Deepti Kushwaha al. International Journal of Recent Research Aspects ISSN: 2349-7688, Special Issue: International Conference on Intelligent Systems for Complex, Chaotic, & Connected Environments Sept 2025, pp. 11-16

VOICE BASED INTERFACES IN FAST FOOD INDUSTRY USING SOUNDHOUND

[1]Deepti Kushwaha, [2]Aditya Jha, [3]Divyanshu Yadav

Trinity Institute of Innovations In Professional Studies, Greater Noida, India

deeptiritu@gmail.com, Ajha82063@gmail.com, Divyanshuyadav0813@gmail.com

ABSTRACT-**A voice assistant for fast food deliveries using SoundHound leverages advanced AI-driven conversational technologies to enable customers to order food quickly and naturally through speech, significantly improving efficiency and convenience for both diners and restaurants. SoundHound's voice assistant empowers fast food delivery services by providing a seamless and hands-free ordering experience. Integrated with major restaurant point-of-sale systems, this solution utilizes proprietary Speech-to-Meaning® and Deep Meaning Understanding® technologies to accurately process food orders made in natural language, whether in-vehicle, via phone, or through drive-thru kiosks. Orders are synchronized with restaurant partners, and advanced GPS functionality ensures timely pickups and fresh food ready on arrival, bypassing queues and reducing wait times**

Keywords: *voice ai ,natural language processing , generative ai , cloud edge hybrid connectivity , gps integration*

I INTRODUCTION

SoundHound's voice assistant for fast food deliveries is a cutting-edge solution that enables customers to seamlessly order food using natural speech, either from their vehicles, phones, or restaurant kiosks. By integrating directly with restaurant systems, SoundHound transforms the ordering experience into a hands-free, rapid, and highly accurate process, revolutionizing how diners interact with quick service and fast-casual restaurants [1][2][3].Deployed in thousands of restaurant locations, SoundHound's technology applies advanced speech recognition and natural language understanding to automate order-taking and transactions. Customers can find nearby restaurants, place orders, make payments, and even coordinate pickups through GPS navigation—all via conversational interfaces[13][14]. Industry research reveals that a majority of drivers prefer this method over traditional drive thru lines due to the convenience and speed it offers [4][5].This innovation marks a major step forward in voice commerce by enabling restaurants to boost efficiency, accuracy, and guest satisfaction while freeing staff to focus on in-person service. SoundHound's platform is shaping the future of fast food and restaurant ordering with next generation AI, meeting customer demands for fast, easy, and personalized service on the go [6][15]16][17]

Key Features

• Natural-speech Ordering: Customers can place complex orders ("classic cheeseburger, add avocado, no pickles, combo with fries and a coke") without navigating menus manually.
• Integration with Restaurants: The system connects to POS systems such as Square, Toast, Oracle, and Olo, streamlining transactions for thousands of restaurant locations.
• Real-time GPS Coordination: Orders are timed with vehicle navigation for optimal pickup convenience and freshness.
• Omnichannel Deployment: Usable in cars, phones, kiosks, and drive-thru lanes, thus supporting various customer touchpoints.
• Business Impact: Restaurants see improved order accuracy, increased throughput, and reduced labor pressures, while customers enjoy convenient, frictionless experiences and increased loyalty.

Market Impact

Recent studies reveal that nearly 80% of diners would prefer using in-car voice assistants for food orders over traditional drive-thru methods, marking a transformative shift in restaurant service and customer expectations. SoundHound's platform continues to push boundaries with ongoing partnerships and pilots with global restaurant brands
and automakers, aiming to expand AI voice commerce to broader domains and devices in the future.[18]19]

This technology represents a major advancement in fast food delivery, offering unparalleled speed, convenience, and customer satisfaction through voice-enabled solutions.

II. LITERATURE REVIEW

THE PROGRAMMING LANGUAGE USED IN THIS MODEL IS PYTHON (3.7.2 AND 3.6.8).

