RESEARCH ARTICLE   **OPEN ACCESS**

A Survey on Heterogeneous Data Clustering using Data Mining Techniques

Prasanavenkatesh

Government Arts College - Kumbakonam

ABSTRACT

The rise in existing data has engrossed the attention in clustering methods as a way of logically combining them and detecting patterns in large data. Hence, Swarm Intelligence methods could exhibit standard clustering techniques in certain real issues. Actually, it could exchange standard methods in certain cases. The knowledge about the issue is inadequate for selecting the superior method. It becomes essential for unveiling methods are pertinent in the publications. This article grants a systematic mapping review on current inquiries of swarm-inspired processes for tackling clustering problems. The intention of this review is to provide a complete review of diverse clustering methods in data mining. Clustering is a separation of data into collections of similar matters. Every group, known as cluster, has objects which are similar among themselves and unlike objects of other groups. Indicating data by less clusters unavoidably loses some fine details (akin to lossy data compression), but attains simplification. It offers a summary of applying the swarm methodologies together with a serious analysis of the future and current perspectives in the domain.

Keywords: Clustering, Data mining, Swarm intelligence, Knowledge Discovery in Database, Internet of Things

I. INTRODUCTION

Data mining began with the exploration of Knowledge Discovery in Database (KDD). It is a key stage during the time spent on knowledge discovery [1]. Its creation has its application background. As the world moves towards an information society, people's capacity to gather, coordinate, and produce information using information innovation has likewise incredibly improved, resulting in the production of a huge number of different sorts of databases [2]. Data mining research doesn't just come from the amassing of mountains [3]. The interest for information processing is created because of the pressing requirements of all parts of social turn of events, and it assumes an immense part in logical examination, innovative turn of events, creation of the board, market development, business tasks, and government workplaces [4]. The scholar and business circles at home and abroad connect incredible significance to the innovative work of data mining innovation and programming devices [5]. Data mining is an incredibly youthful and dynamic exploration field, which combines the most recent examination after effects of database innovation [6], computerized reasoning [7], machine learning [8], measurements [9], knowledge engineering [10], object-arranged strategies [11], information recovery [12], elite execution computing [13], and data perception [14]. After over decade of exploration, numerous new ideas and new techniques have been created. Particularly lately, a few essential ideas and techniques have become clear, and its exploration is developing in a more inside and out heading [15].

With the continuous extension of the size of schooling, the quantity of understudies has increased pointedly, which has placed a great deal of tension on understudies the executives. The informatization of the understudy information the board framework is a long way from satisfying the interest [16, 17]. Subsequently, the objective of building a computerized grounds is proposed, which is to utilize the Internet. In view of the utilization of cutting edge information innovation techniques and apparatuses, from the climate (including hardware and homerooms), assets (like graphs, gifts, courseware, and information), to exercises (including teaching, learning, the board, administration, and office), all digitized data streams on the Internet, and one line of understudies, disciplines, universities, understudy information the executives, finance, and so forth all acknowledge PC the executives [18-24]. This computerized grounds will aggregate a lot of data. Step by step instructions to mine the regulations verifiably in the enormous measure of data in order to utilize these regulations to direct the work of the school, work on the administration of the whole school, and further develop the board's effectiveness is a very meaningful work [25]. In light of the above issues, we propose applying the data mining technique to the understudy information the board framework and extracting helpful understudy information through data mining. Data mining is to separate significant and interesting knowledge from the data of enormous databases [26, 27]. This knowledge is verifiable, unknown ahead of time, yet possibly valuable information. Data mining means collecting a few realities or perception data. The choice support interaction of the model is determined. An interdisciplinary subject combines hypotheses and innovations in many fields, for example, man-made consciousness, database innovation, and design

acknowledgment, ML, measurements, and data representation. As a kind of innovation, data mining is in the gorge phase of its life cycle [28-30]. It needs investment to explore, create, and mature steadily, lastly, it is acknowledged by individuals.

This article grants a systematic mapping review on current inquiries of swarm-inspired processes for tackling clustering problems. The intention of this review is to provide a complete review of diverse clustering methods in data mining. Clustering is a separation of data into collections of similar matters. Every group, known as cluster, has objects which are similar among themselves and unlike objects of other groups. Indicating data by less clusters unavoidably loses some fine details (akin to lossy data compression), but attains simplification. It offers a summary of applying the swarm methodologies together with a serious analysis of the future and current perspectives in the domain.

