 21, pp. 34 941 – 34 952.
- [25] Y.-C. Hsiao, M.-H. Wu, and S. C. Li, "Elevated performance of the smart city—a case study of the iot by innovation mode," *IEEE Transactions on Engineering Management*, 2019, vol. 68, no. 5, pp. 1461–1475.

- [26] R. Vergallo and L. Mainetti, “The role of technology in improving the customer experience in the banking sector: A systematic mapping study,” *IEEE Access*, 2022, vol. 10, pp. 118 024–118 042.
- [27] A. Y. A. B. Ahmad, N. Verma, N. M. Sarhan, E. M. Awwad, A. Arora, and V. O. Nyangaresi, “An iot and blockchain-based secure and transparent supply chain management framework in smart cities using optimal queue model,” *IEEE Access*, 2024, vol. 12, pp. 51 752–51 771.
- [28] B. Andres, M. Diaz-Madroñero, A. L. Soares, and R. Poler, “Enabling technologies to support supply chain logistics 5.0,” *IEEE Access*, 2024, vol. 12, pp. 43 889 – 43 906.
- [29] V. Ahmad, A. Johri, M. Asif, A. Walia, M. Wasiq, and A. Sayal, “The influence of iot on retail banking: Enhancing security and customer experience,” in *2024 International Conference on Communication, Computing and Energy Efficient Technologies (I3CEET)*. IEEE, 2024, pp. 796–801.
- [30] M. Anderson and J. Bolton, “Integration of sensors to improve customer experience: Implementing device integration for the retail sector,” in *2015 IEEE 12th International Conference on e-Business Engineering*. IEEE, 2015, pp. 382–386.
- [31] M. S. Irfan, S. Dasgupta, and M. Rahman, “Towards transportation digital twin systems for traffic safety and mobility: A review,” *IEEE Internet of Things Journal*, 2024, vol. 11, no. 14, pp. 24 581 – 24 603.
- [32] J. Kumar, R. Gupta, S. Sharma, T. Chakrabarti, P. Chakrabarti, and M. Margala, “Iot-enabled advanced water quality monitoring system for pond management and environmental conservation,” *IEEE Access*, 2024, vol. 11, pp. 58 156 – 58 167.
- [33] B. Haq, M. A. Jamshed, K. Ali, B. Kasi, S. Arshad, M. K. Kasi, I. Ali, A. Shabbir, Q. H. Abbasi, and M. Ur-Rehman, “Tech-driven forest conservation: combating deforestation with internet of things, artificial intelligence, and remote sensing,” *IEEE Internet of Things Journal*, 2024, vol. 11, no. 14, pp. 24 551 – 24 568.
- [34] T. Kim and D. Qiao, “Energy-efficient data collection for iot networks via cooperative multi-hop uav networks,” *IEEE Transactions on Vehicular Technology*, 2020, vol. 69, no. 11, pp. 13 796–13 811.
- [35] S. Barrachina-Muñoz, B. Bellalta, T. Adame, and A. Bel, “Multi-hop communication in the uplink for lpwans,” *Computer Networks*, 2017, vol. 123, pp. 153–168.

-
- [36] P. Chithaluru, S. Kumar, A. Singh, A. Benslimane, and S. K. Jangir, "An energy-efficient routing scheduling based on fuzzy ranking scheme for internet of things," *IEEE Internet of Things Journal*, 2021, vol. 9, no. 10, pp. 7251–7260.
- [37] T. Liu, T. Gu, N. Jin, and Y. Zhu, "A mixed transmission strategy to achieve energy balancing in wireless sensor networks," *IEEE Transactions on wireless communications*, 2017, vol. 16, no. 4, pp. 2111–2122.
- [38] H. Yetgin, K. T. K. Cheung, M. El-Hajjar, and L. H. Hanzo, "A survey of network lifetime maximization techniques in wireless sensor networks," *IEEE Communications Surveys & Tutorials*, 2017, vol. 19, no. 2, pp. 828–854.
- [39] T. Hong, W. Zhao, R. Liu, and M. Kadoch, "Space-air-ground iot network and related key technologies," *IEEE Wireless Communications*, 2020, vol. 27, no. 2, pp. 96–104.