Jarvis uses the speech-to-text (STT) and text-to-speech (TTS) technology from Google's GTTS. The authors in the paper have recognized 3 generations of VAs and the paper focuses on the 3rd generation where systems are built using

XML. The paper shows tells about the storage of user data in the cloud by intelligent virtual assistants (IVAs) like Amazon Alexa and Google Assistant. It underscores the potential privacy and security threats associated with this practice, outlining the types of data stored by Alexa, including traffic card, sport card, shopping item, task, eon card, notification card, and puffin card, emphasizing the implications for user privacy and provides suggestions for users and vendors to address privacy concerns. [2] This paper focuses on the privacy of the data recorded by the Virtual Assistant. The use of any VA depends on 1) the Quality of speech recognition and 2) VA interaction. The conjoint model of virtual assistants is described in depth in this paper. The paper says that the answers given by the VAs are always personalized and contextual depending on the search history of the web pages. [3] Voice User Interface (VUI) enables an intelligent personal assistant to carry out mental tasks, such as turning on and off smartphone applications. Three things make up a voice assistant: an interface, dialog management, and an input/output medium for communication.[20][21]

[4] VAs have significantly improved the effectiveness and user experience of virtual assistants through advancements in natural language processing and machine learning. [5] This paper proposes a new framework for film-based hand gesture recognition that overcomes this limitation. The framework utilizes real-time video acquisition, video normalization, and a novel Hand Frames Feature Extraction (HFFE) stage. [6] The study focuses on creating prototypes for voice-controlled digital banking and online payments with two-factor authentication. The research explores the potential of utilizing cloud technology and devices equipped with voice assistant software, particularly Amazon's Alexa, for secure authentication. [7] To create lightweight, speech and vision-enabled virtual assistants for smart home and automation applications, this article provides a software architecture. The architecture consists of modules for face detection, face recognition for user identification, and speech synthesis and recognition. An application prototype named. [8] This research introduces three new scales specifically designed to measure the user experience (UX) of voice assistant systems. These scales are intended to be used alongside a modular questionnaire concept to effectively evaluate voice user interfaces (VUIs). [9] Smart virtual assistants have the potential to be applied as AI-driven laboratory assistants. They could assist in tasks such as reading standard operating procedures, reciting chemical parameters, and reading out laboratory devices and sensors. The authors conclude that VUIs have great potential in laboratory settings for instrument control and retrieving and saving experimental data and protocols. This paper presents a solid framework that leverages cloud storage and blockchain to secure medical data in Healthcare 4.0. Elliptic Curve Digital Signature Algorithm is used for authentication, and Elliptic Curve Cryptography is used for encryption [7]. The framework addresses issues with medical data security and privacy while improving security and outperforming current solutions.

The adoption of voice assistants (VA) addresses the shortcomings of conventional models in comprehending AI's emotional impact. It introduces "artificial autonomy" as a crucial quality, which includes autonomy in detecting, thinking, and acting [9]. Virtual Personal Assistants (VPAs) have evolved in the age of Artificial Intelligence and Machine Learning, here we will explore the creation of a Python-based voice assistant for Windows that aims to improve accessibility and usability, with a focus on hands-free operation and email functionality.[14] This paper proposes a digital restaurant system to minimize infection risks for customers and personnel. Utilizing contactless technologies, digital menus, online ordering, and automated payment systems, the solution enhances safety and efficiency, reducing physical interactions and potential contamination in dining environments.

[6] This paper introduces QARMA algorithms for Industry 4.0, emphasizing their computational performance, predictive accuracy, and explainability over traditional ML and Deep Learning models. Practical field deployment and validation on two production lines highlight these advantages, supported by a state-of-the-art Industrial Internet of Things platform.

The paper tackles communication challenges for the hearing impaired by developing a gesture recognition system using image classification models [10][12]. Leverages computer vision and image processing to capture and interpret. [17] This research proposes an enhanced hand gesture recognition (HGR) system using an optimized Artificial Neural Network (ANN). Traditional ANNs struggle with dynamic gestures. To address this, the authors introduce a new approach that combines an emotion detection with hand gestures.

[8] In this paper for those who have hearing loss, this creates computer vision models for machine learning that can precisely record and understand hand movements. It looks at different image categorization techniques and finds the best one. A real-time video model recognizes commonly used signs, improving communication and providing a wide range of uses.