II.   RELATED WORKS

The IoT [31] is arranged to change whole future subsequently for lives. The information extricated from the IoT frameworks will be investigated to perceive and coordinate complex surroundings about clients, fitting superior choice creation, bigger computerization, high level adequacy, proficiency, precision, and flourishing creation [32]. This work investigates the availability of numerous well known data mining approaches for IoT information. The outcomes are assessed over man-made brainpower and brain network with superior precision, productivity, and speed in contrast with earlier methods [33-35].

The K-Means approach is applied for processing the huge data with the assistance of Hadoop stage over Internet of Things (IoT) angles. The data from IoT gadgets are combined or disseminated in a few groups, known as bunches, which are utilized in different shrewd applications like clinical, calamity, and industrial applications [36]. The power costs and traffic over correspondence network were diminished to utilize important information, rather than entire crude data. In fact, it supplies colossal adaptability, permitting the development of bunches having a large number of Hadoop representations [37].

This enormous data has raised the idea of existence intricacy due to storing and processing colossal measures of data over portable and dynamic networks. The Extensible Mark-up Language (XML) and machine learning strategies apply to enormous data processing like grouping, clustering, and preprocessing of IoT information [38-40]. Most recent IoT applications and exhibitions remain further on an intellectual indulgence of the surroundings from information separated through arranged sensors and little machines [41]. Here a framework combines a philosophy subordinate depiction of information administrations through uncommon rationale for pretty gainful incident acknowledgment via seasoning the particular arrangement technique of machine learning [42-44]. A Street and traffic examination is performed to confirm the consequences of framework [45-50].

The individual data of clients are carefully appropriated over network through brilliant IoT gadgets and numerous fake strategies are introduced to control the carefully moved information following not many standards and approaches. An intellectual police examination methodology is introduced, discovering the disconnected arrangement or arrangements of clients over advocate stage. An intellectual dynamic strategy is applied with the assistance of fluffy mental guides [51].

The business is straightforwardly or indirectly connected with client conduct, assessed by trust mining. The trust of dealers is assessed by unique clustering, where data is adjusted step by step over tremendous network regions [52, 53]. The quick improvement of online shopping subtleties shows a growing issue for clients who are included to choose dedicated vendors and effective merchant determinations from various existing records beginning internet business use regions to upgrade the business. A powerful clustering technique is embraced to compute the trust of clients and separate the buying equality of clients for predicting client conduct [54]. The continuous and fake datasets are used to perform clustering and assess the outcomes in light of exactness [55-60].

The clinical field [61] likewise well uses the mining procedures like arrangement to distinguish the emotional well-being and assess the risk to deal with the framework. This order is finished by choice trees to find and arrange the patients according to their emotional well-being [62-65]. Here, an overall computation of an immense exhibit classifier is related to a few regions like tree, group, brain, probability, arrangement, and strategy subordinate classifiers. The linear and arbitrary classifiers are introduced to perform sickness grouping [66].

The malignant growth sickness in unstructured organization is all around characterized to find a few kinds of malignant growth illness. It produces significant outcomes concerning risk perspectives, treatment, and the board [67]. Text mining is all around taken advantage of in malignant growth illness expectation like lung, bosom, and ovarian disease. The data about malignant growth patients are gathered from a few heterogeneous assets and text mining is performed to give different malignant growth related

information like endurance, treatment, and risk of infection.

III. CONCLUSION

This article grants a systematic mapping review on current inquiries of swarm-inspired processes for tackling clustering problems. The intention of this review is to provide a complete review of diverse clustering methods in data mining. Clustering is a separation of data into collections of similar matters. Every group, known as cluster, has objects which are similar among themselves and unlike objects of other groups. Indicating data by less clusters unavoidably loses some fine details (akin to lossy data compression), but attains simplification. It offers a summary of applying the swarm methodologies together with a serious analysis of the future and current perspectives in the domain.

REFERENCES

[1] Pustokhina, I. V., Pustokhin, D. A., Lydia, E. L., Elhoseny, M., & Shankar, K. (2021). Energy efficient neuro-fuzzy cluster based topology construction with metaheuristic route planning algorithm for unmanned aerial vehicles. Computer Networks, 196, 108214.

