Adaptation in IoT-Fog Data Transmission: SLR and Future Perspectives on Dynamic Frequency Control

Firmansyah Maulana Sugiartana Nursuwars[1,2*], Linawati[2], Nyoman Putra Sastra[2], Dewa Made Wiharta[2], Aceng Sambas[3]

[1]*Informatics, Faculty of Engineering, Universitas Siliwangi, Tasikmalaya, Indonesia*
[2]*Department of Electrical Engineering Faculty of Engineering, Udayana University, Bali, Indonesia*
[3]*Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin (UniSZA), Besut Campus, Besut 22200, Malaysia*
[*]*Corresponding author. Email: firmansyah@unsil.ac.id*

Abstract— The advancement of Internet of Things (IoT) and fog computing technologies has created significant opportunities for more efficient, faster, and proximity-based data management. However, IoT-Fog systems face considerable challenges related to device heterogeneity, traffic dynamics, and the complexity of network topologies that continuously change. This study conducts a Systematic Literature Review (SLR) of various research works covering dynamic scheduling, routing, context-aware data flow, offloading, and IoT-Fog systems without adaptive mechanisms. The findings indicate that most existing approaches still rely on relatively static topology assumptions, rendering them insufficiently adaptive to real-time changes in network conditions. One area identified as a research gap is dynamic frequency control, an adaptive mechanism capable of dynamically adjusting data transmission intensity based on network conditions. The main conclusion of this study emphasizes the necessity for developing adaptive systems that are topology-agnostic and supported by dynamic frequency control to maintain optimal performance even under significant topology changes. Such systems are anticipated to become a crucial foundation for future IoT-Fog applications, including smart cities, Industry 4.0, and intelligent healthcare services, which demand high reliability and low latency.

Keywords— Adaptive Systems; Context-Aware; Dynamic Scheduling; Fog Computing; Internet of Things (IoT); Offloading; Routing; Topology-Agnostic.

I. INTRODUCTION

Recent advancements in Internet of Things (IoT) and fog computing technologies have transformed data processing and transmission, especially in essential applications that demand real-time responsiveness and high energy efficiency. One of the biggest challenges with IoT-fog systems is developing adaptive mechanisms that can quickly respond to changing network loads, environmental conditions, and diverse application requirements. Adaptive systems in this ecosystem employ diverse methods, such as rapid detection of changes in data patterns to maintain analytic accuracy [1], fault-tolerant processing to ensure service reliability under node failures [2], and privacy-preserving schemes that safeguard data without imposing excessive computational overhead [3]. Moreover, the combination of lossless data compression techniques with fog computing has been proposed to facilitate the transmission of extensive data, such as EEG signals, thereby reducing latency and conserving bandwidth [4]. Improving the efficiency of data processing near the edge has also become an important trend to help IoT-fog systems work better [5].

Adaptive approaches continue to evolve, encompassing context-based risk management models, multivariate time-series prediction for more intelligent traffic control, and lightweight authentication schemes to secure data transmissions [6]–[9]. Research has also looked into how to improve system performance and resilience in changing conditions by combining collaborative computing, adaptive process migration, and security-based attribute identification at the fog layer [9–11]. The flexible use of blockchain technology is being looked at more to make sure that data is accurate and transactions are safe in fog architectures [12]. To best distribute workloads across the edge, fog, and cloud layers, frameworks like the Adaptive Fog Computing Framework (AFCF) have been created to meet the needs of different workloads and applications [13].

There has also been a lot of research on dynamic resource allocation using differentiated service models, context-aware access control, and fog architecture designs that support real-time data analytics to improve the management of changing traffic loads [14]–[16]. Recent trends show a lot of interest in using acoustic emission (AE) technology to use acoustic data as a key source of information for keeping an eye on the condition of industrial equipment and infrastructure. AE has been incorporated into IoT-fog systems to facilitate predictive monitoring, prompt identification of structural damage, and swift decision-making in industrial maintenance contexts [17]–[23]. Combining AE with fog computing not only improves sensor-based monitoring, but it also creates new possibilities for processing large amounts of real-time data.

TABLE I. DISTRIBUTION OF ADAPTIVE APPROACHES IN 208 SCIENTIFIC ARTICLES

No	Approach	Number of Articles	Percentage (%)
1	AI-based Scheduling	80	38.46%
2	Dynamic Routing	29	13.94%
3	Context-Aware Transmission	64	30.77%
4	Offloading Server	26	12.50%
5	System Implementation (Other)	9	4.33%

Received 18 July 2025, Revised 26 September 2025, Accepted 1 October 2025.
DOI: https://doi.org/10.15294/jte.v17i1.30564

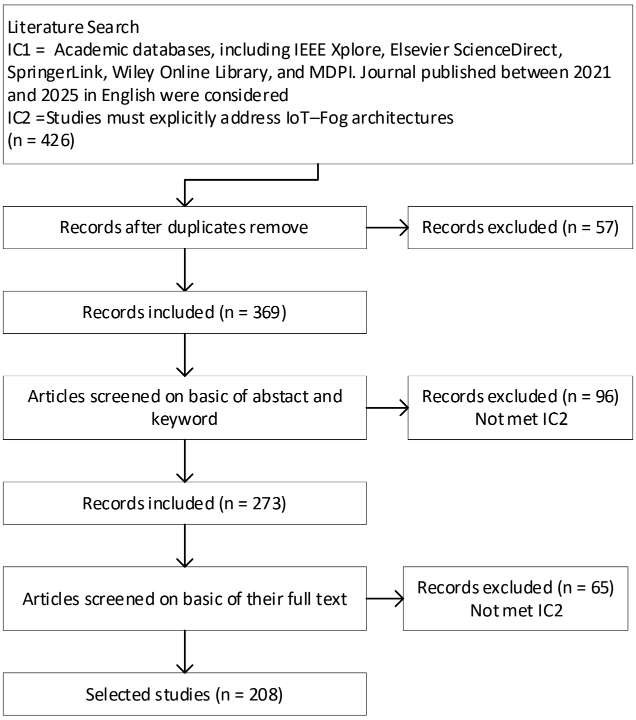

Figure 1. PRISMA Flow Diagram.

Dynamic frequency control is still largely unexplored as a particular adaptive strategy for controlling data transmission intensity in real-time, even though a variety of adaptive approaches have greatly improved the performance of IoT-fog systems. Dynamic frequency control has a lot of promise for maximizing resource utilization efficiency, decreasing latency, and stabilizing data flows—especially in situations with high data loads like AE data processing or other real-time applications. To achieve truly adaptive and scalable IoT-fog systems, dynamic frequency control may be a crucial mechanism, considering traffic dynamics, device conditions, and application requirements. Therefore, this study is particularly interested in the following research question:

RQ: How can dynamic frequency control be developed and systematically integrated into IoT–Fog architectures to enable adaptive, topology-agnostic, and lossless data transmission for real-time applications?

Based on this research gap, the current study intends to perform a thorough Systematic Literature Review (SLR) in order to define future research directions required to address the remaining challenges in the literature and to identify recent approaches related to dynamic frequency control in data transmissions within IoT-fog systems.

II. METHOD

This study was conducted using a Systematic Literature Review (SLR) approach to evaluate developments, trends, and research gaps related to adaptive data flow in IoT-Fog Computing systems, particularly in the context of single-server and single-link scenarios. The methodology comprised four main stages: literature search, article selection, data extraction, and synthesis analysis.

A. Literature Search Strategy

The literature search was performed across several leading academic databases, including IEEE Xplore, Elsevier ScienceDirect, SpringerLink, Wiley Online Library, and MDPI. The search keywords were: IoT-Fog computing, adaptive data transmission, dynamic routing, AI-based scheduling, context-aware data flow, and acoustic emission monitoring. The search focused on journal articles and international conference proceedings published between 2021 and 2025 to ensure relevance and currency of the reviewed findings.

B. Inclusion and Exclusion Criteria

The inclusion criteria for this study comprised articles discussing IoT systems involving fog computing, exploring adaptive approaches at network, server, or data transmission levels, and focusing on system performance optimization metrics such as latency, throughput, bandwidth efficiency, or resource utilization. Additionally, only studies involving real-world scenarios or large-scale simulations were included in the analysis. Conversely, articles solely discussing cloud computing without fog involvement, studies focusing exclusively on security or encryption aspects without direct relation to data flow, non-English publications, and non-peer-reviewed papers such as editorials or opinion pieces were excluded from this review. The purpose of these inclusion and exclusion criteria was to ensure that only relevant, high-quality literature was analyzed within the context of this research.

C. Selection and Data Extraction

The systematic search initially identified 426 articles across major databases. To ensure methodological rigor, the following inclusion criteria were applied:

- IC1: Peer-reviewed journal articles published between 2021 and 2025 in English were considered.
- IC2: Studies must explicitly address IoT–Fog architectures.

Following the removal of duplicate records, 369 unique articles remained. Title and abstract screening was then performed according to IC1 and IC2, which further reduced the dataset to 273 articles. A subsequent full-text review excluded studies that did not fully satisfy the inclusion criteria, resulting in 208 articles being retained for final synthesis and analysis. This multi-stage selection process ensured that only relevant and high-quality studies were considered, thereby strengthening the validity and reproducibility of the review. The complete flow of article identification, screening, and inclusion is summarized in the PRISMA diagram presented in Figure 1.

The extracted data included: Adaptive methods implemented (e.g., offloading, AI-based scheduling, routing, context-aware transmission), System architectures reviewed (multi-server vs. single-server), Optimization focus (transmission frequency, data prioritization, communication paths), System performance evaluations (latency, throughput, bandwidth usage)

D. Synthesis Analysis

The selected articles were analyzed both qualitatively and quantitatively. The analysis involved categorizing articles into dominant adaptive approach groups, identifying their strengths, limitations, and relevance within single-server and single-link contexts. The data synthesis included comparisons among approaches, identification of key trends, areas of research that remain underexplored, and potential future research directions. The results of the analysis were visualized using diagrams, classification tables, and descriptive statistics to reinforce the research findings.

III. Results and Discussion

This study systematically analyzes 208 scientific articles published between 2021 and 2025 to evaluate adaptive approaches in IoT-Fog Computing, particularly concerning data flow management. The review categorizes adaptive solutions into five main approaches: AI-based scheduling, dynamic routing, context-aware transmission, server offloading, and implementations based on specialized methods. The distribution of articles presented in Table I reflects current research trends, ranging from the use of artificial intelligence and dynamic routing to offloading strategies. This classification aids in mapping the contributions of each approach to system optimization and in identifying areas that require further research, serving as the foundation for the analysis in the State-of-the-Art section.

A. AI-based Scheduling

The literature highlights AI-based scheduling as a central mechanism in IoT–Fog environments, targeting energy efficiency, latency reduction, and resource optimization. Various techniques have been developed, ranging from latency-aware neural networks that balance scheduling efficiency with migration delays [24], to heuristic and metaheuristic methods (e.g., greedy, learning-based, hybrid, and nature-inspired approaches) that address heterogeneity and resource constraints [25]. Advanced approaches such as Deep Q-Learning (DQL) outperform traditional methods for delay-sensitive applications [26]–[28], while reinforcement learning integrated with fuzzy logic achieves notable improvements in latency and energy consumption [29], [30]. Evolutionary and swarm-based methods, including Genetic Algorithms (GA) [31]–[34], Particle Swarm Optimization (PSO), the Jellyfish Algorithm [35]–[37], and Simulated Annealing [38], further optimize task mapping and resource allocation.

Recent studies emphasize multi-objective optimization to ensure service quality across multiple parameters [39]–[42], with specialized solutions such as the Intelligent Salp Swarm for scientific workflows [43] and security-driven FUPE for SDN-IoT-Fog [44]. Hybrid AI that combines machine learning with classical algorithms [45]–[47], as well as resource-aware [48]–[51], security-aware [52]–[54], explainable AI (XAI) [55]–[57], and federated learning [58]–[60], has become increasingly important for scalability and data privacy.