[9] Glass-Box is a voice activated gadget that uses declarations of class-contrasting counterfactuals to explain automatic decisions. Through interactive discussion, it draws attention to biases and flaws in decision-making models, rendering the process visible and easily comprehensible for non-expert users. Taking on the role of a loan applicant is one way to demonstrate in the paper on how automated decision making works [11] [22][23] This paper proposes a Text-to-Speech synthesizer that uses Digital Signal Processing (DSP) and Natural Language Processing

(NLP) to translate text into spoken speech. After text is processed by the application, synthesized voice is produced, played aloud to the user, and stored as an MP3 file.

III. METHODOLOGY

The methodology for studying the use of SoundHound AI in fast food restaurants typically involves a multi-faceted approach combining qualitative and quantitative research techniques. Here is a detailed outline of a suitable methodology for research in this area:

A. Literature Review

• Conduct an extensive review of academic papers, industry reports, white papers, and case studies related to voice AI technology, conversational AI, and its application in fast food restaurants.[24][25]

• Review SoundHound's technical documents and press releases for insights into their proprietary technology (e.g., Speech-to-Meaning®).

• Analyze consumer acceptance studies and analytics reports commissioned by SoundHound and third parties to understand trends in customer preferences and market potential.

B. Case Study Analysis

• Select fast food restaurants that have implemented SoundHound AI technology (e.g., Church's Texas Chicken, Taco Bell pilots).

• Collect data on key performance indicators—order processing times, throughput at drive-thrus, customer satisfaction levels, order accuracy, upselling success before and after implementation. • Conduct interviews or surveys with restaurant staff and management to gather qualitative insights on operational impact and employee experience.

C. Consumer Survey

• Design and distribute questionnaires to customers who have used voice AI ordering in these restaurants.

• Evaluate customer satisfaction, ease of use, perceived convenience, and likelihood of future use.

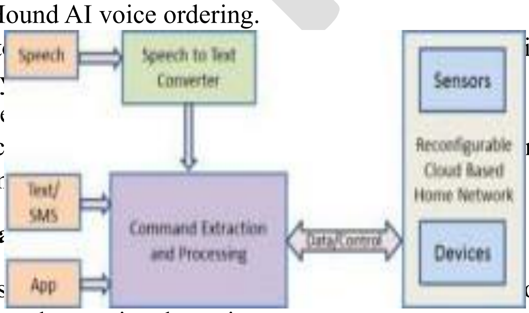
• Include demographic questions to analyze preferences across different customer segments.

D. Experimental Implementation (if applicable)

• Collaborate with a restaurant to deploy a pilot study of SoundHound AI voice ordering.

• Monit… ion accurac… respons…

• Collec… nal flows ar…



E. Data…

• Use s… om surveys and operational metrics.

• Employ qualitative analysis techniques (e.g., thematic coding) for interview and open-ended survey responses.

• Compare pre- and post-implementation data to assess the impact of SoundHound AI on operational efficiency and customer satisfaction.

• Evaluate the technical architecture of SoundHound AI including speech recognition, natural language understanding, integration with POS systems, and multi-modal interfaces.

• Analyze limitations such as ambient noise handling, multi-language support, and system scalability.

F. Flow Of Voice Assistance

Firstly, we have to choose the right NLP model and algorithm to train the dataset for intent classification.

1) SOUNDHOUND is a small yet powerful NLP model to train the dataset.

2) After training the model it is stored in a portable pickle file format, enabling seamless loading and utilization across diverse computing environments. 3) After the training process, we make a voice assistant which sends text to the model file. The user will speak into the voice assistant and the speech will be converted to text using the Speech to Text(STT) library. 4) After sending, the model predicts the user's intent. 5) There are 5 intents defined in this project.
food_order.name.item food_order.other_description.item
food_order.type.foodfood_order.time.pickup
food_order.num.people

6) The Model sends the intent back to the voice assistant according to which the chatbot determines the response. 7) The response in text form is converted to speech using the Text-to-speech (GTTS) library.

8) The output is given to the user [Figure 5: Final output showcased on the display screen along with the audio.]

10) Once detected, the intent is linked to the user's input. If the purpose is to place an order or do an actionable task, the ChatBot records the interaction, together with the identified intent and a timestamp, in a MongoDB database. This logging procedure ensures that all user interactions and intents are systematically captured for future study or reference.

