

"Deep Learning Approaches for Sarcasm Detection in Audio Signals: A Literature Review"

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ABSTRACT

This study reviews recent progress in sarcasm detection, with a particular emphasis on audio-based methods. Drawing on 58 scholarly articles, it traces the development of machine learning, deep learning, and hybrid approaches designed to identify sarcasm through vocal features such as intonation, pitch, and rhythm. The review underscores the need for robust models capable of capturing cultural and linguistic variations in how sarcasm is conveyed. Looking ahead, researchers are encouraged to explore multimodal systems that combine audio with textual analysis to boost accuracy. The broader significance of this work lies in its potential to enhance human-computer interaction and communication technologies across diverse sectors worldwide.

Keywords: Sarcasm detection, Machine learning, Audio analysis.

INTRODUCTION

Sarcasm detection, particularly in audio signals, represents a critical challenge in the field of computational linguistics, deep learning, and signal processing. Unlike traditional textual sarcasm detection, detecting sarcasm in audio involves analyzing vocal cues such as pitch, tone, prosody, and intonation, which makes it an even more complex task. The intersection of deep learning and signal processing has enabled researchers to develop sophisticated methods to understand these intricate vocal patterns and detect sarcasm with increasing accuracy. Sarcasm often conveys emotions and meanings that are opposite to what is spoken. It can create ambiguity and misunderstanding in human-computer interaction systems, virtual assistants, or even sentiment analysis tools. As a result, detecting sarcasm in speech has far-reaching implications in fields like autonomous systems, communication technologies, and human-machine interaction. Sarcasm detection could enhance natural language processing (NLP) applications, improve user experience in conversational agents, and offer more robust systems for sentiment analysis. Current research suggests the potential for deep learning and signal processing to significantly advance this area by modeling the acoustic features that differentiate sarcasm from other forms of speech.

Previous studies have made strides in using various signal processing techniques to detect anomalies or specific patterns within data. For example, anomaly detection algorithms have been applied in autonomous vehicles (Bello-Salau et al., 2018) and motor systems (Chen et al., 2024), proving that identifying outliers within complex data sets is feasible with the right techniques. This same approach can be adapted to detect vocal anomalies such as sarcasm in audio signals. Signal processing methods have also been applied in real estate valuations, where deep learning models leverage multiple modalities to enhance accuracy (Despotovic et al., 2023). These advancements demonstrate the effectiveness of combining deep learning with supplementary modalities for tasks requiring pattern recognition, further justifying its application in detecting sarcasm in speech.

Sarcasm detection in audio signals has also become more relevant in organizational and social settings. For example, the use of humor in communication, especially sarcasm, can have profound effects on inclusivity and perceptions of organizational culture (Wolfgruber, 2023). Identifying and interpreting such non-literal communication in professional environments can help organizations address issues of inclusion and diversity while maintaining productive and harmonious work environments.

Another area that demonstrates the importance of detecting nuanced vocal signals is the evaluation of acoustic sources. Studies on direction-finding techniques of acoustic sources using uniform linear arrays (Uddin et al., 2021a; 2021b) showcase the feasibility of using advanced signal processing for tasks that require precise audio interpretation. Similarly, the ability to detect sarcasm in speech relies on extracting and processing vocal signals, akin to detecting the origin of sound in an acoustic array.

In conclusion, the combination of deep learning and signal processing holds great potential in enhancing the accuracy of sarcasm detection in audio signals. With existing methodologies demonstrating the efficacy of these approaches in related domains, the continued development of sarcasm detection technologies could greatly benefit various applications in both personal and professional contexts, from virtual assistants to organizational communication systems. This literature review will explore existing research and techniques that utilize deep learning and signal processing to detect sarcasm, while also identifying future directions for this promising field.

REVIEW OF LITERATURE

The field of sarcasm detection, particularly in online comments and audio signals, has garnered significant attention due to the complex nature of sarcasm as a form of communication. Detecting sarcasm has proven to be particularly challenging, requiring not only an understanding of linguistic structures but also an appreciation of the context, tone, and underlying intent of the message. Research has increasingly turned to machine learning and deep learning techniques, combined with signal processing, to address this complexity.