Overall, AI-based scheduling consistently outperforms conventional methods [34], [47], [55], [61] and demonstrates significant progress in healthcare, smart cities, industry, and smart grids [66]–[70]. Nonetheless, challenges remain regarding scalability, computational overhead, and robustness in dynamic environments [62]–[65], and integrating these diverse methods into comprehensive frameworks remains a key research direction [71]–[103].

B. Dynamic Routing

Research on dynamic routing within the IoT-Fog ecosystem has become increasingly crucial for communication efficiency, latency reduction, and reliable data transmission [104]. Solutions such as FOG-RPL integrate energy management and load balancing [104], while DMRVR optimizes logistics routing based on Fog-VANET architectures [105]. Approaches leveraging fuzzy logic, trust management, and cognitive computing enhance routing reliability in dynamic environments [106], [107]. Service prioritization models [108], multiple RPL instances [109], and robust protocols like RSock [110] have also been proposed. The integration of Software-Defined Networking (SDN) with machine learning supports adaptive routing [111], while service-aware routing strengthens interoperability across service providers [112]. Advancements in dynamic routing span applications in autonomous vehicles [113], opportunistic and hybrid protocols [114], [115], as well as trust management mechanisms [116], [117]. The application of machine learning in dynamic routing optimizes both Quality of Service (QoS) and security [118]–[122], including improvements in energy efficiency [123]–[126]. Recent trends encompass Industrial IoT-Fog 5.0 [127], [128], big data-driven routing strategies [129], [130], and hybrid heuristic-ML methods [131], [132], although significant challenges related to scalability and security remain.

C. Context-Aware Transmission

Research on context-aware data flow in IoT-Fog systems has rapidly evolved to enhance system intelligence, efficiency, and adaptability [133]–[135]. Context-aware scheduling leverages environmental context, application priorities, and real-time network conditions to reduce latency for delay-sensitive applications [133]–[135]. Meanwhile, context-aware routing utilizes information such as node locations, traffic patterns, and trust levels to improve network stability and energy efficiency [136]–[138], with integration into Software-Defined Networking (SDN) enabling more dynamic communication control [139], [140]. In resource placement, user location context and workload characteristics are key factors in determining application deployment to enhance service performance and conserve bandwidth [141]–[143], aligning with Industry 4.0 demands [144]. Context-aware offloading has also emerged as a solution for deciding where processes should execute—at the edge, fog, or cloud—to achieve energy efficiency and low latency [145]–[147]. Additionally, context-based trust and reputation models support fog network security [148]–[150], including adaptive access control mechanisms [151]–[153]. Context-aware resource discovery facilitates efficient service lookup with low overhead [154]–[156], while machine learning integration enables predictive resource demand forecasting and anomaly detection [157]–[159]. Research has also focused on energy efficiency [160]–[162], big data analytics [163]–[165], and explainable models to improve system transparency [166]–[168]. These trends are expanding into specific applications such as smart transportation, healthcare, and industrial automation [169]–[173], as well as large-scale data processing using context-aware approaches [174]–[196].

D. Offloading Server

The literature on offloading in IoT-Fog systems has been rapidly expanding, driven by the need for real-time services, energy efficiency, and optimal data processing at the edge [197]–[200]. Energy-optimal offloading has gained significant attention, with strategies considering power consumption, latency, and network load to maintain service quality for delay-sensitive applications [197]–[200]. Dynamic collaborative offloading has also been extensively studied, leveraging cooperation among edge and fog nodes to adaptively distribute computational loads based on network conditions [201]–[203]. In the realm of optimization, approaches such as stochastic programming and multi-stage deferred acceptance have produced robust offloading solutions resilient to traffic uncertainties [202], [204]. Hybrid fog-cloud offloading enables the sharing of computational loads between fog and cloud layers, employing machine learning algorithms like Q-learning for autonomous decision-making [205], [206]. Adaptive offloading frameworks, such as FRATO, consider dynamic parameters like traffic load and resource status to achieve efficient service provisioning [203], [207]. Integrating offloading with dynamic resource allocation has been shown to enhance resource utilization and reduce latency [208], [209]. Systematic reviews have identified significant progress alongside major challenges, including data security, communication overhead, and the limitations of edge resources [210], [211]. Recent research directions include predictive analytics-based approaches [212], [213], energy-efficient strategies [199], [214], and QoS-aware offloading [200], [215], with applications extending to big data analytics [216], [217] and edge intelligence [218]–[220]. Nevertheless, energy sustainability and scalability remain critical ongoing challenges [221], [222].

E. System Implementation (Other)

Research on IoT-Fog systems without adaptive schemes continues to make significant contributions, particularly in areas such as security, resource management, and network architecture. Fog security schemes support fine-grained data protection with energy efficiency benefits [223], while multi-level trust management enhances network reliability [224]. In smart building applications, fog-based systems enable rapid anomaly detection and response [225]. Fog architectures have demonstrated reductions in latency for industrial applications [226], and revocable privacy-preserving schemes facilitate dynamic access control [227]. Other studies have focused on stochastic traffic-based fog node planning [228], optimal deployment via Integer Linear Programming (ILP) [229], engineering fog systems [230], and link-aware energy-efficient mechanisms [231].

F. Comparative Quantitative Analysis of Adaptive Approaches

Table II presents a quantitative performance comparison of the five major adaptive IoT-Fog approaches. AI-based scheduling achieves the lowest latency (5–20 ms) and the highest throughput, yet at the cost of very high energy consumption due to intensive ML/DL processing. Dynamic routing provides balanced performance with medium latency and relatively high throughput, but its efficiency is dependent on the availability of multiple paths, and energy usage grows with the number of hops. Context-aware transmission demonstrates strong energy savings through data filtering, but this comes at the expense of data integrity, leading to higher latency (30–70 ms) and only moderate throughput. Offloading server strategies deliver high throughput and low-to-medium latency by distributing tasks to fog or cloud nodes, though this introduces high energy costs and dependency on infrastructure. Finally, the non-adaptive baseline shows the poorest performance, with latency exceeding 70 ms, low throughput, and only marginal energy efficiency, reflecting the absence of any adaptive optimization.

Overall, the table highlights a clear trade-off: none of the existing approaches can simultaneously guarantee low latency, high throughput, and energy efficiency, underscoring the need for a more topology-agnostic and lossless solution.

G. Topology-Agnostic Framework as Future Research Directions

The review highlights five adaptive IoT-Fog approaches: AI-based scheduling, dynamic routing, context-aware transmission, offloading, and the non-adaptive baseline. Each offers advantages but depends on specific topologies. AI-based scheduling reduces latency but incurs high computational cost; dynamic routing requires multi-path availability; context-aware transmission saves energy but sacrifices integrity; offloading improves throughput but relies on multi-server setups; and the non-adaptive baseline, while simple, lacks adaptability.

This analysis underscores that the most suitable solution is a topology-agnostic framework. Unlike conventional approaches, it does not rely on network structure but instead adapts data flow frequency dynamically while preserving lossless transmission, maintaining lightweight computation, and ensuring scalability. Thus, topology-agnostic adaptive frequency control emerges as the answer to the limitations inherent in the five conventional approaches.

TABLE II. DISTRIBUTION OF ADAPTIVE APPROACHES IN 208 SCIENTIFIC ARTICLES

Approach	Average Latency (ms)	Throughput (kbps–Mbps)	Energy Consumption (relative)
AI-based Scheduling	5–20 (low)	High (>90% bandwidth utilization)	High (requires ML/DL, heavy computation)
Dynamic Routing	20–50 (medium)	Medium–High (depends on protocol)	Medium (energy varies with hops and route updates)
Context-Aware Transmission	30–70 (medium–high)	Medium (improved efficiency due to data filtering)	Low (saves bandwidth and energy)
Offloading Server	10–40 (low–medium)	High (depends on fog/cloud capacity)	High (edge devices save energy, but server load increases)
Non-adaptive Baseline	>70 (high)	Low (often bottlenecked)	Low–Medium (no optimization)

TABLE III. COMPARISON OF FIVE ADAPTIVE IOT-FOG APPROACHES ACROSS SEVEN PERFORMANCE CRITERIA.

Approach	A	B	C	D	E	F	G
AI-based Scheduling	3	4	2	5	3	2	3
Dynamic Routing	4	4	3	3	4	3	4
Context-Aware Transmission	3	2	4	3	3	5	4
Offloading Server	2	4	3	2	3	2	4
Non-adaptive Baseline	2	3	5	1	2	3	5
Proposed AFC (Topology-Agnostic)	5	5	4	5	5	4	5

A = Topology Compatibility
B = Data Integrity
C = Computational Load (low=5)
D = Frequency Adaptivity
E = Deployment Scalability
F = Energy Efficiency
G = Reproducibility

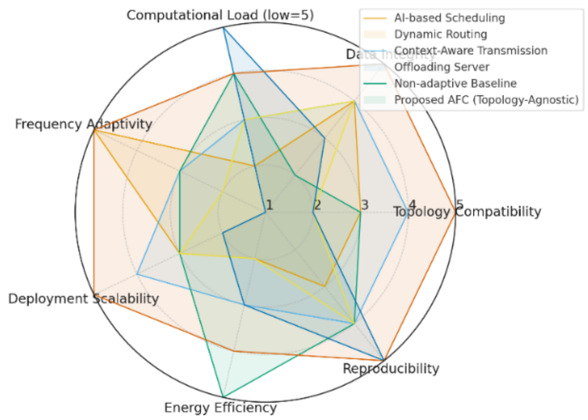

Figure 2. Radar chart of five adaptive IoT-Fog approaches across seven criteria, showing trade-offs and no single optimal solution.

The comparative quantitative analysis (Table III, Figure. 2) demonstrates that the topology-agnostic AFC occupies a dominant position in topology compatibility, data integrity, frequency adaptivity, deployment scalability, and reproducibility (score 5/5), while maintaining low computational load (4/5) through its rule-based logic. Compared with AI-based scheduling, AFC avoids the energy-hungry overhead of ML models (AI: load = 2/5, energy = 2/5) yet still preserves adaptive latency through frequency control. In contrast to context-aware transmission, which is energy-efficient (5/5) but compromises data integrity (2/5), AFC ensures full lossless transmission (5/5). Offloading improves throughput but remains constrained by topology compatibility (2/5) and energy efficiency (2/5). The non-adaptive baseline is easy to replicate (5/5) and imposes minimal computational load (5/5) but completely fails to adapt (1/5). These findings highlight the central trade-offs—ML-heavy versus reproducibility, and filtering-based versus integrity—positioning AFC as a lossless, lightweight, and deployment-friendly solution.

IV. Conclusion

The literature review shows that IoT-Fog systems have advanced considerably through AI-based scheduling, dynamic routing, context-aware data flow, and offloading, enabling data processing closer to the edge. While these innovations address latency, energy, security, and resource challenges, the dynamic and heterogeneous topology of IoT-Fog networks remains problematic, as mobility, traffic variation, and service dynamics cannot be managed by static approaches. This highlights the need for adaptive, topology-agnostic systems that autonomously adjust to changing conditions, ensuring service performance, lower latency, and efficient resource use. Such systems are essential for future IoT-Fog architectures, particularly in critical domains such as smart cities, Industry 4.0, and healthcare.

V. Acknowledgement

The author acknowledges the use of OpenAI"s ChatGPT in assisting the preparation of this manuscript. ChatGPT was utilized to support academic writing tasks, such as summarizing literature, and improving grammar and structure. All intellectual content, critical analysis, interpretation of data, and final conclusions are solely the responsibility of the author.