Fig.1.Flow Chart of Voice Assistance

The equations typically used in research on SoundHound AI applications in fast food restaurants focus on performance metrics, statistical analysis, and operational calculations. Below are some common types of equations and their contexts, based on recent papers and industry studies:

Order Processing Time

Order processing efficiency is a key metric. The average order time is calculated as:

Average Order Processing Time= n∑i=1nTi

where TiTi is the time for the ii-th order and nn is the total number of orders.

Customer Satisfaction Score (CSAT)

Researchers use satisfaction surveys, and CSAT is calculated as:

CSAT= (Number of Satisfied Responses)/(Total Number of Responses)×100%

A higher rate indicates effective AI-driven recommendations.[26][27]

Revenue Impact

To analyze financial improvements, the percent change is calculated as:

Revenue Growth (%)= (RevenueAfter−RevenueBefore)×100%

Applied to monthly or annual restaurant revenue.

Statistical Analysis

Surveys about customer preferences commonly use the proportion equation:

Proportion = (Total Surveyed)/(Subset Count)

For example, nearly 80% of drivers prefer in-car voice assistant ordering.

Error Rate in Voice Recognition

The error rate of AI in order understanding is:

***Error Rate*= (Total Orders)(Number of Misrecognized Orders)×100%**

Used for system improvement tracking.

ROI (Return on Investment)

In some studies, ROI is estimated for technology adoption:

ROI (%)=(Cost of Investment)/(Net Gain from Investment)×100%

Reflects overall business case for AI implementation.

led to substantial growth in operational efficiency, revenue, and customer acceptance, as shown by current study results and statistical graphs.

Revenue Growth

A key result is the dramatic revenue increase:

• In Q2 2024: $13.5 million revenue from restaurant AI deployments.

• In Q2 2025: $42.7 million, representing a 217% year-over-year growth for restaurant solutions.

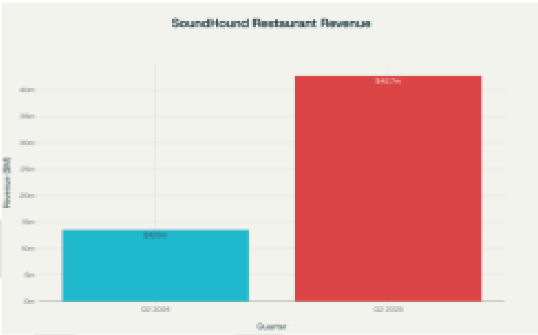


Fig.2. SoundHound AI Restaurant Revenue Growth Q2 2024 vs Q2 2025

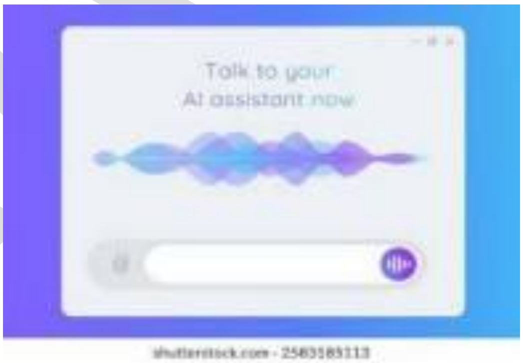


Fig.3. The final output is showcased on the display screen along with the audio

Consumer Acceptance

• A recent survey found that 77% of regular restaurant diners expect to use automated voice assistants for most food orders within a few years.[28]

• About 80% of U.S. drivers would rather order via an in-car voice assistant than wait at the traditional drive-thru,underscoring strong demand for SoundHound-style technology.

• A recent survey found that 77% of regular restaurant diners expect to use automated voice assistants for most food orders within a few years.

• About 80% of U.S. drivers would rather order via an in-car voice assistant than wait at the traditional drive-thru,

underscoring strong demand for SoundHound-style technology.

• SoundHound AI achieved accuracy rates exceeding 95% for voice ordering, reducing human errors and order mistakes, which improves customer satisfaction and lowers costs.

• Their systems have expanded across over 14,000 restaurant locations in 2025, with partnerships with major chains like IHOP, Red Lobster, and more.

Graphs

• The included bar chart visualizes the rapid rise in SoundHound AI's revenue in restaurant markets from Q2 2024 to Q2 2025, confirming the technology's growing impact in the industry.