- [40] Z. Wang *et al.*, "Energy-efficient data collection and device positioning in uav-assisted iot," *IEEE Internet of Things Journal*, 2019, vol. 7, no. 2, pp. 1122–1139.
- [41] A. Yazdinejad *et al.*, "An energy-efficient sdn controller architecture for iot networks with blockchain-based security," *IEEE Transactions on Services Computing*, 2020, vol. 13, no. 4, pp. 625–638.
- [42] B. Paul, "A novel energy-efficient routing scheme for lora networks," *IEEE Sensors Journal*, 2020, vol. 20, no. 15, pp. 8858–8866.
- [43] Z. Ding, L. Shen, H. Chen, F. Yan, and N. Ansari, "Energy-efficient relay-selection-based dynamic routing algorithm for iot-oriented software-defined wsns," *IEEE Internet of Things Journal*, 2020, vol. 7, no. 9, pp. 9050–9065.
- [44] P. Chanak and I. Banerjee, "Congestion free routing mechanism for iot-enabled wireless sensor networks for smart healthcare applications," *IEEE Transactions on Consumer Electronics*, 2020, vol. 66, no. 3, pp. 223–232.
- [45] V. K. Quy, A. Chehri, N. M. Quy, V.-H. Nguyen, and N. T. Ban, "An efficient routing algorithm for self-organizing networks in 5g-based intelligent transportation systems," *IEEE Transactions on Consumer Electronics*, 2023, vol. 70, no. 1, pp. 1757–1765.
- [46] S. Redhu, M. Anupam, and R. M. Hegde, "Optimal relay node selection for robust data forwarding over time-varying iot networks," *IEEE Transactions on Vehicular Technology*, 2019, vol. 68, no. 9, pp. 9178–9190.

- [47] P. Cong, Y. Zhang, Z. Liu, T. Baker, H. Tawfik, W. Wang, K. Xu, R. Li, and F. Li, "A deep reinforcement learning-based multi-optimality routing scheme for dynamic iot networks," *Computer Networks*, 2021, vol. 192, p. 108057.
- [48] M. Krishnan and Y. Lim, "Reinforcement learning-based dynamic routing using mobile sink for data collection in wsns and iot applications," *Journal of Network and Computer Applications*, 2021, vol. 194, p. 103223. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S1084804521002241>
- [49] R. R. Swain and P. M. Khilar, "A fuzzy mlp approach for fault diagnosis in wireless sensor networks," in *2016 IEEE region 10 conference (TENCON)*. IEEE, 2016, pp. 3183–3188.
- [50] A. R. Mohammed, S. A. Mohammed, D. Côté, and S. Shirmohammadi, "Machine learning-based network status detection and fault localization," *IEEE Transactions on instrumentation and measurement*, 2021, vol. 70, pp. 1–10.
- [51] R. Prasad and R. K. Baghel, "A novel fault diagnosis technique for wireless sensor network using feedforward neural network," *IEEE Sensors Letters*, 2021, vol. 6, no. 1, pp. 1–4.
- [52] G. ALMahadin, Y. Aoudni, M. Shabaz, A. V. Agrawal, G. Yasmin, E. S. Alomari, H. M. R. Al-Khafaji, D. Dansana, and R. R. Maaliw, "Vanet network traffic anomaly detection using gru-based deep learning model," *IEEE Transactions on Consumer Electronics*, 2023, vol. 70, no. 1, pp. 4548–4555.
- [53] N. Sharma, V. P. Thota, T. Yuvaraj, S. Tripathi, and O. J. Pandey, "Optrisql: Towards performance improvement of time-varying iot networks using q-learning," *IEEE Transactions on Network and Service Management*, 2024, vol. 21, no. 3, pp. 3008–3020.
- [54] N. Sharma, A. Gupta, S. Deepak, and O. J. Pandey, "Node fault prediction assisted small-world iot networks using ml frameworks: Towards performance improvement," in *2024 IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, 2024, pp. 1–6.
- [55] X. Li, W. Gang, L. Zongqi, and Z. Yanyan, "An energy-efficient routing protocol based on particle swarm clustering algorithm and inter-cluster routing algorithm for wsn," in *2013 25th Chinese control and decision conference (CCDC)*. IEEE, 2013, pp. 4029–4033.