References

[1] L. Yang and A. Shami, "A Lightweight Concept Drift Detection and Adaptation Framework for IoT Data Streams", IEEE Internet of Things Magazine, vol. 4, no. 2, pp. 96–101, Jun. 2021. DOI: 10.1109/IOTM.0001.2100012

[2] K. Wang, Y. Shao, L. Xie, J. Wu, and S. Guo, "Adaptive and Fault-Tolerant Data Processing in Healthcare IoT Based on Fog Computing", IEEE Transactions on Network Science and Engineering, vol. 7.0, no. 1.0, pp. 263.0–273.0, 2020. DOI: 10.1109/TNSE.2018.2859307

[3] S. Chen, X. Zhu, H. Zhang, C. Zhao, G. Yang, and K. Wang, "Efficient Privacy Preserving Data Collection and Computation Offloading for Fog-Assisted IoT", IEEE Transactions on Sustainable Computing, vol. 5, no. 4, pp. 526–540, Oct. 2020. DOI: 10.1109/TSUSC.2020.2968589

[4] S. K. Idrees and A. K. Idrees, "New fog computing enabled lossless EEG data compression scheme in IoT networks", Journal of Ambient Intelligence and Humanized Computing, pp. 1.0–14.0, 2021. DOI: 10.1007/S12652-021-03161-5

[5] J. Bhatia et al., "An Overview of Fog Data Analytics for IoT Applications", Sensors, vol. 23.0, no. 1.0, pp. 199.0–199.0, 2022. DOI: 10.3390/s23010199

[6] S. Selvan and M. Mahinderjit Singh, "Adaptive Contextual Risk-Based Model to Tackle Confidentiality-Based Attacks in Fog-IoT Paradigm", Computers, vol. 11.0, no. 2.0, pp. 16.0–16.0, 2022. DOI: 10.3390/computers11020016

[7] J. Han, G. H. Lee, S. Park, J. Lee, and J. K. Choi, "A Multivariate-Time-Series-Prediction-Based Adaptive Data Transmission Period Control Algorithm for IoT Networks", IEEE Internet of Things Journal, vol. 9, no. 1, pp. 419–436, Jan. 2022. DOI: 10.1109/JIOT.2021.3124673

[8] A. Murugesan, B. Saminathan, R. L. Kumar, and F. Al Turjman, "A lightweight authentication and secure data access between fog and IoT user", International Journal of Electronic Business, vol. 16.0, no. 1.0, pp. 77.0–87.0, 2021. DOI: 10.1504/IJEB.2021.10034874

[9] H. Zhao, G. Sun, W. Li, P. Zuo, Z. Li, and Z. Wei, "Intelligent Computing Collaboration for the Security of the Fog Internet of Things", Symmetry, vol. 15.0, no. 5.0, pp. 974.0–974.0, 2023. DOI: 10.3390/sym15050974

[10] C. Chang, A. Hadachi, and S. N. Srirama, "Adaptive Edge Process Migration for IoT in Heterogeneous Fog and Edge Computing Environments", International Journal of Mobile Computing and Multimedia Communications, vol. 11.0, no. 3.0, pp. 1.0–21.0, 2020. DOI: 10.4018/IJMCMC.2020070101

[11] J. Xiao, C. Chang, P. Wu, and Y. Ma, "Attribute identification based IoT fog data security control and forwarding," *PeerJ Computer Science*, vol. 9, p. e1747, Dec. 2023 [Online]. DOI: 10.7717/peerj-cs.1747

[12] J. N. S. S. J. Naidu and E. N. Ganesh, "An Adaptive Blockchain based Three-Tier Architecture in Fog based IoT for Personal Healthcare Data Application," *International Journal on Recent and Innovation Trends in Computing and Communication*, vol. 11, no. 6, pp. 476–483, Aug. 2023 [Online]. DOI: 10.17762/ijritcc.v11i6.7786

[13] V. K. R. K, V. Bande, N. Jacob, M. A, K. S. SK, and S. Vikruthi, "Adaptive Fog Computing Framework (AFCF): Bridging IoT and Blockchain for Enhanced Data Processing and Security," *International Journal of Electronics and Communication Engineering*, vol. 11, no. 3, Mar. 2024 [Online]. DOI: 10.14445/23488549/IJECE-V11I3P116

[14] V. Mahavaishnavi, V. Padmavathi, and R. Saminathan, "Dynamic Resource Allocation for IoT-Fog Architectures Leveraging Differential Services and Adaptive QoS Models", in 2024 International Conference on IoT Based Control Networks and Intelligent Systems (ICICNIS), 2024, pp. 374–380. DOI: 10.1109/ICICNIS64247.2024.10823234

[15] R. Kalaria, A. S. M. Kayes, W. Rahayu, E. Pardede, and A. Salehi Shahraki, "Adaptive context-aware access control for IoT environments leveraging fog computing," International Journal of Information Security, vol. 23, no. 4, pp. 3089–3107, Aug. 2024. DOI: 10.1007/s10207-024-00866-4

[16] P. Mahalle and S. S. Patil, "Design and Implementation of a Fog Computing Architecture for IoT Data Analytics," *Research Journal of Computer Systems and Engineering*, vol. 4, no. 2, pp. 46–59, Dec. 2023 [Online]. DOI: 10.52710/rjcse.73

[17] V. Godinez-Azcuaga et al.,, "An Acoustic Emission IoT Device for Wind Turbine Rotor Blade Condition Monitoring", E-Journal of nondestructive testing, vol. 28, no. 8, 2023. DOI: 10.58286/28182

[18] Y. L. Zhipeng Xie, "Internet of things acoustic emission for unattended quantitative leakage monitoring", e-Journal of Nondestructive Testing, vol. 28, no. 1, 2023. DOI: 10.58286/27622

[19] F. Zonzini et al., "Structural Health Monitoring and Prognostic of Industrial Plants and Civil Structures: A Sensor to Cloud Architecture", IEEE Instrumentation & Measurement Magazine, vol. 23, no. 9, pp. 21.0–27.0, 2020. DOI: 10.1109/MIM.2020.9289069

[20] X. F. Qi, Y. Yang, W. P. Kang, Q. Wang, and G. Zhao, "On-line Monitoring by Acoustic Emission of Butt Joint Structure on the Composite Fuselage Frame", IOP Conference Series: Materials Science and Engineering, vol. 739, no. 1, p. 012043, Jan. 2020. DOI: 10.1088/1757-899X/739/1/012043

[21] G. L. Mikhail Prokofyev Heribert Marihart, "Acoustic emission monitoring for industrial pressure vessels and infrastructure", E-Journal of nondestructive testing, vol. 29, no. 7, 2024. DOI: 10.58286/29708

[22] S. E. K. Arturo Nunez, "Effective approaches to remote asset monitoring with acoustic emission", e-Journal of Nondestructive Testing, vol. 28, no. 1, 2023. DOI: 10.58286/27600

[23] V. Godinez-Azcuaga, O. Ley, A. Nunez, E. Lowenhar, and S. Kattis, "NDE 4.0 a natural step for acoustic emission", e-Journal of Nondestructive Testing, vol. 28, no. 1, Jan. 2023. DOI: 10.58286/27602

[24] J. B. Lim, "Latency-Aware Task Scheduling for IoT Applications Based on Artificial Intelligence with Partitioning in Small-Scale Fog Computing Environments", Sensors, vol. 22, no. 19.0, p. 7326, 2022. DOI: 10.3390/s22197326

[25] D. Alsadie, "Advancements in heuristic task scheduling for IoT applications in fog-cloud computing: challenges and prospects", PeerJ, vol. 10, pp. e2128–e2128, 2024. DOI: 10.7717/peerj-cs.2128

[26] S. Ö. Ibrahim Kök Feyza Yildirim Okay, "FogAI: An AI-supported fog controller for Next Generation IoT", Internet of things, vol. 19, p. 100572, 2022. DOI: 10.1016/j.iot.2022.100572

[27] B. Sellami, "Energy-aware task scheduling and offloading using deep reinforcement learning in SDN-enabled IoT network", Computer

networks, vol. 210, p. 108957, 2022. DOI: 10.1016/j.comnet.2022.108957

[28] L. Yang, "A New Task Scheduling Framework for Internet of Things based on Agile VNFs On-demand Service Model and Deep Reinforcement Learning Method", International Journal of Advanced Computer Science and Applications, vol. 14, no. 3, 2023. DOI: 10.14569/IJACSA.2023.0140308

[29] M. R. Raju and S. K. Mothku, "Delay and energy aware task scheduling mechanism for fog-enabled IoT applications: A reinforcement learning approach", Computer networks, vol. 224, p. 109603, 2023. DOI: 10.1016/j.comnet.2023.109603

[30] A. S. Gowri, P. S. Bala, Z. Ramdinthara, and T. S. Kumar, "ACT on Monte Carlo FogRA for Time-Critical Applications of IoT", International Journal of Advanced Computer Science and Applications, vol. 13, no. 10.0, 2022. DOI: 10.14569/ijacsa.2022.0131049

[31] J. U. Arshed, M. Ahmed, T. Muhammad, M. Afzal, M. Arif, and B. Bazezew, "GA-IRACE: Genetic Algorithm-Based Improved Resource Aware Cost-Efficient Scheduler for Cloud Fog Computing Environment", Wireless Communications and Mobile Computing, vol. 2022, pp. 1–19, 2022. DOI: 10.1155/2022/6355192

[32] R. K. Behera, A. Patro, K. H. K. Reddy, and D. S. Roy, "An Efficient Fog Layer Task Scheduling Algorithm for Multi-Tiered IoT Healthcare Systems", International journal of reliable and quality e-healthcare, vol. 11, no. 4.0, pp. 1–11, 2022. DOI: 10.4018/ijrqeh.308802

[33] O. A. Khan et al., "A cache-based approach toward improved scheduling in fog computing", Software - Practice and Experience, vol. 51, no. 12.0, pp. 2360–2372, 2021. DOI: 10.1002/SPE.2824

[34] H. Eldin Refaat, "MLITS:Multi-Level tasks scheduling model for IoT Service Provisioning", Bulletin of Informatics, vol. 2, no. 1, pp. 1–9, Jan. 2020. DOI: 10.21608/fcihib.2020.107525

[35] R. S. C. Ruchika Bhakhar, "Dynamic multi-criteria scheduling algorithm for smart home tasks in fog-cloud IoT systems", Dental science reports, vol. 14, no. 1.0, 2024. DOI: 10.1038/s41598-024-81055-0

[36] M. Hosseinzadeh et al., "Task Scheduling Mechanisms for Fog Computing: A Systematic Survey", IEEE Access, pp. 1–1, 2023. DOI: 10.1109/ACCESS.2023.3277826

[37] R. B. Mohammad Goudarzi Marimuthu Palaniswami, "Scheduling IoT Applications in Edge and Fog Computing Environments: A Taxonomy and Future Directions", ACM Computing Surveys, vol. 55, no. 7.0, pp. 1–41, 2022. DOI: 10.1145/3544836

[38] A. Mahjoubi, K.-J. Grinnemo, and J. Taheri, "An Efficient Simulated Annealing-based Task Scheduling Technique for Task Offloading in a Mobile Edge Architecture", in 2022 IEEE 11th International Conference on Cloud Networking (CloudNet), 2022, pp. 159–167. DOI: 10.1109/CloudNet55617.2022.9978900

[39] A. Nazari, S. Sohrabi, R. Mohammadi, M. Nassiri, and M. Mansoorizadeh, "IETIF: Intelligent Energy-Aware Task Scheduling Technique in IoT/Fog Networks", Journal of Sensors, vol. 2023, pp. 1–13, 2023. DOI: 10.1155/2023/2644846

[40] D. Rahbari, "Analyzing Meta-Heuristic Algorithms for Task Scheduling in a Fog-Based IoT Application", Algorithms, vol. 15, no. 11.0, p. 397, 2022. DOI: 10.3390/a15110397

[41] A. G. Jakwa, Dr Gital, P. Souley, and Dr. F. U. Z. U. Zambuk, "Hybrid Meta-Heuristics Based Task Scheduling Algorithm for Energy Efficiency in Fog Computing", International journal of advances in scientific research and engineering, vol. 09, no. 2.0, pp. 20–28, 2023. DOI: 10.31695/ijasre.2023.9.2.3