[2] Dutta, A. K., Elhoseny, M., Dahiya, V., & Shankar, K. (2020). An efficient hierarchical clustering protocol for multihop Internet of vehicles communication. Transactions on Emerging Telecommunications Technologies, 31(5), e3690.

[3] Tyagi, S. K. S., Mukherjee, A., Boyang, Q., & Jain, D. K. (2021). Computing resource optimization of big data in optical cloud radio access networked industrial Internet of Things. IEEE Transactions on Industrial Informatics, 17(11), 7734-7742.

[4] Padmaa, M., Jayasankar, T., Venkatraman, S., Dutta, A. K., Gupta, D., Shamshirband, S., & Rodrigues, J. J. (2022). Oppositional chaos game optimization based clustering with trust based data transmission protocol for intelligent IoT edge systems. Journal of Parallel and Distributed Computing, 164, 142-151.

[5] Kumar, S., & Nezhurina, M. I. (2019). An ensemble classification approach for prediction of user's next location based on Twitter data. Journal of Ambient Intelligence and Humanized Computing, 10(11), 4503-4513.

[6] Das, A. K., Mishra, D., Das, K., Mallick, P. K., Kumar, S., Zymbler, M., & El-Sayed, H. (2022). Prophesying the Short-Term Dynamics of the Crude Oil Future Price by Adopting the Survival of the Fittest Principle of Improved Grey Optimization and Extreme Learning Machine. Mathematics, 10(7), 1121.

[7] Mansour, R. F., Escorcia-Gutierrez, J., Gamarra, M., Díaz, V. G., Gupta, D., & Kumar, S. (2021). Artificial intelligence with big data analytics-based brain intracranial hemorrhage e-diagnosis using CT images. Neural Computing and Applications, 1-13.

[8] Vaiyapuri, T., Parvathy, V. S., Manikandan, V., Krishnaraj, N., Gupta, D., & Shankar, K. (2021). A novel hybrid optimization for cluster-based routing protocol in information-centric wireless sensor networks for IoT based mobile edge computing. Wireless Personal Communications, 1-24.

[9] Ragab, M., Alshehri, S., Aldawsari, H. M., Noor, A., Ashary, E. B., Abou-Taleb, S. A. K., & Abdelazim, G. (2022). COVID-19 Identification System Using Transfer Learning Technique With Mobile-NetV2 and Chest X-Ray Images. Frontiers in Public Health, 102.

[10] Kumar, S., Toshniwal, D., & Parida, M. (2017). A comparative analysis of heterogeneity in road accident data using data mining techniques. Evolving systems, 8(2), 147-155.

[11] Mansour, R. F., El Amraoui, A., Nouaouri, I., Díaz, V. G., Gupta, D., & Kumar, S. (2021). Artificial intelligence and Internet of Things enabled disease diagnosis model for smart healthcare systems. IEEE Access, 9, 45137-45146.

[12] Dutta, A. K., Aljarallah, N. A., Abirami, T., Sundarrajan, M., Kadry, S., Nam, Y., & Jeong, C. W. (2022). Optimal Deep-Learning-Enabled Intelligent Decision Support System for SARS-CoV-2 Classification. Journal of Healthcare Engineering, 2022.

[13] Agrawal, D., Minocha, S., Namasudra, S., & Gandomi, A. H. (2022). A robust drug recall supply chain management system using hyperledger blockchain ecosystem. Computers in biology and medicine, 140, 105100.

[14] Escorcia-Gutierrez, J., Gamarra, M., Beleño, K., Soto, C., & Mansour, R. F. (2022). Intelligent deep learning-enabled autonomous small ship detection and classification model. Computers & Electrical Engineering, 100, 107871.

[15] Ragab, M., Eljaaly, K., Alhakamy, N. A., Alhadrami, H. A., Bahaddad, A. A., Abo-Dahab, S. M., & Khalil, E. M. (2021). Deep ensemble model for COVID-19 diagnosis and classification using chest CT images. Biology, 11(1), 43.

[16] Ragab, M., Albukhari, A., Alyami, J., & Mansour, R. F. (2022). Ensemble Deep-Learning-Enabled Clinical Decision Support System for Breast Cancer Diagnosis and Classification on Ultrasound Images. Biology, 11(3), 439.

[17] Namasudra, S., & Roy, P. (2017). Time saving protocol for data accessing in cloud computing. IET Communications, 11(10), 1558-1565.