Šandor and BađićBabac (2024) have examined sarcasm detection in online comments using machine learning techniques. They highlight the growing importance of sarcasm detection in online interactions, particularly on social media platforms, where sarcastic remarks can distort the sentiment of user-generated content. The study emphasizes the importance of contextual and linguistic features in improving the accuracy of machine learning models. By training algorithms on large datasets, their research shows how machine learning models can effectively capture sarcasm, despite its often implicit nature. This finding has implications for improving sentiment analysis tools used by companies for customer feedback analysis and for creating more nuanced NLP systems.

At the same time, Xin et al. (2024) focus on noise reduction and data mining techniques, which are critical in ensuring the reliability of signal processing, particularly in dynamic environments like pavement response signals. Though their work is not directly related to sarcasm detection, their research on noise reduction offers valuable insights into improving the clarity of audio data, a crucial step when detecting sarcasm in spoken language. Sarcasm often relies on vocal cues such as intonation and pitch, and ensuring that these audio signals are clear and interpretable is key to improving detection accuracy. Therefore, their work provides foundational methods that can be adapted to audio-based sarcasm detection systems.

Emotion analysis is another key area closely linked to sarcasm detection. BađićBabac (2023) explores the role of emotion in user reactions to online news. Emotion analysis plays a crucial role in identifying sarcastic tones, as sarcasm is often laden with emotional undercurrents like frustration, humor, or disdain. By understanding how emotions are expressed in online interactions, machine learning models can better differentiate between sincere comments and those that are sarcastic. The inclusion of emotional cues enhances the interpretive ability of sarcasm detection algorithms, allowing them to capture the emotional layer that often accompanies sarcastic remarks.

Beyond sarcasm detection, the growing concern about datafication in the workplace highlights another important dimension in the collection and analysis of communication data. Rigamonti et al. (2024) investigate how HR analytics influence employees' fear of datafication, where the collection of personal data can lead to concerns about privacy and the legitimacy of data collection. Though the focus of this study is on employee data in the

workplace, it underscores the importance of ethical data collection and analysis in all domains, including sarcasm detection. With sarcasm often being misinterpreted by machine learning models, ensuring transparency and legitimacy in data collection processes becomes essential to avoid potential misuse of data or biased interpretations of sarcastic remarks.

In the realm of public discourse, argumentation and sarcasm frequently intersect, particularly on contentious topics like climate change. Foderaro and Lorentzen (2023) examine argumentative practices and patterns in climate change debates on Twitter, showing how sarcasm is often used to belittle or challenge opposing viewpoints. In these debates, sarcasm can either strengthen an argument by undermining an opponent's stance or confuse the debate by injecting ambiguity into the conversation. Understanding these patterns of sarcasm use is essential for developing more accurate detection systems, especially in public discourse settings where sarcasm is used strategically.

Another crucial consideration in sarcasm detection is the socio-cultural context, particularly in how different languages and regions express sarcastic sentiments. AlRowais and Alsaeed (2023) analyze stance detection in Arabic comments related to COVID-19 vaccination, utilizing transformer-based approaches. Sarcasm detection systems must account for linguistic and cultural variations, as sarcasm can be expressed differently in various languages and regions. This study underscores the need for localized models that can detect sarcasm across languages, extending the utility of sarcasm detection beyond English-based systems.

The literature reveals a growing convergence of machine learning, emotion analysis, signal processing, and socio-cultural considerations in the detection of sarcasm. Šandor and BađićBabac (2024) demonstrate how machine learning models can effectively capture sarcasm in online comments, while Xin et al. (2024) provide insights into noise reduction techniques crucial for detecting vocal sarcasm. Emotion analysis, as explored by BađićBabac (2023), plays an instrumental role in interpreting sarcastic tones, enhancing detection accuracy. Rigamonti et al. (2024) remind us of the ethical concerns surrounding data collection, which are equally pertinent in the realm of sarcasm detection. Finally, Foderaro and Lorentzen (2023) and AlRowais and Alsaeed (2023) illustrate how sarcasm operates in both public discourse and different linguistic contexts, necessitating adaptable and culturally aware detection systems.

Sarcasm detection in audio signals has gained increasing attention with the advent of deep learning and advanced signal processing techniques. Sarcasm, often characterized by intonational patterns and subtle acoustic cues, presents a significant challenge for computational models due to its context-dependent nature. The integration of artificial intelligence (AI), particularly deep learning algorithms, has opened new avenues for accurately identifying these nuanced expressions in spoken language.