[42] A. Hazra, M. Adhikari, T. Amgoth, and S. N. Srirama, "Joint Computation Offloading and Scheduling Optimization of IoT Applications in Fog Networks", IEEE Transactions on Network Science and Engineering, vol. 7, no. 4.0, pp. 3266–3278, 2020. DOI: 10.1109/TNSE.2020.3021792

[43] N. Rizvi, D. Ramesh, P. C. S. Rao, and K. Mondal, "Intelligent Salp Swarm Scheduler With Fitness Based Quasi-Reflection Method for Scientific Workflows in Hybrid Cloud-Fog Environment", IEEE Transactions on Automation Science and Engineering, vol. 20, pp. 862–877, 2023. DOI: 10.1109/TASE.2022.3170549

[44] S. Javanmardi, M. Shojafar, R. Mohammadi, A. Nazari, V. Persico, and A. Pescapè, "FUPE: A security driven task scheduling approach for SDN-based IoT–Fog networks", Journal of Information Security and Applications, vol. 60, p. 102853, Aug. 2021. DOI: 10.1016/j.jisa.2021.102853

[45] S. Arisdakessian, O. A. Wahab, A. Mourad, H. Otrok, and N. Kara, "FoGMatch: An Intelligent Multi-Criteria IoT-Fog Scheduling Approach Using Game Theory", IEEE ACM Transactions on Networking, vol. 28, no. 4.0, pp. 1779–1789, 2020. DOI: 10.1109/TNET.2020.2994015

[46] S. Iftikhar et al., "HunterPlus: AI based energy-efficient task scheduling for cloud-fog computing environments", Internet of things, vol. 21, p. 100667, 2022. DOI: 10.1016/j.iot.2022.100667

[47] X. T. Tran, "A Proposed Scheduling Algorithm for IoT Applications in a Merged Environment of Edge, Fog, and Cloud", Computing and Informatics Computers and Artificial Intelligence, vol. 42, no. 2.0, pp. 311–339, 2023. DOI: 10.31577/cai_2023_2_311

[48] Z. R. Nupur Jangu, "Improved Jellyfish Algorithm-based multi-aspect task scheduling model for IoT tasks over fog integrated cloud environment", Journal of cloud computing, vol. 11, no. 1.0, pp. 1–21, 2022. DOI: 10.1186/s13677-022-00376-5

[49] S. K. Munish Bhatia Sandeep K. Sood, "Quantumized approach of load scheduling in fog computing environment for IoT applications", Computing, vol. 102, no. 5.0, pp. 1097–1115, 2020. DOI: 10.1007/S00607-019-00786-5

[50] A. Hazra, P. K. Donta, T. Amgoth, and S. Dustdar, "Cooperative Transmission Scheduling and Computation Offloading With Collaboration of Fog and Cloud for Industrial IoT Applications", IEEE Internet of Things Journal, vol. 10, pp. 3944–3953, 2023. DOI: 10.1109/JIOT.2022.3150070

[51] A. S. Ahmad Sharif Mohsen Nickray, "Fault-tolerant with load balancing scheduling in a fog-based IoT application", Iet Communications, vol. 14, no. 16.0, pp. 2646–2657, 2020. DOI: 10.1049/IET-COM.2020.0080

[52] P. Krivic, M. Kusek, I. Cavrak, and P. Skocir, "Dynamic Scheduling of Contextually Categorised Internet of Things Services in Fog Computing Environment", Sensors, vol. 22, no. 2.0, p. 465, 2022. DOI: 10.3390/s22020465

[53] O. Sharma, G. Rathee, C. A. Kerrache, and J. Herrera-Tapia, "Two-Stage Optimal Task Scheduling for Smart Home Environment Using Fog Computing Infrastructures", Applied Sciences, vol. 13, no. 5.0, p. 2939, 2023. DOI: 10.3390/app13052939

[54] B. M. Nguyen *et al.*, "A Novel Nature-Inspired Algorithm for Optimal Task Scheduling in Fog–Cloud Blockchain System," *IEEE Internet of Things Journal*, vol. 11, no. 2, pp. 2043–2057, Jan. 2024 [Online]. DOI: 10.1109/JIOT.2023.3292872

[55] A. mohammad H. Zahra Movahedi Bruno Defude, "An efficient population-based multi-objective task scheduling approach in fog computing systems", Journal of Cloud Computing, vol. 10, no. 1.0, pp. 1–31, 2021. DOI: 10.1186/S13677-021-00264-4

[56] W. Liu, C. Li, A. Zheng, Z. Zheng, Z. Zhang, and Y. Xiao, "Fog Computing Resource-Scheduling Strategy in IoT Based on Artificial Bee Colony Algorithm", Electronics, vol. 12, no. 7.0, p. 1511, 2023. DOI: 10.3390/electronics12071511

[57] J. Xu, Z. Hao, R. Zhang, and X. Sun, "A Method Based on the Combination of Laxity and Ant Colony System for Cloud-Fog Task Scheduling", IEEE Access, vol. 7, pp. 116218–116226, 2019. DOI: 10.1109/ACCESS.2019.2936116

[58] B. M. Nguyen *et al.*, "Directed Search: A New Operator in NSGA-II for Task Scheduling in IoT Based on Cloud-Fog Computing", IEEE Transactions on Cloud Computing, vol. 11, pp. 2144–2157, 2023. DOI: 10.1109/TCC.2022.3188926

[59] R. Ebrahim Pourian, M. Fartash, and J. Akbari Torkestani, "A Deep Learning Model for Energy-Aware Task Scheduling Algorithm Based on Learning Automata for Fog Computing", The Computer Journal, vol. 67, no. 2, pp. 508–518, Feb. 2024. DOI: 10.1093/comjnl/bxac192

[60] S. Ghanavati, J. Abawajy, and D. Izadi, "Automata-Based Dynamic Fault Tolerant Task Scheduling Approach in Fog Computing", IEEE Transactions on Emerging Topics in Computing, vol. 10, no. 1, pp. 488–499, Jan. 2022. DOI: 10.1109/TETC.2020.3033672

[61] Q. Duan, H. Liang, J. Xu, X. Sun, and R. Zhang, "Fog-cloud task scheduling of energy consumption optimisation with deadline consideration", International Journal of Internet Manufacturing and Services, vol. 7, no. 4.0, pp. 375–392, 2020. DOI: 10.1504/IJIMS.2020.10028654

[62] M. Ashraf, M. Shiraz, A. Abbasi, O. Alqahtani, G. Badshah, and A. Lasisi, "Microservice Application Scheduling in Multi-Tiered Fog-Computing-Enabled IoT", Sensors, vol. 23, no. 16, p. 7142, Aug. 2023. DOI: 10.3390/s23167142

[63] N. Potu, C. Jatoth, and P. Parvataneni, "Optimum Batch Scheduling Model for Quality Aware Delay Sensitive Data Transmission over Fog Enabled IOT Network", Scalable Computing: Practice and Experience, vol. 25, no. 2, pp. 1152–1166, Feb. 2024. DOI: 10.12694/scpe.v25i2.2620

[64] P. Yadav and D. P. Vidyarthi, "An efficient fuzzy-based task offloading in edge-fog-cloud architecture," *Concurrency and Computation: Practice and Experience*, vol. 35, no. 26, Nov. 2023 [Online]. DOI: 10.1002/cpe.7843

[65] S. Javanmardi, M. Shojafar, R. Mohammadi, V. Persico, and A. Pescapè, "S-FoS: A secure workflow scheduling approach for performance optimization in SDN-based IoT-Fog networks", Journal of information security and applications, vol. 72, p. 103404, 2023. DOI: 10.1016/j.jisa.2022.103404

[66] A. Hazra, M. Adhikari, T. Amgoth, and S. N. Srirama, "Collaborative AI-Enabled Intelligent Partial Service Provisioning in Green Industrial Fog Networks", IEEE Internet of Things Journal, vol. 10, no. 4, pp. 2913–2921, Feb. 2023. DOI: 10.1109/JIOT.2021.3110910

[67] K. C. Serdaroglu and S. Baydere, "An Efficient Multipriority Data Packet Traffic Scheduling Approach for Fog of Things", IEEE Internet of Things Journal, vol. 9, no. 1, pp. 525–534, Jan. 2022. DOI: 10.1109/JIOT.2021.3084502

[68] G. Vijayasekaran and M. Duraipandian, "Resource scheduling in edge computing IoT networks using hybrid deep learning algorithm", System research and information technologies, no. 3, pp. 86–101, Oct. 2022. DOI: 10.20535/SRIT.2308-8893.2022.3.06

[69] A. Najafizadeh, A. Salajegheh, A. M. Rahmani, and A. Sahafi, "Multi-objective Task Scheduling in cloud-fog computing using goal programming approach," *Cluster Computing*, vol. 25, no. 1, pp. 141–165, Feb. 2022 [Online]. DOI: 10.1007/s10586-021-03371-8

[70] M. Hajvali, S. Adabi, A. Rezaee, and M. Hosseinzadeh, "Decentralized and scalable hybrid scheduling-clustering method for real-time applications in volatile and dynamic Fog-Cloud Environments", Journal of cloud computing, vol. 12, no. 1.0, 2023. DOI: 10.1186/s13677-023-00428-4

[71] S. Sheng, P. Chen, Z. Chen, L. Wu, and Y. Yao, "Deep Reinforcement Learning-Based Task Scheduling in IoT Edge Computing", Sensors, vol. 21, no. 5.0, p. 1666, 2021. DOI: 10.3390/S21051666

[72] J. Yao and N. Ansari, "Task Allocation in Fog-Aided Mobile IoT by Lyapunov Online Reinforcement Learning", IEEE Transactions on Green Communications and Networking, vol. 4, no. 2, pp. 556–565, Jun. 2020. DOI: 10.1109/TGCN.2019.2956626

[73] M. Abdel-Basset, R. Mohamed, R. K. Chakrabortty, and M. J. Ryan, "IEGA: An improved elitism-based genetic algorithm for task scheduling problem in fog computing", International Journal of Intelligent Systems, vol. 36, no. 9.0, pp. 4592–4631, 2021. DOI: 10.1002/INT.22470

[74] O. A. Saraereh and A. Ali, "Evolutionary Algorithm Based Task Scheduling in IoT Enabled Cloud Environment", Computers, Materials & Continua, vol. 71, no. 1, pp. 1095–1109, 2022. DOI: 10.32604/cmc.2022.021859

[75] M. Zhang, L. Liu, C. Li, H. Wang, and M. Li, "A Particle Swarm Optimization Method for AI Stream Scheduling in Edge Environments", Symmetry, vol. 14, no. 12.0, p. 2565, 2022. DOI: 10.3390/sym14122565

[76] C. Jin, Y. Han, Z. Deng, Y. Chen, C. Liu, and J. Huang, "Reinforcement Learning-Based Intelligent Task Scheduling for Large-Scale IoT Systems", Wireless Communications and Mobile Computing, vol. 2023, pp. 1–11, 2023. DOI: 10.1155/2023/3660882

[77] M. Mitev, M. M. Butt, P. Sehier, A. Chorti, L. Rose, and A. Lehti, "Smart Link Adaptation and Scheduling for IIoT", IEEE networking letters, vol. 4, no. 1.0, pp. 6–10, 2022. DOI: 10.1109/lnet.2022.3144733

[78] A. M. Yadav, K. N. Tripathi, and S. C. Sharma, "A bi-objective task scheduling approach in fog computing using hybrid fireworks algorithm", The Journal of Supercomputing, pp. 1–25, 2021. DOI: 10.1007/S11227-021-04018-6

[79] I. M. Ali, K. M. Sallam, N. Moustafa, R. Chakraborty, M. Ryan, and K.-K. R. Choo, "An Automated Task Scheduling Model Using Non-Dominated Sorting Genetic Algorithm II for Fog-Cloud Systems," *IEEE Transactions on Cloud Computing*, vol. 10, no. 4, pp. 2294–2308, Oct. 2022 [Online]. DOI: 10.1109/TCC.2020.3032386