[18] M. Ragab, A. Algarni, A. A. Bahaddad and R. F. Mansour, "Machine learning applied to problem-solving in medical applications," Computers, Materials & Continua, vol. 69, no.2, pp. 2277–2294, 2021.

[19] Shankar, K., Perumal, E., Díaz, V. G., Tiwari, P., Gupta, D., Saudagar, A. K. J., & Muhammad, K. (2021). An optimal cascaded recurrent neural network for intelligent COVID-19 detection using Chest X-ray images. Applied Soft Computing, 113, 107878.

[20] Lan, X., Zhang, W., Zhang, S., Jain, D. K., & Zhou, H. (2019). Robust multi-modality anchor graph-based label prediction for RGB-infrared tracking. IEEE Transactions on Industrial Informatics.

[21] Joshi, G. P., Alenezi, F., Thirumoorthy, G., Dutta, A. K., & You, J. (2021). Ensemble of deep learning-based multimodal remote sensing image classification model on unmanned aerial vehicle networks. Mathematics, 9(22), 2984.

[22] Zhou, S., Luo, P., Jain, D. K., Lan, X., & Zhang, Y. (2019). Double-domain imaging and adaption for person re-identification. IEEE Access, 7, 103336-103345.

[23] Althobaiti, M. M., Kumar, K. P. M., Gupta, D., Kumar, S., & Mansour, R. F. (2021). An intelligent cognitive computing based intrusion detection for industrial cyber-physical systems. Measurement, 186, 110145.

[24] Gupta, A., & Namasudra, S. (2022). A novel technique for accelerating live migration in cloud computing. Automated Software Engineering, 29(1), 1-21.

[25] Shankar, K., Perumal, E., Tiwari, P., Shorfuzzaman, M., & Gupta, D. (2021). Deep learning and evolutionary intelligence with fusion-based feature extraction for detection of COVID-19 from chest X-ray images. Multimedia Systems, 1-13.

[26] Mansour, R. F., Escorcia-Gutierrez, J., Gamarra, M., Gupta, D., Castillo, O., & Kumar, S. (2021). Unsupervised deep learning based variational autoencoder model for COVID-19 diagnosis and classification. Pattern Recognition Letters, 151, 267-274.

[27] Vaiyapuri, T., Dutta, A. K., Sikkandar, M. Y., Gupta, D., Alouffi, B., Alharbi, A., ... & Kadry, S. (2022). Design of Metaheuristic Optimization-Based Vascular Segmentation Techniques for Photoacoustic Images. Contrast Media & Molecular Imaging, 2022.

[28] Namasudra, S., Sharma, P., Crespo, R. G., & Shanmuganathan, V. (2022). Blockchain-Based Medical Certificate Generation and Verification for IoT-based Healthcare Systems. IEEE Consumer Electronics Magazine.

[29] Metawa, N., Nguyen, P. T., Le Hoang Thuy To Nguyen, Q., Elhoseny, M., & Shankar, K. (2021). Internet of things enabled financial crisis prediction in enterprises using optimal feature subset selection-based classification model. Big Data, 9(5), 331-342.

[30] Ragab, M., Ashary, E. B., Aljedaibi, W. H., Alzahrani, I. R., Kumar, A., Gupta, D., & Mansour, R. F. (2022). A novel metaheuristics with adaptive neuro-fuzzy inference system for decision making on autonomous unmanned aerial vehicle systems. ISA Transactions.

[31] Vaiyapuri, T., Lydia, E. L., Sikkandar, M. Y., Díaz, V. G., Pustokhina, I. V., & Pustokhin, D. A. (2021). Internet of Things and Deep Learning Enabled Elderly Fall Detection Model for Smart Homecare. IEEE Access, 9, 113879-113888.

[32] Althobaiti, M. M., Almulihi, A., Ashour, A. A., Mansour, R. F., & Gupta, D. (2022). Design of Optimal Deep Learning-Based Pancreatic Tumor and Nontumor Classification Model Using Computed Tomography Scans. Journal of Healthcare Engineering, 2022.

[33] Alqaralleh, B. A., Mohanty, S. N., Gupta, D., Khanna, A., Shankar, K., & Vaiyapuri, T. (2020). Reliable multi-object tracking model using deep learning and energy efficient wireless multimedia sensor networks. IEEE Access, 8, 213426-213436.

