

AI-Driven Intelligent Ecosystems: Sentiment Analysis, Healthcare Informatics, and Future Wireless Communication Technologies Simulation Cipher Algorithm

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Abstract: To make an intelligent system, AI have a major role on data analytics, natural language processing, healthcare informatics, and communication technologies. Machine learning models were applied for analysis the social media tweets. There are different AI models used for disease diagnosis, support clinical decision-making, and provide personalized treatment recommendations. Different wireless communication technologies were used for real-time data exchange and intelligent service delivery. This paper discussed the role AI technology to make an intelligent system which revolve our day-to-day activities.

Keywords: *Intelligent Ecosystems, Sentiment Analysis, Healthcare Informatics, Deep Learning, Internet of Things, 6G Networks, Natural Language Processing.*

1. Introduction

Artificial Intelligence is playing a crucial role to make an intelligent modern society. These ecosystems consists of artificial intelligence, cloud computing, IoT, and advanced communication networks to provide efficient and intelligent services. This paper discussed on homophily network on social media [1]. Our aim in this paper is to discuss the AI-driven intelligent ecosystems by exploring the sentiment analysis, healthcare informatics, and future wireless communication technologies. By using these technologies, enormous changes are found in the society as compared to twenty years back.

2. Artificial Intelligence and Intelligent Ecosystems

The architecture of an AI-driven intelligent ecosystem generally consists of five major layers:

- Data acquisition layer.
- Data processing layer.
- Artificial intelligence analytics layer.
- Decision support layer.
- Application layer.

Each layer contributes to the efficient functioning of the ecosystem by enabling the collection, analysis, and utilization

of information. Figure 1 shown the architectural view of our study.

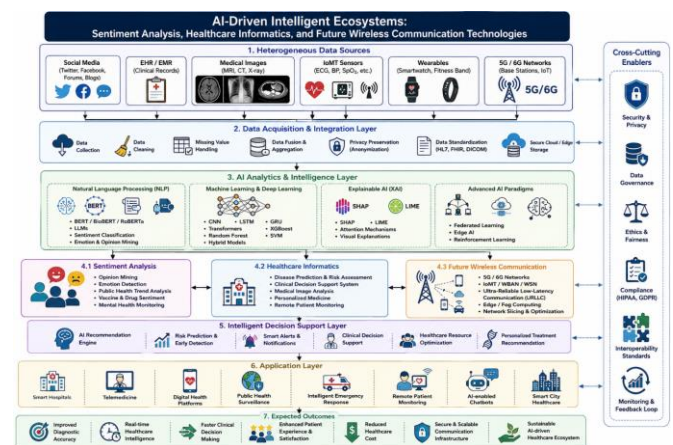


Figure 1: Architectural View

3. Sentiment Analysis in Intelligent Ecosystems

There are different techniques for analysis on sentiments or opinions. This study discuss different techniques for sentiment analysis on social media posts[2].This study proposed a novel approach using Genetic algorithm[3].In this

study we used machine learning algorithm for sentiment analysis[4]. The proposed hybrid model is showing better result than other traditional model for analyzing the sentiments [5].This worked introduced a new model for healthcare reviews[6].This proposed model most useful analysis the tweets[7]. The proposed model have the better confidence than other related models [8].This worked discussed on students physiological parameters [9]. In this work, we investigate the quality of medical service using LDA model [10].This worked developed a model for analysis the financial tweets [11]. This study discussed the analysis of public tweets [12]. This study also discussed on analysis the drug tweets [13].The proposed work developed a software systems analysis the tweets [14].In this study proposed a fuzzy based model [15].This study discussed the analysis of guest tweets [16].In this research work we use only text and image sentiment. For the text sentiment, we use BERT and for the image, we use ResNet-50. Our model performed well than other models. This sentiment is required for improving the healthcare system[17]. This study presents an AI-powered medication recommendation system. It uses Natural Language Processing (NLP) to analyze patient emotions and medical conditions [18].