• Additional available metrics (not shown): customer satisfaction scores, order accuracy improvement, and adoption rate by locations.

VI. CONCLUSION

Through the utilization of machine learning (ML) and natural language processing (NLP) tools, we developed a sophisticated Virtual Assistant (VA) that streamlines the food ordering process while significantly reducing the need for manpower. Our choice of employing SOUNDHOUND enables data training even in resource constrained environments and optimizes the performance of model. Our VA integrates user inputs, processes them through NLP algorithms to discern intent, and generates tailored responses accordingly. Leveraging MongoDB, we efficiently store customer orders and interactions, facilitating not only real-time order management but also serving as valuable data for ongoing model refinement and customer demand analysis.

The versatility of our VA extends beyond mere digital interfaces, as it can be integrated with IoT devices such as speakers, allowing for its deployment in diverse environments for enhanced accessibility and convenience. In essence, our smart VA represents a union of technologies, empowering businesses to streamline operations, enhance customer experiences, and adapt dynamically to evolving market demand.

REFERENCES

[1] Takehara, M., Tamura, S., Hayamizu, S., Tenmoku, R., Okuma, T., Fukuhara, T., & Kurata, T. (2013, November). Measurement and analysis of speech data toward improving service in restaurant. In *2013 International Conference Oriental COCOSDA held jointly with 2013 Conference on Asian Spoken Language Research and Evaluation (O-COCOSDA/CASLRE)* (pp. 1-4). IEEE.Parola Analytics. "The patents behind SoundHound AI's in-car voice platform." 2025.

[2] López-Cózar, R., García-Teodoro, P., Verdejo, J. E. D., & Rubio, A. J. (1997). A voice activated dialogue system for fast-food restaurant applications. In *Eurospeech* (pp. 1783-1786).

[3] Siegert, I., Nietzold, J., Heinemann, R., & Wendemuth, A. (2019, March). The restaurant booking corpus–content-identical comparative human-human and humancomputer simulated telephone conversations. In *Konferenz Elektronische Sprachsignalverarbeitung* (pp. 126-133). TUDpress, Dresden.

[4] Huang, Y., Yu, H., Sharma, A., & Zhang, Z. (2024). A multilevel investigation of the impact of error management culture on restaurant employee voice. *International journal of contemporary hospitality management*, *36*(9), 3016-3031.

[5] Schalow, B. (2025). Restaurants in the Digital Age: Embrace Technology to Drive Efficiency and Customer Satisfaction. *Artificial Intelligence, Machine Learning, & Robotics in Business*, *1*(1), 45-48.

[6] Tayebi, P., Sun, Y., & Guo, Y. (2025, May). From Menus to Management: An Integrated Platform Leveraging Large Language Models in Automatic Restaurant Ordering Systems. In *2025 IEEE/ACIS 23rd International Conference on Software Engineering Research, Management and Applications (SERA)* (pp. 9-14). IEEE.

[7] Meng, Q., Zhang, S., & Kang, J. (2017). Effects of typical dining styles on conversation behaviours and acoustic perception in restaurants in China. *Building and Environment*, *121*, 148-157.

[8] Huang, X., & Agu, E. (2015, November). A speech-based mobile app for restaurant order recognition and low-burden diet tracking. In *International Conference on Smart Health* (pp. 333-339). Cham: Springer International Publishing.

[9] Bottalico, P., Kost, K., Palacios, E., Perlman, A., & Wozniak, A. LOMBARD EFFECT IN A RESTAURANT SETTING. *ICVPB 2018 Scientific Committee*, 17.

[10] Mishra, A., Gupta, P., & Tewari, P. (2022). Global U-net with amalgamation of inception model and improved kernel variation for MRI brain image segmentation. *Multimedia Tools and Applications*, *81*(16), 23339-23354.

[11] Chaturvedi, R. P., & Ghose, U. (2023). An effective framework for detecting the object from the video sequences by utilizing deep learning with hybrid technology. *Journal of Information and Optimization Sciences*, *44*(1), 113-126.

[12] Sharma, K., Jain, N., Upadhyay, A., Mishra, A., Chaturvedi, R. P., & Pruthi, J. (2024, November). Recent Trends In Sign Language Detection System Using Machine Learning Algorithms. In *2024 International Conference on IoT, Communication and Automation Technology (ICICAT)* (pp. 1449-1455). IEEE.