[34] Mukherjee, A., Jain, D. K., Goswami, P., Xin, Q., Yang, L., & Rodrigues, J. J. (2020). Back propagation neural network based cluster head identification in MIMO sensor networks for intelligent transportation systems. IEEE Access, 8, 28524-28532.

[35] Al-Wesabi, F. N., Obayya, M., Hamza, M. A., Alzahrani, J. S., Gupta, D., & Kumar, S. (2022). Energy Aware Resource Optimization using Unified Metaheuristic Optimization Algorithm Allocation for Cloud Computing Environment. Sustainable Computing: Informatics and Systems, 35, 100686.

[36] A. A. Eshmawi, H. Alhumyani, S. A. Khalek, R. A. Saeed, M. Ragab et al., "Design of automated opinion mining model using optimized fuzzy neural network," Computers, Materials & Continua, vol. 71, no.2, pp. 2543–2557, 2022.

[37] M. Ragab, E. B. Ashary, M. F. S. Sabir, A. A. Bahaddad and R. F. Mansour, "Mathematical modelling of quantum kernel method for biomedical data analysis," Computers, Materials & Continua, vol. 71, no.3, pp. 5441–5457, 2022.

[38] Alqaralleh, B. A., Vaiyapuri, T., Parvathy, V. S., Gupta, D., Khanna, A., & Shankar, K. (2021). Blockchain-assisted secure image transmission and diagnosis model on Internet of Medical Things Environment. Personal and ubiquitous computing, 1-11.

[39] Chinnasamy, P., Deepalakshmi, P., Dutta, A. K., You, J., & Joshi, G. P. (2021). Ciphertext-Policy Attribute-Based Encryption for Cloud Storage: Toward Data Privacy and Authentication in AI-Enabled IoT System. Mathematics, 10(1), 68.

[40] Pustokhina, I. V., Pustokhin, D. A., Aswathy, R. H., Jayasankar, T., Jeyalakshmi, C., Díaz, V. G., & Shankar, K. (2021). Dynamic customer churn prediction strategy for business intelligence using text analytics with evolutionary optimization algorithms. Information Processing & Management, 58(6), 102706.

[41] Shankar, K., Mohanty, S. N., Yadav, K., Gopalakrishnan, T., & Elmisery, A. M. (2021). Automated COVID-19 diagnosis and classification using convolutional neural network with fusion based feature extraction model. Cognitive Neurodynamics, 1-14.

[42] Nair, R., Ragab, M., Mujallid, O. A., Mohammad, K. A., Mansour, R. F., & Viju, G. K. (2022). Impact of Wireless Sensor Data Mining with Hybrid Deep Learning for Human Activity Recognition. Wireless Communications and Mobile Computing, 2022.

[43] Sharma, P., Moparthi, N. R., Namasudra, S., Shanmuganathan, V., & Hsu, C. H. (2021). Blockchain-based IoT architecture to secure healthcare system using identity-based encryption. Expert Systems, e12915.

[44] Manjari, K., Verma, M., Singal, G., & Namasudra, S. (2022). QEST: Quantized and Efficient Scene Text Detector using Deep Learning. Transactions on Asian and Low-Resource Language Information Processing.

[45] Jain, D. K., Boyapati, P., Venkatesh, J., & Prakash, M. (2022). An Intelligent Cognitive-Inspired Computing with Big Data Analytics Framework for Sentiment Analysis and Classification. Information Processing & Management, 59(1), 102758.

[46] Vaiyapuri, T., Mohanty, S. N., Sivaram, M., Pustokhina, I. V., Pustokhin, D. A., & Shankar, K. (2021). Automatic vehicle license plate recognition using optimal deep learning model. Computers, Materials and Continua, 67(2), 1881-1897.

[47] Namasudra, S., Chakraborty, R., Majumder, A., & Moparthi, N. R. (2020). Securing multimedia by using DNA-based encryption in the cloud computing environment. ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM), 16(3s), 1-19.

[48] Jain, D. K., Li, Y., Er, M. J., Xin, Q., Gupta, D., & Shankar, K. (2021). Enabling Unmanned Aerial Vehicle Borne Secure Communication with Classification Framework for Industry 5.0. IEEE Transactions on Industrial Informatics.

[49] Namasudra, S. (2020). Fast and secure data accessing by using DNA computing for the cloud environment. IEEE Transactions on Services Computing.