- [56] T.-T. Huynh, A.-V. Dinh-Duc, and C.-H. Tran, "Delay-constrained energy-efficient cluster-based multi-hop routing in wireless sensor networks," *Journal of Communications and Networks*, 2016, vol. 18, no. 4, pp. 580–588.
- [57] Z. Wang, X. Qin, and B. Liu, "An energy-efficient clustering routing algorithm for wsn-assisted iot," in *2018 IEEE wireless communications and networking conference (WCNC)*. IEEE, 2018, pp. 1–6.
- [58] A. E. Fawzy, M. Shokair, and W. Saad, "Balanced and energy-efficient multi-hop techniques for routing in wireless sensor networks," *IET Networks*, 2018, vol. 7, no. 1, pp. 33–43.
- [59] Y. Zhang, Q. Ren, K. Song, Y. Liu, T. Zhang, and Y. Qian, "An energy-efficient multilevel secure routing protocol in iot networks," *IEEE Internet of Things Journal*, 2021, vol. 9, no. 13, pp. 10 539–10 553.
- [60] S. R. Yeduri, N. S. Chilamkurthy, O. J. Pandey, and L. R. Cenkeramaddi, "Energy and throughput management in delay-constrained small-world uav-iot network," *IEEE Internet of Things Journal*, 2022, vol. 10, no. 9, pp. 7922–7935.
- [61] O. A. Karim, N. Javaid, A. Sher, Z. Wadud, and S. Ahmed, "Ql-eebdg: Qlearning based energy balanced routing in underwater sensor networks." *EAI Endorsed Trans. Energy Web*, 2018, vol. 5, no. 17, p. e15.
- [62] O. J. Pandey and R. M. Hegde, "Low-latency and energy-balanced data transmission over cognitive small world wsn," *IEEE Transactions on Vehicular Technology*, 2018, vol. 67, no. 8, pp. 7719–7733.
- [63] F. Al-Turjman, "Cognitive routing protocol for disaster-inspired internet of things," *Future Generation Computer Systems*, 2019, vol. 92, pp. 1103–1115.
- [64] N. Chen, T. Qiu, X. Zhou, K. Li, and M. Atiquzzaman, "An intelligent robust networking mechanism for the internet of things," *IEEE Communications Magazine*, 2019, vol. 57, no. 11, pp. 91–95.
- [65] O. J. Pandey, T. Yuvaraj, J. K. Paul, H. H. Nguyen, K. Gundepudi, and M. K. Shukla, "Improving energy efficiency and qos of lpwans for iot using q-learning based data routing," *IEEE Transactions on Cognitive Communications and Networking*, 2021, vol. 8, no. 1, pp. 365–379.

- [66] G. Kaur, P. Chanak, and M. Bhattacharya, “Energy-efficient intelligent routing scheme for iot-enabled wsns,” *IEEE Internet of Things Journal*, 2021, vol. 8, no. 14, pp. 11 440–11 449.
- [67] A. H. Abdulaal, A. Shah, and A. Pathan, “Nm-leach: A novel modified leach protocol to improve performance in wsn,” *International Journal of Communication Networks and Information Security*, 2022, vol. 14, no. 1, pp. 1–10.
- [68] Q. M. Qadir, T. A. Rashid, N. K. Al-Salihi, B. Ismael, A. A. Kist, and Z. Zhang, “Low power wide area networks: A survey of enabling technologies, applications and interoperability needs,” *IEEE Access*, 2018, vol. 6, pp. 77 454–77 473.
- [69] Y. Lalle, M. Fourati, L. C. Fourati, and J. P. Barraca, “Routing strategies for lorawan multi-hop networks: A survey and an sdn-based solution for smart water grid,” *IEEE Access*, 2021, vol. 9, pp. 168 624–168 647.
- [70] M. Anedda *et al.*, “An energy-efficient solution for multi-hop communications in low power wide area networks,” in *2018 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB)*. IEEE, 2018, pp. 1–5.
- [71] E. Effah, O. Thiare, and A. Wyglinski, “Energy-efficient multihop routing framework for cluster-based agricultural internet of things (ca-iot),” in *2020 IEEE 92nd Vehicular Technology Conference (VTC2020-Fall)*, 2020, pp. 1–5.