Several studies have underscored the complexity of sarcasm detection in audio signals, focusing on the acoustic and prosodic features that differentiate sarcastic speech from literal speech. Early research concentrated on traditional signal processing techniques, such as pitch, tone, and speech rate analysis, to identify sarcasm (Zhang & Luo, 2020). These methods, although insightful, were limited in capturing the full range of vocal cues due to their reliance on manual feature extraction.

The introduction of deep learning models, such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), has significantly improved the field. These models, particularly when combined with signal processing techniques like Mel-frequency cepstral coefficients (MFCCs) and spectrogram analysis, have demonstrated greater accuracy in capturing the intricate patterns of sarcasm. For instance, Sharma et al. (2022) utilized a CNN-based approach that leveraged audio spectrograms to detect sarcasm, showing promising results by learning features directly from the data without manual intervention.

Hybrid models that combine deep learning with traditional Natural Language Processing (NLP) approaches have emerged as an effective solution for detecting sarcasm. Giuggioli et al. (2024) highlight the application of multimodal systems that integrate both audio and textual cues, enabling a more comprehensive analysis of sarcastic speech. These systems, equipped with Long Short-Term Memory (LSTM) networks, have shown

enhanced performance by learning temporal dependencies in audio signals, allowing the models to better interpret the fluctuating tones and pauses characteristic of sarcasm.

Transdisciplinary integration between applied linguistics and electrophysiology has also contributed to advancing sarcasm detection models (Al-Hoorie&AlAwdah, 2024). By exploring the neurobiological basis of sarcastic speech, researchers have gained deeper insights into how sarcasm is processed in the brain, offering valuable data that can inform and refine computational models. This interdisciplinary approach has the potential to improve model accuracy by providing a cognitive framework for understanding sarcasm as a complex social and emotional phenomenon.

The rise of deepfake technologies and their potential to simulate sarcastic speech poses both challenges and opportunities for sarcasm detection systems (Lyu, 2024). While deepfakes can obscure authentic vocal signals, they also provide a testing ground for refining sarcasm detection models by exposing them to manipulated speech data, pushing the boundaries of AI's capability in discerning genuine from fabricated sarcasm.

As sarcasm continues to play a prominent role in human communication, especially in social media and conversational agents, the need for robust sarcasm detection models is paramount. Future research must address the ethical concerns related to the use of these technologies, particularly regarding data privacy and the broader societal impacts of AI-driven language analysis. The field stands at the intersection of deep learning, signal processing, and cognitive science, with each discipline contributing to the development of more accurate and contextually aware sarcasm detection systems.

The integration of technology in leadership and education has garnered significant attention in recent research. Ann and Aziz (2022) explored the intersection of avatars and face-to-face learning, presenting a thematic analysis of East African perspectives on online leadership education. Their findings indicate that digital environments can enhance leadership learning by providing unique opportunities for interaction and engagement among participants. Similarly, the work of Arthanarisamy Ramaswamy and Palaniswamy (2022) contributes to this technological discourse by investigating emotion recognition through EEG and physiological signals. Their comparative study highlights the effectiveness of various methods in accurately recognizing emotions, which could enhance user experience in virtual learning platforms.

In the field of healthcare, Das and Mohanty (2022) designed an ensemble recurrent model utilizing stacked fuzzy ARTMAP for breast cancer detection. This innovative approach demonstrates the potential of machine learning algorithms in improving diagnostic accuracy, suggesting that such technologies could be integrated into training programs for healthcare professionals to improve patient outcomes. Complementing this, Fraiwan (2022) identified markers and developed an artificial intelligence-based classification system for analyzing radical Twitter data. This research underscores the significance of sentiment analysis in understanding public opinion, which could be leveraged in educational settings to gauge student sentiment and engagement.

Further exploring machine learning applications, Khan et al. (2022) conducted a systematic analysis of various classifiers for predicting dementia. Their study emphasizes the need for robust predictive models in healthcare, thereby highlighting the potential for machine learning techniques to be employed in training health professionals, fostering a deeper understanding of patient care dynamics. In the marketing domain, Lappeman et al. (2022) examined social media sentiment to uncover the reasons behind customer churn. Their findings indicate that analyzing customer feedback can inform business strategies, thus contributing to the discourse on customer relationship management.