4. Healthcare Informatics and Artificial Intelligence

This study discussed the analysis of healthcare data and healthcare monitoring from this data [19].This worked analysis the big data related to healthcare [20].This work discuss the integration of cloud computing and deep learning model for medical data analysis[21].This study discussed the application of Cloud computing on revolution in healthcare [22]. This research work established a voice assistant system [23].This worked proposed a nurse staffing system for better hospital management system [24].The authors proposed a model for remote healthcare system [25].

This worked more helpful for health administrators to track COVID-19 status across states and districts [26]. MedWheels is transforming emergency medical transportation by harnessing the power of technology to provide swift, reliable, and professional ambulance [27].This worked developed a remote healthcare monitoring system using TMIS [28].

5. Future Wireless Communication Technologies

The fifth-generation wireless network has already introduced significant improvements in different domain. This research discussed how to protect households and individuals from potential threats [29].This paper explores the role of CDMA in network technology [30]. This chapter describes how the Raspberry Pi Pico, a low-cost and widely available microcontroller, can be used to carry out a security attack on Windows systems [31].This worked discussed on AI power remote sensing and applications [32].This worked

developed an emergency based ambulance system [33]. The authors proposed a shared-key authentication mechanism to identify malicious nodes in wireless ad hoc networks [34].

6. Conclusion

Sentiment analysis provides valuable insights into human emotions and public opinions, while healthcare informatics improves medical diagnosis and personalized treatment. Future wireless communication technologies offer the infrastructure necessary for supporting real-time intelligent applications. The convergence of these domains will play an important role in building next-generation intelligent ecosystems that improve healthcare delivery, communication efficiency, and overall societal well-being. Continued research and innovation are essential for addressing existing challenges.

Authors' Contributions

Authors are required to include a statement of responsibility in the manuscript that specifies the contribution of every author. The level of detail varies; some disciplines produce manuscripts that comprise discrete efforts readily articulated in detail, whereas other fields operate as group efforts at all stages.

For Example- Author-1 researched literature and conceived the study. Author-2 involved in protocol development, gaining ethical approval, patient recruitment, and data analysis. Author-3 wrote the first draft of the manuscript. All authors reviewed and edited the manuscript and approved the final version of the manuscript.

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References

- [1]. Jana, R.K., Maity, S. and Maiti, S., 2022, May. An empirical study of sentiment and behavioural analysis using homophily effect in social network. 6th International Conference on Intelligent Computing and Control Systems (ICICCS) (pp. 1508-1515). IEEE, 2022.
- [2]. Jana, R.K. and Maity, S., 2022. An Accuracy based Comparative Study on Different Techniques and challenges for Sentiment Analysis. Pervasive Computing and Social Networking: Proceedings of ICPCSN 2022, pp.601-619.
- [3]. Radha, K., Dharmapal, S., Saikat, M. and Hritthik, P., 2023. Perception Analysis of Social Network Tweets Using a Genetic Algorithm Based Approach s. Journal of Software Engineering Tools &Technology Trends, 10(02), pp.27-38.