[13] Ramdoss, V. S., & Rajan, P. D. M. (2025). Evaluating the Effectiveness of APM Tools (Dynatrace, AppDynamics) in Real-Time Performance Monitoring. *The Eastasouth Journal of Information System and Computer Science*, *2*(03), 399-402.

[14] Ramdoss, V. S. (2025). AI-ENHANCED GRPC LOAD TESTING AND BENCHMARKING. *International journal of data science and machine learning*, *5*(01), 7-10.

[15] Singh A, Prakash N, Jain A. A review on prevalence of worldwide COPD situation. Proceedings of Data Analytics and Management: ICDAM 2022. 2023 Mar 25:391-405.

[16] Singh A, Payal A. CAD diagnosis by predicting stenosis in arteries using data mining process. Intelligent Decision Technologies. 2021 Feb;15(1):59-68.

[17] Singh A, Prakash N, Jain A. A comparative study of metaheuristic-based machine learning classifiers using non-parametric tests for the detection of COPD severity grade.

[18] Singh A, Prakash N, Jain A. Chronic Diseases Prediction using two different pipelines TPOT and Genetic Algorithm based models: A Comparative analysis. InProceedings of the 2024 9th International

Conference on Machine Learning Technologies 2024 May 24 (pp. 175-180).

[19] Sharma MM, Agrawal A. Test case design and test case prioritization using machine learning. International Journal of Engineering and Advanced Technology. 2019 Oct;9(1):2742-8.

[20] Vijarania M, Agrawal A, Sharma MM. Task scheduling and load balancing techniques using genetic algorithm in cloud computing. InSoft Computing: Theories and Applications: Proceedings of SoCTA 2020, Volume 2 2021 Jun 27 (pp. 97-105). Singapore: Springer Singapore.

[21] Vijarania M, Gupta S, Agrawal A, Misra S. Achieving sustainable development goals in cyber security using aiot for healthcare application. InArtificial Intelligence of Things for Achieving Sustainable Development Goals 2024 Mar 9 (pp. 207-231). Cham: Springer Nature Switzerland.

[22] Abel KD, Misra S, Agrawal A, Maskeliunas R, Damasevicius R. Data security using cryptography and steganography technique on the cloud. InComputational Intelligence in Machine Learning: Select Proceedings of ICCIML 2021 2022 Mar 3 (pp. 475-481). Singapore: Springer Nature Singapore.

[23] Jain, V., Raman, M., Agrawal, A., Hans, M., & Gupta, S. (Eds.). (2024). Convergence Strategies for Green Computing and Sustainable Development. IGI Global.

[24] Deore, H., Agrawal, A., Jaglan, V., Nagpal, P., & Sharma, M. M. (2020). A new approach for navigation and traffic signs indication using map integrated augmented reality for self-driving cars. Scalable Computing: Practice and Experience, 21(3), 441-450.

[25] Afah, D., Gautam, A., Misra, S., Agrawal, A., Damaševičius, R., & Maskeliūnas, R. (2021, February). Smartphones verification and identification by the use of fingerprint. In International Conference on Emerging Applications of Information Technology (pp. 365-373). Singapore: Springer Singapore.

[26] Gupta, S., Vijarania, M., Agarwal, A., Yadav, A., Mandadi, R. R., & Panday, S. (2024). Big Data Analytics in Healthcare Sector: Potential Strength and Challenges. In Advancement of Data Processing Methods for Artificial and Computing Intelligence (pp. 41-67). River Publishers.

[27] Vijarania M, Udbhav M, Gupta S, Kumar R, Agarwal A. Global cost of living in different geographical areas using the concept of NLP. InHandbook of Research on Applications of AI, Digital Twin, and Internet of Things for Sustainable Development 2023 (pp. 419-436). IGI Global.

[28] Joaquim MM, Kamble AW, Misra S, Badejo J, Agrawal A. IoT and machine learning based anomaly detection in WSN for a smart greenhouse. InData, Engineering and Applications: Select Proceedings of IDEA 2021 2022 Oct 12 (pp. 421-431). Singapore: Springer Nature Singapore.