[80] Y. Deng, Z. Chen, D. Zhang, and M. Zhao, "Workload scheduling toward worst-case delay and optimal utility for single-hop Fog-IoT architecture", Iet Communications, vol. 12, no. 17.0, pp. 2164–2173, 2018. DOI: 10.1049/IET-COM.2018.5077

[81] D. A. Chekired, L. Khoukhi, and H. T. Mouftah, "Industrial IoT Data Scheduling Based on Hierarchical Fog Computing: A Key for Enabling Smart Factory", IEEE Transactions on Industrial Informatics, vol. 14, no. 10.0, pp. 4590–4602, 2018. DOI: 10.1109/TII.2018.2843802

[82] K. Lin, J. Gao, G. Han, H. Wang, and C. Li, "Intelligent Blockchain-Enabled Adaptive Collaborative Resource Scheduling in Large-Scale Industrial Internet of Things", IEEE Transactions on Industrial Informatics, vol. 18, pp. 9196–9205, 2022. DOI: 10.1109/TII.2022.3169457

[83] S. Achar, "Neural-Hill: A Novel Algorithm for Efficient Scheduling IoT-Cloud Resource to Maintain Scalability", IEEE Access, vol. 11, pp. 26502–26511, 2023. DOI: 10.1109/ACCESS.2023.3257425

[84] K. Zanbouri, H. M. R. Al-Khafaji, N. J. Navimipour, and Ş. Yalçın, "A new fog-based transmission scheduler on the Internet of multimedia things using a fuzzy-based quantum genetic algorithm", *IEEE MultiMedia*, vol. 30, no. 3, pp. 74–86, Jul. 2023 [Online]. DOI: 10.1109/MMUL.2023.3247522

[85] X. Cai, S. Geng, D. Wu, J. Cai, and J. Chen, "A Multicloud-Model-Based Many-Objective Intelligent Algorithm for Efficient Task Scheduling in Internet of Things", IEEE Internet of Things Journal, vol. 8, no. 12.0, pp. 9645–9653, 2021. DOI: 10.1109/JIOT.2020.3040019

[86] S. A. Patil and P. K. Gokhale, "RETRACTED: AI-federated novel delay-aware link-scheduling for Industry 4.0 applications in IoT networks," *International Journal of Pervasive Computing and Communications*, vol. 20, no. 4, pp. 478–495, Nov. 2024 [Online]. DOI: 10.1108/IJPCC-12-2021-0297

[87] Y.-H. H. Joo Woong Youn, "Intelligent Task Dispatching and Scheduling Using a Deep Q-Network in a Cluster Edge Computing System", Sensors, vol. 22, no. 11.0, p. 4098, 2022. DOI: 10.3390/s22114098

[88] J. Baek and G. Kaddoum, "Online Partial Offloading and Task Scheduling in SDN-Fog Networks With Deep Recurrent Reinforcement Learning", IEEE Internet of Things Journal, vol. 9, no. 13, pp. 11578–11589, Jul. 2022. DOI: 10.1109/JIOT.2021.3130474

[89] X. Ma, H. Xu, H. Gao, M. Bian, and W. Hussain, "Real-Time Virtual Machine Scheduling in Industry IoT Network: A Reinforcement Learning Method", IEEE Transactions on Industrial Informatics, vol. 19, pp. 2129–2139, 2023. DOI: 10.1109/TII.2022.3211622

[90] R. Vijayalakshmi, V. Vasudevan, S. Kadry, and R. Lakshmana Kumar, "Optimization of makespan and resource utilization in the fog computing environment through task scheduling algorithm", International Journal of Wavelets, Multiresolution and Information Processing, vol. 18, no. 1.0, p. 1941025, 2020. DOI: 10.1142/S021969131941025X

[91] G. Javadzadeh, A. M. Rahmani, and M. S. Kamarposhti, "Mathematical model for the scheduling of real-time applications in IoT using Dew computing," *The Journal of Supercomputing*, vol. 78, no. 5, pp. 7464–7488, Apr. 2022 [Online]. DOI: 10.1007/s11227-021-04170-z

[92] Z. Yin *et al.*, "A Multi-Objective Task Scheduling Strategy for Intelligent Production Line Based on Cloud-Fog Computing", Sensors, vol. 22, no. 4.0, p. 1555, 2022. DOI: 10.3390/s22041555

[93] T. Zhou, D. Tang, H. Zhu, and Z. Zhang, "Multi-agent reinforcement learning for online scheduling in smart factories", Robotics and Computer-integrated Manufacturing, vol. 72, p. 102202, 2021. DOI: 10.1016/J.RCIM.2021.102202

[94] J. Fernandez-Conde, P. Cuenca-Jimenez, and R. Toledo-Moreo, "A multi-level AI-based scheduler to increase adaptiveness in time-constrained mobile communication environments," *Natural Computing*, vol. 21, no. 4, pp. 525–535, Dec. 2022 [Online]. DOI: 10.1007/s11047-020-09813-3

[95] P. Memari, S. S. Mohammadi, F. Jolai, and R. Tavakkoli-Moghaddam, "A latency-aware task scheduling algorithm for allocating virtual machines in a cost-effective and time-sensitive fog-cloud architecture," *The Journal of Supercomputing*, vol. 78, no. 1, pp. 93–122, Jan. 2022 [Online]. DOI: 10.1007/s11227-021-03868-4

[96] H. Ma, R. Li, X. Zhang, Z. Zhou, and X. Chen, "Reliability-Aware Online Scheduling for DNN Inference Tasks in Mobile-Edge Computing", IEEE Internet of Things Journal, vol. 10, no. 13, pp. 11453–11464, Jul. 2023. DOI: 10.1109/JIOT.2023.3243266

[97] L. Pavithra and D. Rekha, "Real Time Scheduling in TSCH for IoT Using Neurogenetic Algorithm", Wireless Personal Communications, pp. 1–18, 2021. DOI: 10.1007/S11277-021-09148-X

[98] R. Ebrahim Pourian, M. Fartash, and J. Akbari Torkestani, "A New Approach to the Resource Allocation Problem in Fog Computing Based on Learning Automata," *Cybernetics and Systems*, vol. 55, no. 7, pp. 1594–1613, Oct. 2024 [Online]. DOI: 10.1080/01969722.2022.2145653

[99] A. A. Hussain and F. Al-Turjman, "IoMT-Cloud Task Scheduling Using AI", Cmes-computer Modeling in Engineering & Sciences, vol. 135, no. 2.0, pp. 1345–1369, 2023. DOI: 10.32604/cmes.2023.022783

[100] Y. J. W. P. L. W. P. Z. Songnong Li Yao Yan, "Hybrid Services Collaborative Resource Scheduling Strategy towards Artificial Intelligence of Things", Applied Sciences, vol. 13, no. 13.0, p. 7956, 2023. DOI: 10.3390/app13137956

[101] Z. Zhang, W. Sun, and Y. Yu, "Research on Intelligent Scheduling Mechanism in Edge Network for Industrial Internet of Things", Security and Communication Networks, vol. 2022, pp. 1–14, Jan. 2022. DOI: 10.1155/2022/5358873

[102] M. Kumar, A. Kishor, J. K. Samariya, and A. Y. Zomaya, "An Autonomic Workload Prediction and Resource Allocation Framework for Fog-Enabled Industrial IoT", IEEE Internet of Things Journal, vol. 10, pp. 9513–9522, 2023. DOI: 10.1109/JIOT.2023.3235107

[103] O. R. Amanjot Kaur Nitin Auluck, "Real-Time Scheduling on Hierarchical Heterogeneous Fog Networks", IEEE Transactions on Services Computing, vol. 16, pp. 1358–1372, 2023. DOI: 10.1109/TSC.2022.3155783

[104] A. Verma and S. Deswal, "FOG-RPL: Fog Computing-based Routing Protocol for IoT Networks," *Recent Advances in Electrical & Electronic Engineering (Formerly Recent Patents on Electrical & Electronic Engineering)*, vol. 17, no. 2, pp. 170–180, Feb. 2024 [Online]. DOI: 10.2174/2352096516666230510125238

[105] D. D. Adriano, C. Montez, A. G. N. Novaes, and M. Wangham, "DMRVR: Dynamic Milk-Run Vehicle Routing Solution Using Fog-

Based Vehicular Ad Hoc Networks", Electronics, vol. 9.0, no. 12.0, p. 2010.0, 2020. DOI: 10.3390/ELECTRONICS9122010

[106] S. Y. Hashemi and F. Shams Aliee, "Fuzzy, Dynamic and Trust Based Routing Protocol for IoT", Journal of Network and Systems Management, vol. 28.0, no. 4.0, pp. 1248.0–1278.0, 2020. DOI: 10.1007/S10922-020-09535-Y

[107] S. Ghosh, T. Dagiuklas, M. Iqbal, and X. Wang, "A Cognitive Routing Framework for Reliable Communication in IoT for Industry 5.0", IEEE Transactions on Industrial Informatics, vol. 18, no. 8, pp. 5446–5457, Aug. 2022. DOI: 10.1109/TII.2022.3141403

[108] R. P. Sandip Patel, "A Layer & Request Priority-based Framework for Dynamic Resource Allocation in Cloud- Fog - Edge Hybrid Computing Environment", International journal of mathematical, engineering and management sciences, vol. 7.0, no. 5.0, pp. 697.0–716.0, 2022. DOI: 10.33889/ijmems.2022.7.5.046

[109] S. Junior, A. Riker, B. Silvestre, W. Moreira, A. Oliveira-Jr, and V. Borges, "DYNASTI-Dynamic Multiple RPL Instances for Multiple IoT Applications in Smart City.", Sensors, vol. 20.0, no. 11.0, p. 3130.0, 2020. DOI: 10.3390/S20113130

[110] A. Altaweel *et al.*, "RSock: A resilient routing protocol for mobile Fog/Edge networks", Ad hoc networks, vol. 134.0, pp. 102926.0–102926.0, 2022. DOI: 10.1016/j.adhoc.2022.102926

[111] A. Akbar, M. Ibrar, M. A. Jan, A. K. Bashir, and L. Wang, "SDN-Enabled Adaptive and Reliable Communication in IoT-Fog Environment Using Machine Learning and Multiobjective Optimization", IEEE Internet of Things Journal, vol. 8.0, no. 5.0, pp. 3057.0–3065.0, 2021. DOI: 10.1109/JIOT.2020.3038768

[112] M. AL-Naday, N. Thomos, J. Hu, B. Volckaert, F. de Turck, and M. J. Reed, "Service-Based, Multi-Provider, Fog Ecosystem With Joint Optimization of Request Mapping and Response Routing", IEEE Transactions on Services Computing, vol. 16.0, pp. 2203.0–2214.0, 2023. DOI: 10.1109/TSC.2022.3211739

[113] G. Sun, Y. Zhang, H. Yu, X. Du, and M. Guizani, "Intersection Fog-Based Distributed Routing for V2V Communication in Urban Vehicular Ad Hoc Networks", IEEE Transactions on Intelligent Transportation Systems, vol. 21.0, no. 6.0, pp. 2409.0–2426.0, 2020. DOI: 10.1109/TITS.2019.2918255

[114] S. Kozlov, E. Spirina, I. Ashaev, A. Bukharina, and A. Gaysin, "Novel Modification of the Collective Dynamic Routing Method for Sensors" Communication in Wi-Fi Public Networks", Sensors, vol. 22.0, no. 22.0, pp. 8602.0–8602.0, 2022. DOI: 10.3390/s22228602

[115] J. H. Cho and H. Lee, "Dynamic Topology Model of Q-Learning LEACH Using Disposable Sensors in Autonomous Things Environment", Applied Sciences, vol. 10.0, no. 24.0, p. 9037.0, 2020. DOI: 10.3390/APP10249037