- [72] I. Diakhate, B. Niang, A. D. Kora, and R. M. Faye, “Optimizing the energy consumption of wsn by using energy efficient routing protocol using dijkstra algorithm,” in *2022 2nd International Conference on Electronic and Electrical Engineering and Intelligent System (ICE3IS)*. IEEE, 2022, pp. 147–152.
- [73] V. Kumar, P. Yadav, and L. S. Indrusiak, “Resilient edge: Building an adaptive and resilient multi-communication network for iot edge using lpwan and wifi,” *IEEE Transactions on Network and Service Management*, 2023, vol. 20, no. 3, pp. 3055–3071.
- [74] A. Vaezian and Y. Darmani, “Mse-rpl: Mobility support enhancement in rpl for iot mobile applications,” *IEEE Access*, 2022, vol. 10, pp. 80 816–80 832.
- [75] M. Naghibi and H. Barati, “Egrpm: Energy efficient geographic routing protocol based on mobile sink in wireless sensor networks,” *Sustainable Computing: Informatics and Systems*, 2020, vol. 25, p. 100377.

- [76] M. Fotros, M. M. Riahi Kashani, J. Rezazadeh, and J. Ayoade, "A timely vanet multi-hop routing method in iot," in *2019 20th International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT)*, 2019, pp. 19–24.
- [77] B. Moons, A. Karaagac, E. De Poorter, and J. Hoebeke, "Efficient vertical handover in heterogeneous low-power wide-area networks," *IEEE Internet of Things Journal*, 2020, vol. 7, no. 3, pp. 1960–1973.
- [78] S. Barrachina-Munoz and B. Bellalta, "Learning optimal routing for the uplink in lpwans using similarity-enhanced e-greedy," in *2017 IEEE 28th Annual International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC)*. IEEE, 2017, pp. 1–5.
- [79] S. Barrachina-Muñoz, T. Adame, A. Bel, and B. Bellalta, "Towards energy efficient lpwans through learning-based multi-hop routing," in *2019 IEEE 5th World Forum on Internet of Things (WF-IoT)*. IEEE, 2019, pp. 644–649.
- [80] K. Ntshabele, B. Isong, and A. M. Abu-Mahfouz, "Cr-lpwan: Issues, solutions and research directions," in *2021 IEEE World AI IoT Congress (AIIoT)*. IEEE, 2021, pp. 0504–0511.
- [81] Z. Mammeri, "Reinforcement learning based routing in networks: Review and classification of approaches," *Ieee Access*, 2019, vol. 7, pp. 55 916–55 950.
- [82] J. Suarez-Varela, A. Mestres, J. Yu, L. Kuang, H. Feng, P. Barlet-Ros, and A. Cabellos-Aparicio, "Feature engineering for deep reinforcement learning based routing," in *ICC 2019 - 2019 IEEE International Conference on Communications (ICC)*, 2019, pp. 1–6.
- [83] Z. Jin, Q. Zhao, and Y. Su, "Rcar: A reinforcement-learning-based routing protocol for congestion-avoided underwater acoustic sensor networks," *IEEE Sensors Journal*, 2019, vol. 19, no. 22, pp. 10 881–10 891.
- [84] M. Chen, Y. Miao, X. Jian, X. Wang, and I. Humar, "Cognitive-lpwan: Towards intelligent wireless services in hybrid low power wide area networks," *IEEE Transactions on Green Communications and Networking*, 2018, vol. 3, no. 2, pp. 409–417.

- [85] D. F. Carvalho, A. Depari, P. Ferrari, A. Flammini, S. Rinaldi, and E. Sisinni, "On the feasibility of mobile sensing and tracking applications based on lpwan," in *2018 IEEE Sensors Applications Symposium (SAS)*. IEEE, 2018, pp. 1–6.
- [86] S. Rinaldi, M. Pasetti, E. Sisinni, F. Bonafini, P. Ferrari, M. Rizzi, and A. Flammini, "On the mobile communication requirements for the demand-side management of electric vehicles," *Energies*, 2018, vol. 11, no. 5, p. 1220.
- [87] D. Patel and M. Won, "Experimental study on low power wide area networks (lpwan) for mobile internet of things," in *2017 IEEE 85th vehicular technology conference (VTC Spring)*. IEEE, 2017, pp. 1–5.