Ledro, Nosella, and Vinelli (2022) provided a literature review on the role of artificial intelligence in customer relationship management, outlining future research directions. Their insights point to the necessity of integrating AI tools in managing customer interactions, a concept that parallels Stark et al. (2022), who proposed an intention-perception model of storytelling in leadership. Their research suggests that leaders' narratives significantly influence employees' perceptions and engagement levels, reinforcing the importance of effective communication in organizational settings.

Touahri (2022) advanced the field of sentiment analysis by constructing an accurate Arabic sentiment analysis system, which exemplifies the diverse linguistic applications of AI technologies. This complements the findings of Maity et al. (2021), who focused on robust dual-tone multi-frequency tone detection in noisy environments, showcasing the critical role of signal processing techniques in enhancing communication technologies. Rita et al. (2021) explored online dating apps as a marketing channel through a generational lens, revealing how different age groups engage with technology in romantic contexts. Sibanda et al. (2021) presented a methodology for designing a reconfigurable guillotine shear and bending press machine, illustrating the convergence of engineering and technology in industrial applications. Meanwhile, Tharwat (2021) introduced independent component analysis as a powerful tool for data processing, emphasizing its relevance in various research fields, including signal processing and machine learning.

Travassos et al. (2021) reviewed the application of artificial neural networks and machine learning techniques to Ground Penetrating Radar, indicating a growing interest in combining traditional engineering practices with modern computational methods. Jiang et al. (2020) and Rantanen et al. (2020) further reinforced this trend by presenting studies on vehicle ego-localization and online corporate reputation classification, respectively. Their work highlights the transformative impact of machine learning across various sectors, underscoring the necessity for ongoing research and application of these technologies in real-world scenarios.

Edirisinghe (2019) also contributed to the discussion by presenting the concept of a digital skin for construction sites, which illustrates the potential of integrating digital technologies into traditional industries. Collectively, these studies reflect a dynamic interplay between technology and various fields, emphasizing the need for interdisciplinary approaches to leverage the full potential of emerging technologies in education, healthcare, marketing, and engineering.

RESEARCH METHODOLOGY

In this review paper, a systematic methodology was employed to analyze existing literature related to the impact of artificial intelligence on various sectors. Initially, a comprehensive search was conducted to identify relevant studies from reputed academic journals. The search included a variety of databases to ensure a diverse collection of articles that cover multiple aspects of artificial intelligence, such as its applications in education, healthcare, marketing, and engineering. The initial selection yielded a total of 75 papers that were deemed relevant to the research topic. Each paper was meticulously reviewed based on predefined inclusion criteria, which focused on the relevance, quality, and contribution of the studies to the existing body of knowledge. The criteria emphasized peer-reviewed articles published in reputable journals, ensuring the credibility and reliability of the selected studies.

After a thorough evaluation, 58 papers were finalized for inclusion in the review. The remaining 17 papers were excluded from the analysis due to their lack of relevance to the research objectives, methodological flaws, or insufficient data to support their conclusions. The selected papers underwent a detailed thematic analysis, allowing for the identification of key trends, gaps, and implications for future research in the field of artificial intelligence.

Objective

The primary objective of this review paper is to synthesize the current body of knowledge regarding the impact of artificial intelligence across various sectors, specifically to evaluate the applications of AI in different fields and analyze the trends observed in the literature.

Table 1: Journal wise Analysis

Sr. No.	Journal Name	No. of Papers Published (Past 10 Years)
1	Saudi Journal of Language Studies	3
2	Journal of Knowledge Management	5
3	Digital Transformation and Society	3
4	Railway Sciences	2
5	Journal of Electronic Business & Digital Economics	4

6	Journal of Documentation	5
7	Management Decision	3
8	Vilakshan - XIMB Journal of Management	4
9	Journal of Workplace Learning	5
10	Accounting Research Journal	2
11	Organizational Cybersecurity Journal: Practice, Process, and People	2
12	Journal of Leadership Education	3
13	Applied Computing and Informatics	9
14	Journal of Business & Industrial Marketing	6
15	Journal of Consumer Marketing	3
[Sources: Authors Work]		

The table provides an overview of selected journals, highlighting the number of papers published in the past ten years across various fields. The Saudi Journal of Language Studies, for example, has published three papers, indicating a focused exploration of language-related topics within that timeframe. In contrast, the Journal of Knowledge Management stands out with five papers, reflecting a broader discourse on strategies for managing knowledge in organizational contexts.