[116] W. Fang, W. Zhang, W. Chen, Y. Liu, and C. Tang, "TMSRS: trust management-based secure routing scheme in industrial wireless sensor network with fog computing", Wireless Networks, vol. 26.0, no. 5.0, pp. 3169.0–3182.0, 2020. DOI: 10.1007/S11276-019-02129-W

[117] N. A. Tuan et al., "Dynamic Data Optimization in IoT-Assisted Sensor Networks on Cloud Platform", Computers, Materials & Continua, vol. 72, no. 1, pp. 1357–1372, 2022. DOI: 10.32604/cmc.2022.024096

[118] Q.-D. N. Hai-Viet Le, "V-Sandbox for Dynamic Analysis IoT Botnet", IEEE Access, vol. 8.0, pp. 145768.0–145786.0, 2020. DOI: 10.1109/ACCESS.2020.3014891

[119] N. Levering, M. Boon, M. Mandjes, and R. Núñez-Queija, "A framework for efficient dynamic routing under stochastically varying conditions", Transportation Research Part B: Methodological, vol. 160, pp. 97–124, Jun. 2022. DOI: 10.1016/j.trb.2022.04.001

[120] Y. M. F. Z. Yang Huang Caiyong Hao, "Dynamic Resource Configuration for Low-Power IoT Networks: A Multi-Objective Reinforcement Learning Method", IEEE Communications Letters, vol. 25.0, no. 7.0, pp. 2285.0–2289.0, 2021. DOI: 10.1109/LCOMM.2021.3074756

[121] Z. Wang, "Probabilistic Connectionless Multipath Routing Algorithm for Reliability and Stability Evaluation", Journal of Physics: Conference Series, vol. 1744, no. 4, p. 042183, Feb. 2021. DOI: 10.1088/1742-6596/1744/4/042183

[122] N. W. I. Y. Mingqiang Zhu Liu Chang, "A Smart Collaborative Routing Protocol for Delay Sensitive Applications in Industrial IoT", IEEE Access, vol. 8.0, pp. 20413.0–20427.0, 2020. DOI: 10.1109/ACCESS.2019.2963723

[123] J. Cheng, "Dynamic Path Optimization Based on Improved Ant Colony Algorithm", Journal of Advanced Transportation, vol. 2023.0, pp. 1.0–11.0, 2023. DOI: 10.1155/2023/7651100

[124] J. H. L. J. W. Chao Bu Xinyang Zhang, "Dynamic Detection and Placement for VSFs over Edge Computing Scenarios: An ACO-Based Approach", Security and Communication Networks, vol. 2022.0, pp. 1.0–10.0, 2022. DOI: 10.1155/2022/2151645

[125] A. Talpur and M. Gurusamy, "DRLD-SP: A Deep-Reinforcement-Learning-Based Dynamic Service Placement in Edge-Enabled Internet of Vehicles", IEEE Internet of Things Journal, vol. 9, no. 8, pp. 6239–6251, Apr. 2022. DOI: 10.1109/JIOT.2021.3110913

[126] I. I. Ioannou, C. Christophorou, V. Vassiliou, M. Lestas, and A. Pitsillides, "Dynamic D2D Communication in 5G/6G Using a Distributed AI Framework", IEEE Access, vol. 10, pp. 62772–62799, 2022. DOI: 10.1109/ACCESS.2022.3182388

[127] J. B. Lee, G. Nguyen, R. A. Rossi, N. K. Ahmed, E. Koh, and S. Kim, "Dynamic Node Embeddings From Edge Streams," *IEEE Transactions on Emerging Topics in Computational Intelligence*, pp. 1–16, 2020 [Online]. DOI: 10.1109/TETCI.2020.3011432

[128] A. Volkov, "Routing Task in Dynamic Fog Computing Network", Trudy učebnyh zavedenij svâzi, vol. 10.0, no. 4.0, pp. 27.0–37.0, 2024. DOI: 10.31854/1813-324x-2024-10-4-27-37

[129] P. Bellavista, C. Giannelli, and D. D. P. Montenero, "A Reference Model and Prototype Implementation for SDN-Based Multi Layer Routing in Fog Environments", IEEE Transactions on Network and Service Management, vol. 17.0, no. 3.0, pp. 1460.0–1473.0, 2020. DOI: 10.1109/TNSM.2020.2995903

[130] P. Bellavista, C. Giannelli, D. D. P. Montenero, F. Poltronieri, C. Stefanelli, and M. Tortonesi, "HOlistic pRocessing and NETworking (HORNET): An Integrated Solution for IoT-Based Fog Computing Services", IEEE Access, vol. 8.0, pp. 66707.0–66721.0, 2020. DOI: 10.1109/ACCESS.2020.2984930

[131] S. D. Ankit Verma, "Efficient routing protocol for IoT networks based on fog computing and routing protocol of low-power lossy networks", International Journal of Internet Protocol Technology, vol. 16.0, no. 3.0, pp. 176.0–184.0, 2023. DOI: 10.1504/ijipt.2023.133031

[132] K. Haseeb, F. A. Alzahrani, M. Siraj, Z. Ullah, and J. Lloret, "Energy-Aware Next-Generation Mobile Routing Chains with Fog Computing for Emerging Applications", Electronics, vol. 12.0, no. 3.0, pp. 574.0–574.0, 2023. DOI: 10.3390/electronics12030574

[133] M. S. U. Islam and A. Kumar, "Context-aware application scheduling in fog computing environment," *Concurrency and Computation: Practice and Experience*, vol. 35, no. 26, Nov. 2023 [Online]. DOI: 10.1002/cpe.7836

[134] A. K. Mir Salim Ul Islam, "CaPTS scheduler: A context-aware priority tuple scheduling for Fog computing paradigm", Transactions on emerging telecommunications technologies, vol. 33, no. 12.0, 2022. DOI: 10.1002/ett.4647

[135] M. Ozturk, A. I. Abubakar, R. N. Bin Rais, M. Jaber, S. Hussain, and M. A. Imran, "Context-Aware Wireless Connectivity and Processing Unit Optimization for IoT Networks", IEEE Internet of Things Journal, vol. 9, no. 17, pp. 16028–16043, Sep. 2022. DOI: 10.1109/JIOT.2022.3152381

[136] V. Karagiannis, P. A. Frangoudis, S. Dustdar, and S. Schulte, "Context-Aware Routing in Fog Computing Systems", IEEE Transactions on Cloud Computing, vol. 11, no. 1, pp. 532–549, Jan. 2023. DOI: 10.1109/TCC.2021.3102996

[137] R. S. Karan Bajaj Shaily Jain, "Context-Aware Offloading for IoT Application using Fog-Cloud Computing", International journal of electrical & electronics research, vol. 11, no. 1.0, pp. 69–83, 2023. DOI: 10.37391/ijeer.110110

[138] A. Ben Sada, A. Naouri, A. Khelloufi, S. Dhelim, and H. Ning, "A Context-Aware Edge Computing Framework for Smart Internet of Things", Future Internet, vol. 15, no. 5.0, p. 154, 2023. DOI: 10.3390/fi15050154

[139] B. G. Kumbar and L. B. Bhajantri, "Context Aware Resource Discovery in Fog Computing: Agent Approach", in 2024 Second International Conference on Advances in Information Technology (ICAIT), 2024, pp. 1–5. DOI: 10.1109/ICAIT61638.2024.10690445

[140] M. De Brouwer *et al.*, "Context-aware query derivation for IoT data streams with DIVIDE enabling privacy by design", Semantic web, vol. 14, no. 5.0, pp. 893–941, 2023. DOI: 10.3233/sw-223281

[141] R. Mahmud, A. N. Toosi, K. Ramamohanarao, and R. Buyya, "Context-Aware Placement of Industry 4.0 Applications in Fog Computing Environments", IEEE Transactions on Industrial Informatics, vol. 16, no. 11.0, pp. 7004–7013, 2020. DOI: 10.1109/TII.2019.2952412

[142] A. Munoz-Arcentales, S. López-Pernas, J. Conde, Á. Alonso, J. Salvachúa, and J. J. Hierro, "Enabling Context-Aware Data Analytics in Smart Environments: An Open Source Reference Implementation.", Sensors, vol. 21, no. 21.0, p. 7095, 2021. DOI: 10.3390/S21217095

[143] M. Vila, M.-R. Sancho, E. Teniente, and X. Vilajosana, "Critical infrastructure awareness based on IoT context data", Internet of things, p. 100855, 2023. DOI: 10.1016/j.iot.2023.100855

[144] A. S. M. Kayes *et al.*, "A Survey of Context-Aware Access Control Mechanisms for Cloud and Fog Networks: Taxonomy and Open Research Issues.", Sensors, vol. 20, no. 9.0, p. 2464, 2020. DOI: 10.3390/S20092464

[145] Y. Hussain *et al.*, "Context-Aware Trust and Reputation Model for Fog-Based IoT", IEEE Access, vol. 8, pp. 31622–31632, 2020. DOI: 10.1109/ACCESS.2020.2972968