- [4]. Khemani, B., Malave, S., Patil, S. et al. Sentimatrix: sentiment analysis using GNN in healthcare. *Int. j. inf. tecnol.* 16, 5213–5219 (2024). <https://doi.org/10.1007/s41870-024-02142-z>.
- [5]. Jana, R.K., Singh, D., Maity, S. and Paul, H., 2024. A Hybrid Approach to Analyse the Public Sentiment on Covid-19 Tweets. *Indian Journal of Science and Technology*, 17(7), pp.610-616.
- [6]. D. Singh, S. Shivprakash Barve and A. Krishna Dwivedi, "OptiASAR: Optimized Aspect-Based Sentiment Analysis of Reviews With BiLSTM-GRU and NER-BERT in Healthcare Decision-Making," in *IEEE Access*, vol. 13, pp. 47459-47474, 2025, doi: 10.1109/ACCESS.2025.3549303.
- [7]. Jana, R.K., Singh, D. and Maity, S., 2024. Modified firefly algorithm and different approaches for sentiment analysis. *The Scientific Temper*, 15(01), pp.1745-1754.
- [8]. Jana, R.K., Singh, D., Maity, S., Paul, H., Mallick, A., Ghatak, S., Mallik, S. and Wang, M., 2024. Public perception analysis on COVID-19 tweets using hybridised method. *International Journal of Computational Biology and Drug Design*, 16(1), pp.19-41.
- [9]. Das, S., Nag, S. and Jana, R., 2025. A Multimodal Systematic Review of Stress Detection in University Students Based on Machine Learning and Physiological Measures.
- [10]. Dai J, Lyu F, Yu L, Zhou Z, He Y. Medical service quality evaluation based on LDA and sentiment analysis: Examples of seven chronic diseases. *Digital health*. 2024 Mar;10:20552076241233864.
- [11]. Samarпита Roy, Dr. Radha Krishna Jana, Dr. Bidisha Bhabani, Dr. Tanaya Das, "From Tweets to Trades: Applications of Financial Sentiment Analysis in Market Forecasting", *Journal of Computer Science and Engineering in Innovations and Research (ISSN No: 3049-1762 online)*, June 15, 2025, Vol2(1), pp 1-6 .
- [12]. Shabbir Ahamad Molla, Sarmistha Sarkar, Dr. Radha Krishna Jana, Dr. Bidisha Bhabani, Dr. Tanaya Das", *The Sentiment Behind the Tweet*", *Journal of Computer Science and Engineering in Innovations and Research (ISSN No: 3049-1762 online)*, June 15, 2025, Vol2(1), pp 7-12 .
- [13]. Dr. Radha Krishna Jana, Dr. Atanu Kotal, Asit Kumar Nayek, "Healthcare Made Smarter: AI-Driven Drug Recommendation Systems", *Journal of Computer Science and Engineering in Innovations and Research (ISSN No: 3049-1762 online)*, June 15, 2025, Vol2(1), pp 25-30.
- [14]. Debanjan Pan, Dr. Radha Krishna Jana, Tirthajyoti Nag, Achyut Mitra, "Analyzing Sentiments to Detect Drug-Related Tweets: A Software Engineering Framework", *Journal of Computer Science and Engineering in Innovations and Research (ISSN No: 3049-1762 online)*, June 15, 2025, Vol2(1), pp 31-36.
- [15]. Serrano-Guerrero J, Bani-Doumi M, Romero FP, Olivas JA. A 2-tuple fuzzy linguistic model for recommending health care services grounded on aspect-based sentiment analysis. *Expert Systems with Applications*. 2024 Mar 15;238:122340.
- [16]. Sandip Mandal, Shemanti Pal, Dr. Radha Krishna Jana, Asit Kumar Nayek, "Uncovering Guest Sentiment: Analyzing Hotel Reviews", *Journal of Computer Science and Engineering in Innovations and Research (ISSN No: 3049-1762 online)*, June 15, 2025, Vol2(1), pp 37-42
- [17]. Neelanjan Ghosh, Radha Krishna Jana, "Tweeting Health: Multimodal Sentiment Analysis for Healthcare Insights", 4th International Conference on Innovations in Data Analytics (ICIDA 2025) , Eminent College of Management and Technology(ECMT), West Bengal, India, 5th -6th December 2025.
- [18]. Neelanjan Ghosh, Radha Krishna Jana, " Emotion-Driven Medication Recommendations for Patients ", 4th International Conference on Innovations in Data Analytics (ICIDA 2025) , Eminent College of Management and Technology(ECMT), West Bengal, India, 5th -6th December 2025.