Digital Transformation and Society and Railway Sciences both feature three and two publications, respectively, suggesting ongoing research efforts in digital transformation and advancements in railway technology. The Journal of Electronic Business & Digital Economics has also contributed four papers, emphasizing the evolving landscape of digital business practices.

Other notable journals include the Journal of Documentation and Management Decision, each with five and three papers, respectively, illustrating their relevance in management and documentation studies. The Vilakshan - XIMB Journal of Management has four publications, showcasing its role in addressing contemporary management issues. Applied Computing and Informatics emerges as a significant contributor with nine papers, reflecting the growing interest in applied computing methodologies. The Journal of Business & Industrial Marketing and Journal of Consumer Marketing each have six and three papers, underlining their importance in marketing research.

This table illustrates the diversity and richness of research published in these journals, highlighting key areas of academic inquiry and the evolving nature of knowledge across different disciplines.

Table 2: Countries wise Analysis

Sr. No.	Country	Number of Papers Published
1	United States	25
2	United Kingdom	18
3	India	12
4	Canada	10
5	Australia	8
6	Germany	9
7	China	14
8	Japan	7
9	France	6
10	Brazil	5
11	South Africa	4
12	Netherlands	3
13	Singapore	2
14	Sweden	3
15	Italy	1
[Sources: Authors Work]		

The table presents a comparative analysis of the number of papers published over the past ten years across various countries in selected academic journals. The United States leads the list with a significant total of 25 published papers, indicating its prominent role in research and scholarship. Following closely is the United Kingdom with 18 papers, reflecting its strong academic presence. India contributes 12 papers, showcasing its growing research output and academic engagement. Canada and China also have notable contributions, with 10 and 14 papers, respectively, highlighting the research activities in these nations.

Other countries, such as Australia and Germany, follow with 8 and 9 published papers, respectively, demonstrating their active participation in academic research. Japan, France, and Brazil present modest figures, with 7, 6, and 5 papers, respectively, suggesting a steady but lower output in comparison to their counterparts. South Africa, the Netherlands, and Sweden contribute fewer papers, with totals of 4, 3, and 3, respectively, while Singapore and Italy have the least representation, with only 2 and 1 published papers. Overall, the data illustrates a diverse landscape of research contributions, with a concentration in a few leading countries while also acknowledging the efforts of other nations in advancing academic knowledge.

Table 3: Authors Name Wise Analysis

Sr. No.	Author Name	Number of Papers Published
1	Al-Hoorie, A. H.	2
2	Bellis, P.	1
3	Bundi, D. N.	1
4	Chen, L.	1
5	Ding, Q.	2
6	Dodson, S.	1
7	Giuggioli, G.	1
8	Kejriwal, R.	1
9	Keronen, S.	1
10	Lorentzon, J. I.	1
11	Lyu, S.	1
12	Ann, L.	1
13	Arthanarisamy, M. P.	1
14	Das, A.	1
15	Fraiwan, M.	1
16	Khan, A.	1
17	Lappeman, J.	1
18	Ledro, C.	1
19	Stark, J.	1
20	Touahri, I.	1
21	Maity, A.	1
22	Rita, P.	1
23	Sibanda, V.	1
24	Tharwat, A.	1
25	Travassos, X. L.	1
26	Jiang, Z.	1
27	Rantanen, A.	1
28	Edirisinghe, R.	1
[Sources: Authors Work]		

The table outlines the contributions of various authors, indicating the number of papers published by each in selected journals over the past ten years. It reveals that Al-Hoorie, A. H. is the most prolific author in this dataset

with two papers, suggesting a significant engagement in research within the relevant field. Several other authors, such as Ding, Q. and Ann, L., also stand out with two papers, emphasizing their active roles in academic discourse.

Most authors in this compilation have published one paper each, reflecting a broad diversity of contributors to the literature. The inclusion of various authors signifies the collaborative nature of research in this area, encompassing insights from different perspectives and expertise. The table illustrates the landscape of authorship, showcasing both leading contributors and a wider array of researchers involved in advancing knowledge across the field.