[146] M. M. Gomes, R. da Rosa Righi, C. A. da Costa, and D. Griebler, “Steam++ An Extensible End-to-end Framework for Developing IoT Data Processing Applications in the Fog”, International Journal of Computer Science and Information Technology, vol. 14, no. 1.0, pp. 31–51, 2022. DOI: 10.5121/ijcsit.2022.14103
[147] E. Khezri, R. O. Yahya, H. Hassanzadeh, M. Mohaidat, S. Ahmadi, and M. Trik, “DLJSF: Data-Locality Aware Job Scheduling IoT tasks in fog-cloud computing environments,” *Results in Engineering*, vol. 21, p. 101780, Mar. 2024 [Online]. DOI: 10.1016/j.rineng.2024.101780
[148] H. Vahdat Nejad *et al.*, “A Survey on Context-Aware Fog Computing Systems”, Computación Y Sistemas, vol. 25, no. 1.0, pp. 5–12, 2021. DOI: 10.13053/CYS-25-1-3149
[149] L. Duo, Q. Li, H. Xu, and Y. Zhou, “Dynamic Priority-Based Service Resource Allocation for Context-Aware Conflict Resolution in Wisdom Network with Fog Computing”, Wireless Communications and Mobile Computing, vol. 2020, pp. 1–7, 2020. DOI: 10.1155/2020/8812482
[150] A. A. Bukhari, F. K. Hussain, and O. K. Hussain, “Intelligent context-aware fog node discovery”, Internet of things, vol. 20, p. 100607, 2022. DOI: 10.1016/j.iot.2022.100607
[151] T. R. Chhetri, C. K. Dehury, B. Varghese, A. Fensel, S. N. Srirama, and R. J. DeLong, “Enabling privacy-aware interoperable and quality IoT data sharing with context,” *Future Generation Computer Systems*, vol. 157, pp. 164–179, Aug. 2024 [Online]. DOI: 10.1016/j.future.2024.03.039
[152] S.-M. Y. Eman Yaser Daraghmi Meng Chian Wu, “A multilayer data processing and aggregating fog-based framework for latency-sensitive iot services”, Applied Sciences, vol. 11, no. 4.0, pp. 1–21, 2021. DOI: 10.3390/APP11041374
[153] S. Byun, “Design of Context-aware Resource Management for Healthcare IoT”, International Journal of Smart Device and Appliance, vol. 8, no. 1, pp. 17–24, Jun. 2020. DOI: 10.21742/IJSDA.2020.8.1.03
[154] F. S. Costa, S. M. Nassar, and M. A. R. Dantas, “FOCUSeR: A Fog Online Context-Aware Up-to-Date Sensor Ranking Method”, Journal of Sensor and Actuator Networks, vol. 11, no. 2.0, p. 25, 2022. DOI: 10.3390/jsan11020025
[155] I. Ullah, J.-B. Kim, and Y.-H. Han, “Compound Context-Aware Bayesian Inference Scheme for Smart IoT Environment”, Sensors, vol. 22, no. 8.0, p. 3022, 2022. DOI: 10.3390/s22083022
[156] K. Bajaj, B. Sharma, and R. Singh, “Implementation analysis of IoT-based offloading frameworks on cloud/edge computing for sensor generated big data,” *Complex & Intelligent Systems*, vol. 8, no. 5, pp. 3641–3658, Oct. 2022 [Online]. DOI: 10.1007/s40747-021-00434-6
[157] A. O. Almagrabi and Y. D. Al-Otaibi, “A Survey of Context-Aware Messaging-Addressing for Sustainable Internet of Things (IoT)”, Sustainability, vol. 12, no. 10.0, p. 4105, 2020. DOI: 10.3390/SU12104105
[158] V. Nikolopoulos, M. Nikolaidou, M. Voreakou, and D. Anagnostopoulos, “Fog Node Self-Control Middleware: Enhancing context awareness towards autonomous decision making in Fog Colonies”, Internet of things, vol. 19, p. 100549, 2022. DOI: 10.1016/j.iot.2022.100549
[159] R. Klimek, “Sensor-Enabled Context-Aware and Pro-Active Queue Management Systems in Intelligent Environments.”, Sensors, vol. 20, no. 20.0, p. 5837, 2020. DOI: 10.3390/S20205837
[160] X. R. Siguang Chen Zihui You, “Privacy and Energy Co-Aware Data Aggregation Computation Offloading for Fog-Assisted IoT Networks”, IEEE Access, vol. 8, pp. 72424–72434, 2020. DOI: 10.1109/ACCESS.2020.2987749
[161] S. Islam, S. Jamwal, and M. H. Mir, “Fog Data Processing and Analytics for Agriculture IoT Data Streams,” *International Journal of Next-Generation Computing*, vol. 13, no. 3, Oct. 2022 [Online]. DOI: 10.47164/ijngc.v13i3.870
[162] Y. W. Derrick Ntalasha Renfa Li, “Adaptive Context-Aware Design Using Context State Information for the Internet of Things Paradigm”, Journal of Multimedia, vol. 15, pp. 289–320–289–320, 2020. DOI: 10.13052/JMM1550-4646.1542
[163] J. Pinzón Castellanos and M. A. Cadena Carter, “Fog Computing in the context of Smart Home, voice assistant and the future of IoT”, Revista Colombiana de Computación, vol. 21, no. 1, pp. 6–12, Jun. 2020. DOI: 10.29375/25392115.3894
[164] F.-S. Hsieh, “A Dynamic Context-Aware Workflow Management Scheme for Cyber-Physical Systems Based on Multi-Agent System Architecture”, Applied Sciences, vol. 11, no. 5.0, p. 2030, 2021. DOI: 10.3390/APP11052030
[165] A. T. Ameer B. A. Alaasam Gleb Radchenko, “Micro-Workflows Data Stream Processing Model for Industrial Internet of Things,” vol. 8, no. 1.0, pp. 82–98, 2021. DOI: 10.14529/210106
[166] S. Inshi, R. Chowdhury, H. Ould-Slimane, and C. Talhi, “Secure Adaptive Context-Aware ABE for Smart Environments”, Iot, vol. 4, no. 2.0, pp. 112–130, 2023. DOI: 10.3390/iot4020007
[167] D. M. A. Da Silva and R. C. Sofia, “A Discussion on Context-Awareness to Better Support the IoT Cloud/Edge Continuum”, IEEE Access, vol. 8, pp. 193686–193694, 2020. DOI: 10.1109/ACCESS.2020.3032388
[168] K. Haseeb, T. Saba, A. Rehman, N. Abbas, and P. W. Kim, “AI-driven IoT-fog analytics interactive smart system with data protection,” *Expert Systems*, vol. 42, no. 1, Jan. 2025 [Online]. DOI: 10.1111/exsy.13573
[169] R. K. Dina Nawara, “Context-Aware Recommendation Systems in the IoT Environment (IoT-CARS)–A Comprehensive Overview”, IEEE Access, vol. 9, pp. 144270–144284, 2021. DOI: 10.1109/ACCESS.2021.3122098
[170] U. Mahmud, S. Hussain, and I. K. Toure, “Gathering Contextual Data with Power Information Using Smartphones in Internet of Everything”, Wireless Communications and Mobile Computing, vol. 2022, pp. 1–14, 2022. DOI: 10.1155/2022/4445751
[171] Dr. J. I. Zong Chen and Dr. S. S., “Interoperability Improvement in Internet of Things Using Fog Assisted Semantic Frame Work”, Journal of Trends in Computer Science and Smart Technology, vol. 2, no. 1, pp. 56–68, Mar. 2020. DOI: 10.36548/jtcsst.2020.1.006
[172] S. Byun, “A Sensor-aware Offloading Model for IoT Edge Computing”, Webology, vol. 19, no. 1.0, pp. 4505–4514, 2022. DOI: 10.14704/web/v19i1/web19297
[173] P. H. da Silva, “Models for Internet of Things Environments—A Survey”, Information-an International Interdisciplinary Journal, vol. 11, no. 10.0, p. 487, 2020. DOI: 10.3390/INFO11100487
[174] K. Khettabi, Z. Kouahla, B. Farou, H. Seridi, and M. Ferrag, “Efficient Method for Continuous IoT Data Stream Indexing in the Fog-Cloud Computing Level”, Big data and cognitive computing, vol. 7, no. 2.0, p. 119, 2023. DOI: 10.3390/bdcc7020119
[175] C. X. Mavromoustakis, M. Mukherjee, G. Mastorakis, H. Song, M. Gorlatova, and M. Aazam, “Guest Editorial Special Issue on Emerging Trends and Challenges in Fog Computing for IoT”, IEEE Internet of Things Journal, vol. 7, no. 5.0, pp. 4155–4159, 2020. DOI: 10.1109/JIOT.2020.2982520
[176] L. M. Pham, T.-T. Nguyen, and T.-Q. Hoang, “Towards an Elastic Fog-Computing Framework for IoT Big Data Analytics Applications”, Wireless Communications and Mobile Computing, vol. 2021, pp. 1–16, 2021. DOI: 10.1155/2021/3833644
[177] P. Wang, R. Yu, N. Gao, C. Lin, and Y. Liu, “Task-Driven Data Offloading for Fog-Enabled Urban IoT Services”, IEEE Internet of Things Journal, vol. 8, no. 9.0, pp. 7562–7574, 2021. DOI: 10.1109/JIOT.2020.3039467
[178] H. U. Atiq, Z. Ahmad, S. K. uz Zaman, M. A. Khan, A. A. Shaikh, and A. Al-Rasheed, “Reliable Resource Allocation and Management for IoT Transportation Using Fog Computing”, Electronics, vol. 12, no. 6.0, p. 1452, 2023. DOI: 10.3390/electronics12061452
[179] V. Nikolopoulos, M. Nikolaidou, M. Voreakou, and D. Anagnostopoulos, “Context Diffusion in Fog Colonies: Exploring Autonomous Fog Node Operation Using ECTORAS”, IoT, vol. 3, no. 1, pp. 91–108, Jan. 2022. DOI: 10.3390/iot3010005
[180] A. Kumar, Hariharan, S. Ahamed, and Gokilavani, “Lightweight Fog Attention Graph Convolutional Network for Secure Data Aggregation Mechanism to Fog based Cloud Assisted IoT Network”, in 2024 8th International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), 2024, pp. 176–181. DOI: 10.1109/I-SMAC61858.2024.10714820
[181] M. Ahmed, R. Mumtaz, S. M. H. Zaidi, M. Hafeez, S. A. R. Zaidi, and M. Ahmad, “Distributed Fog Computing for Internet of Things (IoT) Based Ambient Data Processing and Analysis”, Electronics, vol. 9, no. 11.0, p. 1756, 2020. DOI: 10.3390/ELECTRONICS9111756
[182] I. M. El-Hasnony, R. R. Mostafa, M. Elhoseny, and S. I. Barakat, “Leveraging mist and fog for big data analytics in <scp>IoT</scp> environment”, Transactions on Emerging Telecommunications Technologies, vol. 32, no. 7, Jul. 2021. DOI: 10.1002/ett.4057
[183] L. Zhao, “Privacy-Preserving Distributed Analytics in Fog-Enabled IoT Systems”, Sensors, vol. 20, no. 21.0, p. 6153, 2020. DOI: 10.3390/S20216153
[184] K. S. Jagarlamudi, A. Zaslavsky, S. W. Loke, A. Hassani, and A. Medvedev, “Requirements, Limitations and Recommendations for Enabling End-to-End Quality of Context-Awareness in IoT Middleware”, Sensors, vol. 22, no. 4.0, p. 1632, 2022. DOI: 10.3390/s22041632
[185] M. Ammad *et al.*, “A novel fog-based multi-level energy-efficient framework for IoT-enabled smart environments”, IEEE Access, vol. 8, pp. 150010–150026, 2020. DOI: 10.1109/ACCESS.2020.3010157
[186] R. Raghu, V. Jayaramaan, J. Jayaraman, S. S. V. Nukala, and C. E. Montenegro-Marin, “A User-Centered Security Approach to Create an IoT based Multi-Layered Fog-Cloud Architecture for Data Optimization in Raised Bed Farming”, International Journal of Safety and Security Engineering, vol. 12, no. 6.0, pp. 767–776, 2022. DOI: 10.18280/ijsse.120614