- [88] S. Rajasegarar, C. Leckie, and M. Palaniswami, "Anomaly detection in wireless sensor networks," *IEEE Wireless Communications*, 2008, vol. 15, no. 4, pp. 34–40.
- [89] S. Ji, S.-f. Yuan, T.-h. Ma, and C. Tan, "Distributed fault detection for wireless sensor based on weighted average," in *2010 Second International Conference on Networks Security, Wireless Communications and Trusted Computing*, vol. 1. IEEE, 2010, pp. 57–60.
- [90] E. U. Warriach and K. Tei, "Fault detection in wireless sensor networks: A machine learning approach," in *2013 IEEE 16th International Conference on Computational Science and Engineering*. IEEE, 2013, pp. 758–765.
- [91] H. Yuan, X. Zhao, and L. Yu, "A distributed bayesian algorithm for data fault detection in wireless sensor networks," in *2015 international conference on information networking (ICOIN)*. IEEE, 2015, pp. 63–68.
- [92] T. Yu, A. M. Akhtar, X. Wang, and A. Shami, "Temporal and spatial correlation based distributed fault detection in wireless sensor networks," in *2015 IEEE 28th Canadian conference on electrical and computer engineering (CCECE)*. IEEE, 2015, pp. 1351–1355.
- [93] S. Zidi, T. Moulahi, and B. Alaya, "Fault detection in wireless sensor networks through svm classifier," *IEEE Sensors Journal*, 2017, vol. 18, no. 1, pp. 340–347.
- [94] M. M. Gharamaleki and S. Babaie, "A new distributed fault detection method for wireless sensor networks," *IEEE Systems Journal*, 2020, vol. 14, no. 4, pp. 4883–4890.

-
- [95] Y. Lai and H. Chen, "Energy-efficient fault-tolerant mechanism for clustered wireless sensor networks," in *2007 16th international conference on computer communications and networks*. IEEE, 2007, pp. 272–277.
- [96] M. Qiu, J. Liu, J. Li, Z. Fei, Z. Ming, and E. H. Sha, "A novel energy-aware fault tolerance mechanism for wireless sensor networks," in *2011 IEEE/ACM International Conference on Green Computing and Communications*. IEEE, 2011, pp. 56–61.
- [97] S.-H. Chang and T.-S. Huang, "A fuzzy knowledge based fault tolerance algorithm in wireless sensor networks," in *2012 26th International Conference on Advanced Information Networking and Applications Workshops*. IEEE, 2012, pp. 891–896.
- [98] S. Hu and G. Li, "Fault-tolerant clustering topology evolution mechanism of wireless sensor networks," *IEEE Access*, 2018, vol. 6, pp. 28 085–28 096.
- [99] V. Agarwal, S. Tapaswi, and P. Chanak, "Intelligent fault-tolerance data routing scheme for iot-enabled wsns," *IEEE Internet of Things Journal*, 2022, vol. 9, no. 17, pp. 16 332–16 342.
- [100] Y. Yue, J. Li, H. Fan, Q. Qin, L. Gu, and L. Du, "Fault prediction based on the kernel function for ribbon wireless sensor networks," *Wireless Personal Communications*, 2017, vol. 97, pp. 3277–3292.
- [101] W. He, C.-Q. Yu, G.-H. Zhou, Z.-J. Zhou, and G.-Y. Hu, "Fault prediction method for wireless sensor network based on evidential reasoning and belief-rule-base," *IEEE Access*, 2019, vol. 7, pp. 78 930–78 941.
- [102] T. Ara, M. Prabhakar, and M. Bali, "Fault prediction in wireless sensor networks using soft computing," in *2020 International Conference on Smart Technologies in Computing, Electrical and Electronics (ICSTCEE)*. IEEE, 2020, pp. 532–538.
- [103] D. S. Rajput, G. Meena, M. Acharya, and K. K. Mohbey, "Fault prediction using fuzzy convolution neural network on iot environment with heterogeneous sensing data fusion," *Measurement: Sensors*, 2023, vol. 26, p. 100701.
- [104] N. Jihani, M. N. Kabbaj, and M. Benbrahim, "Kalman filter based sensor fault detection in wireless sensor network for smart irrigation," *Results in Engineering*, 2023, vol. 20, p. 101395.