- [19]. Aneesh Bose , Deblina Pal , Radhakrishna Jana, " Population Health Tracking System: Analyzing Health Data for Effective Healthcare Planning" *International Journal of Computer Sciences and Engineering Vol.11, Special Issue.1*, pp.323-330, November 2023.
- [20]. Nirbhay Mishra Protyusha Chatterjee, Akash Barman, Debashish Dey, Aditya Dutta, Radha Krishna Jana, Dharmpal Singh, Sudipta Dutta, "Unlocking the Future: Leveraging Big Data Analytics for Predictive Healthcare Insights", *International Journal of Computer Sciences and Engineering, Vol.11, Special Issue.1*, pp.114-119, November 2023.
- [21]. Shakor, M.Y. and Khaleel, M.I., 2024. Recent advances in big medical image data analysis through deep learning and cloud computing. *Electronics*, 13(24), p.4860.
- [22]. Atin Bera, Arya Bhattacharyya, Radhakrishna Jana, Sudipta Kumar Dutta, "A Simplified Review of Cloud Computing in the Healthcare System", *International Journal of Computer Sciences and Engineering Vol.11, Special Issue.1*, pp.290-295, November 2023.
- [23]. Arpan Kumar Chall, Anapeksha Das, Asmi Mondal, Radhakrishna Jana, " Wellness Management Guided by Voice Input, Featuring an Intelligent AI Health Assistant Named: Raie", *International Journal of Computer Sciences and Engineering Vol.11, Special Issue.1*, pp.169-176, November 2023 .
- [24]. Abhisar Paul, Diganta Biswas, Radha Krishna Jana, "Utilizing an Implicit Health Analysis Integrated Simulation for Hospital-Nurse Staffing Strategy," *International Journal of Computer Sciences and Engineering*, Vol.11, Issue.01, pp.127-133, 2023.
- [25]. Asit Kumar Nayek, Radha Krishna Jana, Arpan Adhikary, " An improved algorithm with Multifactor Authentication Scheme for Telecare Medical Information System (TMIS)", *International Journal of Computer Sciences and Engineering Vol.11, Special Issue.1*, pp.107-113, November 2023.
- [26]. Sonia Thakur, Ritaja Bhattacharya, Bidisha Debnath, Radha Krishna Jana, Hrithik Paul, "Novel Approach of Health Heatmap Design for Public Health Emergencies: A Covid-19 Perspective", *Journal of Computer Science and Engineering in Innovations and Research , Vol.-1, Issue- 1*, July 2024.
- [27]. Ghosh, D., Mukhopadhyay, A. and Jana, R.K., 2025. Ambulance booking and tracking website. *Drug Discovery and Telemedicine: Through Artificial Intelligence, Computer Vision, and IoT*, p.183.
- [28]. Nayek, A.K., Jana, R.K. and Adhikary, A., Enhanced multifactor authentication scheme for telecare medical information system (TMIS). In *Transformative Technologies* (pp. 129-139). CRC Press.
- [29]. Souvik Sikdar, Samya Das, Soham Dey, Radha Krishna Jana, " IoT Home Guard: Enhancing Security for Smart Home Privacy and Protection", *International Journal of Computer Sciences and Engineering Vol.11, Special Issue.1*, pp.301-309, November 2023.
- [30]. Sanjoy Paul, Radha Krishna Jana, "CDMA Technique & Its Special Function in Network Technology", *IJCST Vol. 3, Issue 1*, Jan - March 2012.
- [31]. Kamilya, R. and Jana, R.K., Bypassing Windows Security Using a Raspberry Pi Pico as a Rubber Ducky for Remote Access. In *Intelligent Systems in Solid-State Electronics and Communication Engineering* (pp. 183-188). CRC Press.
- [32]. Jana, R.K. and Mitra, A., 2026. AI-Powered Remote Sensing: A Review of Recent Developments and Emerging Applications. *Intelligent Systems in Solid-State Electronics and Communication Engineering*, pp.207-227.
- [33]. Ghosh, D., Mukhopadhyay, A. and Jana, R.K., 2025. 11 Ambulance booking and tracking website. *Drug Discovery and Telemedicine: Through Artificial Intelligence, Computer Vision, and IoT*, p.183.
- [34]. Pijush Barui, Radha Krishna Jana, "An Approach to Identify a Malicious Node Based on Shared Key Establishment in Ad

Hoc Network” International Journal of Computer Science and Technology (IJCT), IJCT Vol. 2 Issue 1 .APRIL -JUNE, 2012 - ISSN: 0976-8491 (online), 2229-4333 (Print).

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