[187] Sandeep Narayanrao Khandare and Dr. Shrinivas P Deshpande, “Survey of Fog Architectures: Research Opportunities & Future Development”, International journal of next-generation computing, 2022. DOI: 10.47164/ijngc.v13i1.231
[188] S.-Y. Jeong and Y.-K. Kim, “Deep Learning-Based Context-Aware Recommender System Considering Change in Preference”, Electronics, vol. 12, no. 10.0, p. 2337, 2023. DOI: 10.3390/electronics12102337
[189] Q. Shaheen, M. Shiraz, M. U. Hashmi, D. Mahmood, Z. zhiyu, and R. Akhtar, “A Lightweight Location-Aware Fog Framework (LAFF) for QoS in Internet of Things Paradigm”, Mobile Information Systems, vol. 2020, 2020. DOI: 10.1155/2020/8871976
[190] K. Michalakis, Y. Christodoulou, G. Caridakis, Y. Voutos, and P. Mylonas, “A Context-Aware Middleware for Context Modeling and Reasoning: A Case-Study in Smart Cultural Spaces”, Applied Sciences, vol. 11, no. 13.0, p. 5770, 2021. DOI: 10.3390/APP11135770
[191] T. A. Ahanger, U. Tariq, A. Ibrahim, I. Ullah, Y. Bouteraa, and F. Gebali, “Securing IoT-Empowered Fog Computing Systems: Machine Learning Perspective”, Mathematics, vol. 10, no. 8.0, p. 1298, 2022. DOI: 10.3390/math10081298
[192] T. Qayyum, Z. Trabelsi, A. Waqar Malik, and K. Hayawi, “Mobility-aware hierarchical fog computing framework for Industrial Internet of Things (IIoT)”, Journal of cloud computing, vol. 11, no. 1.0, pp. 1–17, 2022. DOI: 10.1186/s13677-022-00345-y
[193] S. Y. Deniz Taşkin, “A Long-range Context-aware Platform Design For Rural Monitoring With IoT In Precision Agriculture”, International Journal of Computers Communications & Control, vol. 15, no. 2.0, 2020. DOI: 10.15837/IJCCC.2020.2.3821
[194] A. H. Mayer, V. F. Rodrigues, C. A. da Costa, R. da R. Righi, A. Roehrs, and R. S. Antunes, “FogChain: A Fog Computing Architecture Integrating Blockchain and Internet of Things for Personal Health Records”, IEEE Access, vol. 9, pp. 122723–122737, 2021. DOI: 10.1109/ACCESS.2021.3109822
[195] H. Li, T. Liu, H. K.-H. Chan, and H. Lu, “Spatial data analysis for intelligent buildings: Awareness of context and data uncertainty,” *Frontiers in Big Data*, vol. 5, Nov. 2022 [Online]. DOI: 10.3389/fdata.2022.1049198
[196] S. Xiao, Y. Ye, N. Kanwal, T. Newe, and B. Lee, “SoK: Context and Risk Aware Access Control for Zero Trust Systems”, Security and Communication Networks, vol. 2022, pp. 1–20, 2022. DOI: 10.1155/2022/7026779
[197] H. LE, “Optimizing Energy in Fog Computing Architecture Based on Offloading Mechanism for IoT Devices”, in 2023 Asia Meeting on Environment and Electrical Engineering (EEE-AM), 2023, pp. 01–06. DOI: 10.1109/EEE-AM58328.2023.10395179
[198] C. Swain, M. N. Sahoo, A. Satpathy, S. Bakshi, and S. K. Ghosh, “M-DAFTO: Multi-Stage Deferred Acceptance Based Fair Task Offloading in IoT-Fog Systems,” *IEEE Transactions on Services Computing*, vol. 17, no. 6, pp. 3928–3941, Nov. 2024 [Online]. DOI: 10.1109/TSC.2024.3436648
[199] H. Tran-Dang and D.-S. Kim, “FRATO: Fog Resource Based Adaptive Task Offloading for Delay-Minimizing IoT Service Provisioning”, IEEE Transactions on Parallel and Distributed Systems, vol. 32.0, no. 10.0, pp. 2491–2508, 2021. DOI: 10.1109/TPDS.2021.3067654
[200] M. Sheikh Sofla, M. Haghi Kashani, E. Mahdipour, and R. Faghih Mirzaee, “Towards effective offloading mechanisms in fog computing,” *Multimedia Tools and Applications*, vol. 81, no. 2, pp. 1997–2042, Jan. 2022 [Online]. DOI: 10.1007/s11042-021-11423-9
[201] L. Zhang, B. Cao, Y. Li, M. Peng, and G. Feng, “A Multi-Stage Stochastic Programming-Based Offloading Policy for Fog Enabled IoT-eHealth”, IEEE Journal on Selected Areas in Communications, vol. 39.0, no. 2.0, pp. 411–425, 2021. DOI: 10.1109/JSAC.2020.3020659
[202] D.-S. K. Hoa Tran-Dang, “Dynamic collaborative task offloading for delay minimization in the heterogeneous fog computing systems”, Journal of Communications and Networks, vol. 25.0, no. 2.0, pp. 244–252, 2023. DOI: 10.23919/jcn.2023.000008
[203] A. C. Saif Aljanabi, “Improving IoT Services Using a Hybrid Fog-Cloud Offloading”, IEEE Access, vol. 9.0, pp. 13775–13788, 2021. DOI: 10.1109/ACCESS.2021.3052458
[204] R. S. Parvinder Singh, “Energy-Efficient Delay-Aware Task Offloading in Fog-Cloud Computing System for IoT Sensor Applications”, Journal of Network and Systems Management, vol. 30.0, no. 1.0, p. 14, 2022. DOI: 10.1007/S10922-021-09622-8
[205] S. Chen, Y. Zheng, W. Lu, V. Varadarajan, and K. Wang, “Energy-Optimal Dynamic Computation Offloading for Industrial IoT in Fog Computing”, IEEE Transactions on Green Communications and Networking, vol. 4, no. 2, pp. 566–576, Jun. 2020. DOI: 10.1109/TGCN.2019.2960767
[206] P. Nalayini and R. Arun Prakash, “Hierarchical Data Aggregation with Data Offloading Scheme for Fog Enabled IoT Environment”, Computer Systems Science and Engineering, vol. 44, no. 3, pp. 2033–2047, 2023. DOI: 10.32604/csse.2023.028269
[207] Z. Chang, L. Liu, X. Guo, and Q. Sheng, “Dynamic Resource Allocation and Computation Offloading for IoT Fog Computing System”, IEEE Transactions on Industrial Informatics, vol. 17.0, no. 5.0, pp. 3348–3357, 2021. DOI: 10.1109/TII.2020.2978946
[208] C. A. S. P. L. G. A. Sávio Rennan Menêzes Melo Felipe P. de Oliveira, “OffFog: An Approach to Support the Definition of Offloading Policies on Fog Computing”, Wireless Communications and Mobile Computing, vol. 2022.0, pp. 5331712:1–5331712:15, 2022. DOI: 10.1155/2022/5331712
[209] S. S. Tripathy, S. Bebortta, and T. Mukherjee, “DynaFog: A Dynamic Task Offloading Framework for IoT-Based Fog Computing Platforms”, in 2024 IEEE 13th International Conference on Communication Systems and Network Technologies (CSNT), 2024, pp. 464–469. DOI: 10.1109/CSNT60213.2024.10545918
[210] P. Kaur, “Fault tolerant data offloading in opportunistic fog enhanced IoT architecture”, Multiagent and Grid Systems, vol. 18.0, no. 2.0, pp. 107–118, 2022. DOI: 10.3233/mgs-220211
[211] H. Tran-Dang and D.-S. Kim, “A Survey on Matching Theory for Distributed Computation Offloading in IoT-Fog-Cloud Systems: Perspectives and Open Issues”, IEEE Access, vol. 10, pp. 118353–118369, 2022. DOI: 10.1109/ACCESS.2022.3219427
[212] Z. Wu, B. Li, Z. Fei, Z. Zheng, B. Li, and Z. Han, “Energy-Efficient Robust Computation Offloading for Fog-IoT Systems”, IEEE Transactions on Vehicular Technology, vol. 69.0, no. 4.0, pp. 4417–4425, 2020. DOI: 10.1109/TVT.2020.2975056
[213] X. Gao, X. Huang, Z. Shao, and Y. Yang, “An Integration of Online Learning and Online Control for Green Offloading in Fog-Assisted IoT Systems”, IEEE Transactions on Green Communications and Networking, vol. 5, no. 3, pp. 1632–1646, Sep. 2021. DOI: 10.1109/TGCN.2021.3083426
[214] S. Yu-Jie, W. Hui, and Z. Cheng-Xiang, “Balanced Computing Offloading for Selfish IoT Devices in Fog Computing”, IEEE Access, vol. 10, pp. 30890–30898, 2022. DOI: 10.1109/ACCESS.2022.3160198
[215] A. Hazra, M. Adhikari, T. Amgoth, and S. N. Srirama, “Fog Computing for Energy-Efficient Data Offloading of IoT Applications in Industrial Sensor Networks”, IEEE sensors journal, vol. 22.0, no. 9.0, pp. 8663–8671, 2022. DOI: 10.1109/jsen.2022.3157863
[216] Z. Zhou, H. Liao, B. Gu, S. Mumtaz, and J. Rodriguez, “Resource Sharing and Task Offloading in IoT Fog Computing: A Contract-Learning Approach”, IEEE Transactions on Emerging Topics in Computational Intelligence, vol. 4, no. 3, pp. 227–240, Jun. 2020. DOI: 10.1109/TETCI.2019.2902869
[217] K. Gasmi, S. Dilek, S. Tosun, and S. Ozdemir, “A survey on computation offloading and service placement in fog computing-based IoT,” *The Journal of Supercomputing*, vol. 78, no. 2, pp. 1983–2014, Feb. 2022 [Online]. DOI: 10.1007/s11227-021-03941-y
[218] S. Misra, S. P. Rachuri, P. K. Deb, and A. Mukherjee, “Multiarmed-Bandit-Based Decentralized Computation Offloading in Fog-Enabled IoT”, IEEE Internet of Things Journal, vol. 8.0, no. 12.0, pp. 10010–10017, 2021. DOI: 10.1109/JIOT.2020.3048365
[219] L. C. Keat, A. T. Fong, C. Y. Chong, and T. Yiqi, “(Offloading) QoE-Aware Application Mapping and Energy-Aware Module Placement in Fog Computing + Offloading”, International Journal of Web Services Research, vol. 19.0, no. 1.0, pp. 1–28, 2022. DOI: 10.4018/ijwsr.299017
[220] H. N. Amira S. Ibrahim Hassan Al-Mahdi, “A Collaborative Offloading Task Framework for IoT Fog Computing,” *International journal of computer networks and applications*, vol. 10.0, no. 2.0, p. 244, 2023. DOI: 10.22247/ijcna/2023/220739
[221] Q. Tang, R. Xie, F. R. Yu, T. Huang, and Y. Liu, “Decentralized Computation Offloading in IoT Fog Computing System With Energy Harvesting: A Dec-POMDP Approach”, IEEE Internet of Things Journal, vol. 7.0, no. 6.0, pp. 4898–4911, 2020. DOI: 10.1109/JIOT.2020.2971323
[222] Y. Kyung, “Performance Analysis of Task Offloading With Opportunistic Fog Nodes”, IEEE Access, vol. 10.0, pp. 4506–4512, 2022. DOI: 10.1109/access.2022.3141199
[223] Mamta, B. B. Gupta, and M. D. Lytras, “Fog-Enabled Secure and Efficient Fine-Grained Searchable Data Sharing and Management Scheme for IoT-Based Healthcare Systems”, IEEE Transactions on Engineering Management, vol. 71, pp. 12566–12578, 2024. DOI: 10.1109/TEM.2022.3143661
[224] A. Rehman, K. A. Awan, I. Ud Din, A. Almogren, and M. Alabdulkareem, “FogTrust: Fog-Integrated Multi-Leveled Trust Management Mechanism for Internet of Things”, Technologies (Basel), vol. 11.0, no. 1.0, pp. 27.0–27.0, 2023. DOI: 10.3390/technologies11010027
[225] A. R. Maha Medhat Khaled El-Shafey, “IoT-Fog based Smart-Building Security System Design and Performance Evaluation”, Journal of Computer Science, vol. 16.0, no. 9.0, pp. 1325.0–1333.0, 2020. DOI: 10.3844/JCSSP.2020.1325.1333

[226] Z. Benomar *et al.*, "A Fog-Based Architecture for Latency-Sensitive Monitoring Applications in Industrial Internet of Things", IEEE Internet of Things Journal, vol. 10.0, pp. 1908.0–1918.0, 2023. DOI: 10.1109/JIOT.2021.3138691

[227] J. Zhang, J. Ma, Y. Yang, X. Liu, and N. N. Xiong, "Revocable and Privacy-Preserving Decentralized Data Sharing Framework for Fog-Assisted Internet of Things", IEEE Internet of Things Journal, vol. 9, no. 13, pp. 10446–10463, Jul. 2022. DOI: 10.1109/JIOT.2021.3122949

[228] M. Shao, J. Liu, Q. Yang, B.-Z. Shen, and M. Wu, "Fog Node Planning With Stochastic Sensor Traffic in Dynamic Industrial Environment", IEEE Transactions on Industrial Informatics, vol. 19, no. 8, pp. 9217–9226, Aug. 2023. DOI: 10.1109/TII.2022.3227634

[229] I. Bouzarkouna, M. Sahnoun, B. Bettayeb, D. Baudry, and C. Gout, "Optimal Deployment of Fog-Based Solution for Connected Devices in Smart Factory," *IEEE Transactions on Industrial Informatics*, vol. 20, no. 4, pp. 5137–5146, Apr. 2024 [Online]. DOI: 10.1109/TII.2023.3330336

[230] D. B. Tobias Pfandzelter Jonathan Hasenburg, "From zero to fog: Efficient engineering of fog-based Internet of Things applications", Software - Practice and Experience, vol. 51.0, no. 8.0, pp. 1798.0–1821.0, 2021. DOI: 10.1002/SPE.3003

[231] L. Yang, H. Xu, C. Bai, and Y. Zhang, "Link-Aware Industrial Wireless Sensor Sleeping Scheme via Graph Signal Processing in Fog Enabled Industrial Internet of Things", in 2023 5th International Symposium on Robotics & Intelligent Manufacturing Technology (ISRIMT), 2023, pp. 355–359. DOI: 10.1109/ISRIMT59937.2023.10428608