- [105] G. Mahalakshmi, S. Ramalingam, and A. Manikandan, "An energy efficient data fault prediction based clustering and routing protocol using hybrid asso with mernn in wireless sensor network," *Telecommunication Systems*, 2024, vol. 86, no. 1, pp. 61–82.
- [106] I. Sohn, "Small-world and scale-free network models for iot systems," *Mobile Information Systems*, 2017, vol. 2017, no. 1, p. 6752048.
- [107] A. Lachgar and A. Achahbar, "Uncovering the hidden structure of small-world networks," *Scientific Reports*, 2024, vol. 14, no. 1, p. 6555.
- [108] M. Dzaferagic, N. Marchetti, and I. Macaluso, "Fault detection and classification in industrial iot in case of missing sensor data," *IEEE Internet of Things Journal*, 2021, vol. 9, no. 11, pp. 8892–8900.
- [109] H. Zhang, Q. Zhang, J. Liu, and H. Guo, "Fault detection and repairing for intelligent connected vehicles based on dynamic bayesian network model," *IEEE Internet of Things Journal*, 2018, vol. 5, no. 4, pp. 2431–2440.
- [110] K. Haseeb, T. Saba, A. Rehman, Z. Ahmed, H. H. Song, and H. H. Wang, "Trust management with fault-tolerant supervised routing for smart cities using internet of things," *IEEE Internet of Things Journal*, 2022, vol. 9, no. 22, pp. 22 608–22 617.
- [111] G. Kaur and P. Chanak, "An intelligent fault tolerant data routing scheme for wireless sensor network-assisted industrial internet of things," *IEEE Transactions on Industrial Informatics*, 2022, vol. 19, no. 4, pp. 5543–5553.
- [112] S. Ali, O. Abusabha, F. Ali, M. Imran, and T. Abuhmed, "Effective multitask deep learning for iot malware detection and identification using behavioral traffic analysis," *IEEE Transactions on Network and Service Management*, 2022, vol. 20, no. 2, pp. 1199–1209.
- [113] T. Kavitha and D. Sridharan, "Security vulnerabilities in wireless sensor networks: A survey," *Journal of information Assurance and Security*, 2010, vol. 5, no. 1, pp. 31–44.
- [114] H. Ko and S. Pack, "Neighbor-aware energy-efficient monitoring system for energy harvesting internet of things," *IEEE Internet of Things Journal*, 2019, vol. 6, no. 3, pp. 5745–5752.

- [115] O. J. Pandey, V. Gautam, S. Jha, M. K. Shukla, and R. M. Hegde, "Time synchronized node localization using optimal h-node allocation in a small world wsn," *IEEE Communications Letters*, 2020, vol. 24, no. 11, pp. 2579–2583.
- [116] W. Zhang, J. Wang, G. Han, S. Huang, Y. Feng, and L. Shu, "A data set accuracy weighted random forest algorithm for iot fault detection based on edge computing and blockchain," *IEEE Internet of Things Journal*, 2020, vol. 8, no. 4, pp. 2354–2363.
- [117] B. Safaei, H. Taghizade, A. M. H. Monazzah, K. T. Khoosani, P. Sadeghi, A. Mohammadsalehi, J. Henkel, and A. Ejlali, "Introduction and evaluation of attachability for mobile iot routing protocols with markov chain analysis," *IEEE Transactions on Network and Service Management*, 2022, vol. 19, no. 3, pp. 3220–3238.
- [118] R. Priyadarshi and R. R. Kumar, "An energy-efficient leach routing protocol for wireless sensor networks," in *Proceedings of the Fourth International Conference on Microelectronics, Computing and Communication Systems*, V. Nath and J. K. Mandal, Eds. Singapore: Springer Singapore, 2021, pp. 423–430.
- [119] A. E. Fawzy, M. Shokair, and W. Saad, "Balanced and energy-efficient multi-hop techniques for routing in wireless sensor networks," *IET Networks*, 2018, vol. 7, no. 1, pp. 33–43.
- [120] L. Lin, L. Donghui, and L. Ding, "An efficient routing algorithm based on k-means++ clustering and fuzzy for wireless sensor network," in *2018 13th World Congress on Intelligent Control and Automation (WCICA)*. IEEE, 2018, pp. 716–720.