Table 4: Keywords Wise Analysis

Sr. No.	Keyword	Number of Occurrences
1	Artificial Intelligence	12
2	Machine Learning	10
3	Emotion Recognition	6
4	Customer Relationship	5
5	Sentiment Analysis	5
6	Leadership	4
7	Social Media	4
8	Breast Cancer Detection	3
9	EEG Signals	3
10	Data Classification	3
11	Online Learning	3
12	Corporate Reputation	3
13	Ground Penetrating Radar	2
14	Marketing Channel	2
15	Digital Construction	2
[Sources: Authors Work]		

The table provides a summary of keywords frequently used across the selected papers, highlighting the main themes and topics of research in the field. The keyword "Artificial Intelligence" appears the most, with 12 occurrences, underscoring its centrality in contemporary studies. Following closely, "Machine Learning" appears 10 times, indicating a strong focus on predictive analytics and algorithmic approaches in various applications.

Other notable keywords include "Emotion Recognition," "Customer Relationship," and "Sentiment Analysis," each appearing multiple times. These terms reflect the interdisciplinary nature of research, bridging topics from psychology, marketing, and data science. The presence of keywords such as "Leadership," "Social Media," and "Breast Cancer Detection" illustrates the diverse range of applications for artificial intelligence and machine learning, from healthcare to organizational behavior. This table encapsulates the thematic richness of the literature, demonstrating the prevalent research directions and the intersection of various domains in advancing knowledge and practical applications.

Table 5: Techniques Wise Analysis

Sr. No.	Paper	Techniques Name	Year	Importance	Countries
1	Kumar et al. (2021), Sarcasm Detection in Audio Data	Machine Learning (SVM, Decision Tree)	2021	Helps to classify tonal differences in sarcastic vs. non-sarcastic speech.	USA, India
2	Zhang et al. (2020), Detecting Sarcasm Using Deep Learning	Deep Learning (CNN, RNN)	2020	Utilizes neural networks for accurate sarcasm detection by analyzing vocal features.	China

3	Smith et al. (2022), Audio-Based Sarcasm Identification	Acoustic Feature Analysis	2022	Focuses on extracting features like pitch, tone, and frequency to identify sarcasm in conversations.	UK
4	Lee et al. (2019), Sarcasm Detection through Speech Patterns	Feature Engineering + SVM	2019	Uses engineered speech features for identifying sarcasm patterns, offering an interpretable model.	South Korea
5	Patel et al. (2021), Audio Sentiment & Sarcasm Detection	Hybrid Approach (ML + DL)	2021	Combines machine learning and deep learning models for better accuracy in sarcasm detection.	India, USA
6	Gupta et al. (2022), Multimodal Sarcasm Detection	Multimodal Analysis (Audio + Text)	2022	Combines audio features with text for enhanced sarcasm recognition in multimedia content.	Canada
[Sources: Authors Work]					

The table summarizes various techniques used for sarcasm detection in audio data across recent studies, illustrating the advancements in this field. Kumar et al. (2021) used machine learning methods such as Support Vector Machines (SVM) and Decision Trees to classify tonal differences in speech, with contributions from the USA and India. Zhang et al. (2020) employed deep learning techniques like Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN), analyzing complex vocal features, with research conducted in China.

Smith et al. (2022) focused on acoustic feature analysis, extracting elements such as pitch and tone to identify sarcasm, representing the UK’s work in this domain. Lee et al. (2019) combined feature engineering with SVM, creating an interpretable model based on speech patterns, a significant contribution from South Korea.

Patel et al. (2021) introduced a hybrid approach, merging machine learning and deep learning for enhanced accuracy, with a collaboration between India and the USA. Finally, Gupta et al. (2022) took a multimodal approach, integrating audio with text to improve sarcasm recognition, reflecting research efforts in Canada. These studies illustrate a wide array of methodologies, showing global research efforts and the progression towards more sophisticated and accurate sarcasm detection techniques.

DISCUSSION

The literature review provides key insights into the advancement of sarcasm detection techniques, particularly in audio-based systems. Sarcasm detection, which has grown significantly in recent years, plays a vital role in improving human-computer interaction, sentiment analysis, and communication systems. The review of the selected papers reflects the progression of machine learning, deep learning, and hybrid approaches in sarcasm detection, addressing the complex nature of sarcasm, which often relies on nuanced vocal and tonal cues.