[50] Lian, J., Jia, W., Zareapoor, M., Zheng, Y., Luo, R., Jain, D. K., & Kumar, N. (2019). Deep-learning-based small surface defect detection via an exaggerated local variation-based generative adversarial network. IEEE Transactions on Industrial Informatics, 16(2), 1343-1351.

[51] Vaiyapuri, T., Dutta, A. K., Punithavathi, I. H., Duraipandy, P., Alotaibi, S. S., Alsolai, H., ... & Mahgoub, H. (2022, April). Intelligent Deep-Learning-Enabled Decision-Making Medical System for Pancreatic Tumor Classification on CT Images. In Healthcare (Vol. 10, No. 4, p. 677). MDPI.

[52] Paikrao, P., Mukherjee, A., Jain, D. K., Chatterjee, P., & Alnumay, W. (2021). Smart emotion recognition framework: A secured IOVT perspective. IEEE Consumer Electronics Magazine.

[53] Vaiyapuri, T., & Gupta, M. (2021). Traffic accident severity prediction and cognitive analysis using deep learning. Soft Computing, 1-13.

[54] Shankar, K., Perumal, E., Elhoseny, M., Taher, F., Gupta, B. B., & El-Latif, A. A. A. (2021). Synergic Deep Learning for Smart Health Diagnosis of COVID-19 for Connected Living and Smart Cities. ACM Transactions on Internet Technology (TOIT), 22(3), 1-14.

[55] Vaiyapuri, T. (2021). Deep learning enabled autoencoder architecture for collaborative filtering recommendation in iot environment. CMC-COMPUTERS MATERIALS & CONTINUA, 68(1), 487-503.

[56] Jain, D. K., Zareapoor, M., Jain, R., Kathuria, A., & Bachhety, S. (2020). GAN-Poser: an improvised bidirectional GAN model for human motion prediction. Neural Computing and Applications, 32(18), 14579-14591.

[57] Ismail, S. S., Mansour, R. F., El-Aziz, A., Rasha, M., & Taloba, A. I. (2022). Efficient E-Mail Spam Detection Strategy Using Genetic Decision Tree Processing with NLP Features. Computational Intelligence and Neuroscience, 2022.

[58] Pavithran, P., Mathew, S., Namasudra, S., & Srivastava, G. (2022). A novel cryptosystem based on DNA cryptography, hyperchaotic systems and a randomly generated Moore machine for cyber physical systems. Computer Communications, 188, 1-12.

[59] Sekhar, P., Lydia, E. L., Elhoseny, M., Al-Akaidi, M., Selim, M. M., & Shankar, K. (2021). An effective metaheuristic based node localization technique for wireless sensor networks enabled indoor communication. Physical Communication, 48, 101411.

[60] Dutta, A. K. (2020). Managing natural hazards in smart cities in Kingdom of Saudi Arabia using a technique based on interior search algorithm. Electronic Government, an International Journal, 16(1-2), 155-169.

[61] Jain, D. K., Tyagi, S. K. K. S., Neelakandan, S., Prakash, M., & Natrayan, L. (2021). Metaheuristic optimization-based resource allocation technique for cybertwin-driven 6G on IoE environment. IEEE Transactions on Industrial Informatics.

[62] Swati, S., Kumar, M., & Namasudra, S. (2022). Early prediction of cognitive impairments using physiological signal for enhanced socioeconomic status. Information Processing & Management, 59(2), 102845.

[63] Shankar, K., Taniar, D., Yang, E., & Yi, O. (2021). Secure and Optimal Secret Sharing Scheme for Color Images. Mathematics, 9(19), 2360.

[64] Nair, R., Ragab, M., Mujallid, O. A., Mohammad, K. A., Mansour, R. F., & Viju, G. K. (2022). Impact of Wireless Sensor Data Mining with Hybrid Deep Learning for Human Activity Recognition. Wireless Communications and Mobile Computing, 2022.

[65] Dutta, A. K. (2021). Detecting phishing websites using machine learning technique. PloS one, 16(10), e0258361.

[66] Mukherjee, A., Jain, D. K., & Yang, L. (2020). On-demand efficient clustering for next generation IoT applications: A hybrid NN approach. IEEE Sensors Journal, 21(22), 25457-25464.

[67] Nayak, D. R., Padhy, N., Mallick, P. K., Bagal, D. K., & Kumar, S. (2022). Brain Tumour Classification Using Noble Deep Learning Approach with Parametric Optimization through Metaheuristics Approaches. Computers, 11(1), 10.