[29] Bhutani, M., Dalal, S., Alhussein, M., Lilhore, U. K., Aurangzeb, K., & Hussain, A. (2025). SAD-GAN: A Novel Secure Anomaly Detection Framework for Enhancing the Resilience of Cyber-Physical Systems. Cognitive Computation, 17.0(4), 127.

[30] Dalal, S., Dahiya, N., Kundu, S., Verma, A., Devi, G., Ayadi, M., Dubale, M., & Hashmi, A. (2025). GAN-CSA: Enhanced Generative Adversarial Networks for Accurate Detection and Surgical Guidance in Skull Base Brain Metastases. International Journal of Computational Intelligence Systems, 18.0(1), 310.

[31] Dalal, S., Lilhore, U. K., Faujdar, N., Simaiya, S., Agrawal, A., Rani, U., & Mohan, A. (2025). Enhancing thyroid disease prediction with improved XGBoost model and bias management techniques. Multimedia Tools and Applications, 84.0(16), 16757-16788.

[32] Dalal, S., Lilhore, U. K., Seth, B., Radulescu, M., & Hamrioui, S. (2025). A Hybrid Model for Short-Term Energy Load Prediction Based on Transfer Learning with LightGBM for Smart Grids in Smart Energy Systems. Journal of Urban Technology, 32.0(1), 49-75.

[33] Kaur, N., Mittal, A., Lilhore, U. K., Simaiya, S., Dalal, S., Saleem, K., & Ghith, E. S. (2025). Securing fog computing in healthcare with a zero-trust approach and blockchain. EURASIP Journal on Wireless Communications and Networking, 2025.0(1), 5.

[34] Lilhore, U. K., Dalal, S., Radulescu, M., & Barbulescu, M. (2025). Smart grid stability prediction model using two-way attention based hybrid deep learning and MPSO. Energy Exploration & Exploitation, 43.0(1), 142-168.

[35] Lilhore, U. K., Simaiya, S., & Dalal, S. (2025). 10 Hybrid Mathematical Optimization Techniques in AI. Math Optimization for Artificial Intelligence: Heuristic and Metaheuristic Methods for Robotics and Machine Learning, 2.0, 223.

[36] Lilhore, U. K., Simaiya, S., Alhussein, M., Dalal, S., Aurangzeb, K., & Hussain, A. (2025). An Attention-Driven Hybrid Deep Neural Network for Enhanced Heart Disease Classification. Expert Systems, 42.0(2), e13791.

[37] Lilhore, U. K., Simaiya, S., Dalal, S., & Faujdar, N. (2025). Revolutionizing air quality forecasting: Fusion of state-of-the-art deep learning models for precise classification. Urban Climate, 59.0, 102308.

[38] Lilhore, U. K., Simaiya, S., Dalal, S., Alshuhail, A., & Almusharraf, A. (2025). A Post-Quantum Hybrid Encryption Framework for Securing Biometric Data in Consumer Electronics. IEEE Transactions on Consumer Electronics.

[39] Lilhore, U. K., Simaiya, S., Dalal, S., Radulescu, M., & Balsalobre-Lorente, D. (2025). Intelligent waste sorting for sustainable environment: A hybrid deep learning and transfer learning model. Gondwana Research, 146.0, 252-266.

[40] Malik, N., Kalonia, A., Dalal, S., & Le, D. N. (2025). Optimized XGBoost Hyper-Parameter Tuned Model with Krill Herd Algorithm (KHA) for Accurate Drinking Water Quality Prediction. SN Computer Science, 6.0(3), 263.

[41] Ritika, R., Chhillar, R. S., Dalal, S., Moorthi, I., Dubale, M., & Hashmi, A. (2025). Enhanced heart disease diagnosis and management: A multi-phase framework leveraging deep learning and personalized nutrition. PLoS One, 20.0(10), e0334217.

[42] Yadav, S., Sehrawat, H., Jaglan, V., Singh, S., Kantha, P., Goyal, P., & Dalal, S. (2025). A Novel Effective Forecasting Model Developed Using Ensemble Machine Learning For Early Prognosis of Asthma Attack and Risk Grade Analysis. Scalable Computing: Practice and Experience, 26.0(1), 398-414.