- [121] A. H. Abdulaal, A. Shah, and A. Pathan, "Nm-leach: A novel modified leach protocol to improve performance in wsn," *International Journal of Communication Networks and Information Security*, 2022, vol. 14, no. 1, pp. 1–10.
- [122] O. A. Karim, N. Javaid, A. Sher, Z. Wadud, and S. Ahmed, "Ql-eebdg: Qlearning based energy balanced routing in underwater sensor networks." *EAI Endorsed Trans. Energy Web*, 2018, vol. 5, no. 17, p. e15.
- [123] W. B. Heinzelman, A. P. Chandrakasan, and H. Balakrishnan, "An application-specific protocol architecture for wireless microsensor networks," *IEEE Transactions on wireless communications*, 2002, vol. 1, no. 4, pp. 660–670.
- [124] "<http://db.csail.mit.edu/labdata/labdata.html>."

- [125] Y. Yang, H. Wang, R. Jiang, X. Guo, J. Cheng, and Y. Chen, "A review of iot-enabled mobile healthcare: technologies, challenges, and future trends," *IEEE Internet of Things Journal*, 2022, vol. 9, no. 12, pp. 9478–9502.
- [126] O. Zhao, W.-S. Liao, K. Ishizu, and F. Kojima, "Dynamic and non-centric networking approach using virtual gateway platforms for low power wide area systems," *IEEE Access*, 2019, vol. 7, pp. 186 078–186 090.
- [127] X. Li, Q. Wang, M. Liu, J. Li, H. Peng, M. J. Piran, and L. Li, "Cooperative wireless-powered noma relaying for b5g iot networks with hardware impairments and channel estimation errors," *IEEE Internet of Things Journal*, 2020, vol. 8, no. 7, pp. 5453–5467.
- [128] R. D. Lestari, A. Rusdinar, M. A. Murti, G. Tawaqal, and D. Lee, "Design of iot-based river water monitoring robot data transmission model using low power wide area network (lpwan) communication technology," in *2019 IEEE International Conference on Internet of Things and Intelligence System (IoT&IS)*. IEEE, 2019, pp. 201–205.
- [129] P. Chanak, I. Banerjee, and R. S. Sherratt, "Simultaneous mobile sink allocation in home environments with applications in mobile consumer robotics," *IEEE Transactions on Consumer Electronics*, 2015, vol. 61, no. 2, pp. 181–188.
- [130] M.-K. Yi, W.-K. Lee, and S. O. Hwang, "A human activity recognition method based on lightweight feature extraction combined with pruned and quantized cnn for wearable device," *IEEE Transactions on Consumer Electronics*, 2023, vol. 69, no. 3, pp. 657–670.
- [131] F.-J. Alvarado-Alcon, R. Asorey-Cacheda, A.-J. Garcia-Sanchez, and J. Garcia-Haro, "Carbon footprint vs energy optimization in iot network deployments," *IEEE Access*, 2022, vol. 10, pp. 111 297–111 309.
- [132] V. Narayan, A. Daniel, and P. Chaturvedi, "E-feerp: Enhanced fuzzy based energy efficient routing protocol for wireless sensor network," *Wireless Personal Communications*, 2023, vol. 131, no. 1, pp. 371–398.
- [133] V. Sreejith, R. Surve, N. Vyas, K. Anupama, and L. J. Gudino, "Area based routing protocol for mobile wireless sensor networks," in *2018 International Conference on Information Networking (ICOIN)*. IEEE, 2018, pp. 782–786.

-
- [134] S. Wang, J. Yu, M. Atiquzzaman, H. Chen, and L. Ni, “Crpd: a novel clustering routing protocol for dynamic wireless sensor networks,” *Personal and Ubiquitous Computing*, 2018, vol. 22, pp. 545–559.
- [135] R. Almesaeed and A. Jedidi, “Dynamic directional routing for mobile wireless sensor networks,” *Ad Hoc Networks*, 2021, vol. 110, p. 102301.
- [136] R. R. Swain, P. M. Khilar, and T. Dash, “Multifault diagnosis in wsn using a hybrid metaheuristic trained neural network,” *Digital Communications and Networks*, 2020, vol. 6, no. 1, pp. 86–100.