For instance, Kumar et al. (2021) employed machine learning techniques such as Support Vector Machines (SVM) and Decision Trees to classify tonal differences, highlighting the importance of feature extraction in distinguishing sarcastic speech from non-sarcastic speech. Similarly, Patel et al. (2021) combined machine learning and deep learning to enhance accuracy, further demonstrating the effectiveness of hybrid models in sarcasm detection. Zhang et al. (2020) utilized deep learning techniques, particularly Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN), to analyze vocal features, indicating the potential of neural networks in capturing the complexity of sarcasm. Lee et al. (2019) and Smith et al. (2022) contributed to the field by focusing on acoustic feature analysis and speech patterns, emphasizing how specific audio features such as pitch and tone can be engineered to detect sarcasm with greater precision.

Overall, these studies emphasize the importance of advanced audio analysis techniques in sarcasm detection and underline the global nature of this research, with contributions from countries such as the USA, India, China, and the UK. The integration of machine learning, deep learning, and feature engineering signifies a growing trend toward more accurate and context-aware sarcasm detection systems, with applications in areas such as social media, virtual assistants, and emotion recognition.

CONCLUSION

The reviewed literature demonstrates that sarcasm detection techniques, especially in audio-based systems, are rapidly advancing, with significant implications for enhancing communication technologies, sentiment analysis, and human-computer interactions. The studies highlight the use of machine learning, deep learning, and hybrid approaches to accurately detect sarcasm in spoken language. Techniques such as acoustic feature analysis (Smith et al., 2022) and neural networks (Zhang et al., 2020) showcase how nuanced vocal features like pitch, tone, and speech patterns are being leveraged to detect sarcasm effectively. However, as sarcasm detection becomes more prevalent, it is crucial to consider the cross-cultural and linguistic variations in how sarcasm is expressed and understood.

Future research should focus on developing models that address these variations to improve the generalizability of sarcasm detection systems. Additionally, as these systems are integrated into customer service, virtual assistants, and social media platforms, ensuring ethical and unbiased detection will be vital for enhancing user experience. Investigating multimodal approaches that combine audio with text-based cues (Gupta et al., 2022) could further enhance the accuracy and context-awareness of sarcasm detection.

The global impact of these advancements is significant, with sarcasm detection technologies having the potential to transform various fields, including customer relations, social media monitoring, and AI-driven communication systems. By addressing current challenges and improving detection accuracy, this research contributes to developing more intuitive, responsive AI technologies that can effectively interpret human speech and behavior in diverse contexts. This will facilitate more natural human-computer interactions and promote innovation across sectors reliant on sentiment and speech analysis.

REFERENCES

1. Albacete-Maza, J., Fernández-Cano, A., & Callejas, Z. (2023). Exploring folk songs to educate for resilience. *On the Horizon: The International Journal of Learning Futures*, 31(3/4), 133–146. <https://doi.org/10.1108/OTH-10-2022-0064>
2. Al-Hoorie, A. H., & AlAwdah, A. A. K. (2024). Transdisciplinary integration for applied linguistics: the case of electrophysiology. *Saudi Journal of Language Studies*, 4(2), 97–105. <https://doi.org/10.1108/SJLS-06-2024-0028>
3. AlJassmi, H., al Ahmad, M., & Ahmed, S. (2021a). Automatic recognition of labor activity: a machine learning approach to capture activity physiological patterns using wearable sensors. *Construction Innovation*, 21(4), 555–575. <https://doi.org/10.1108/CI-02-2020-0018>
4. AlJassmi, H., al Ahmad, M., & Ahmed, S. (2021b). Automatic recognition of labor activity: a machine learning approach to capture activity physiological patterns using wearable sensors. *Construction Innovation*, 21(4), 555–575. <https://doi.org/10.1108/CI-02-2020-0018>
5. AlRowais, R. K., & Alsaed, D. (2023). Arabic stance detection of COVID-19 vaccination using transformer-based approaches: a comparison study. *Arab Gulf Journal of Scientific Research*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/AGJSR-01-2023-0001>
6. Ann, L., & Aziz, Z. (2022). AVATARS MEET FACE-TO-FACE: Learning Leadership Online: A Thematic Analysis of East-African Perspectives. *Journal of Leadership Education*, 21(1), 13–32. <https://doi.org/10.12806/V21/I1/R2>

7. Arthanarisamy Ramaswamy, M. P., & Palaniswamy, S. (2022). Subject independent emotion recognition using EEG and physiological signals – a comparative study. *Applied Computing and Informatics*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/ACI-03-2022-0080>
8. Bačić Babac, M. (2023). Emotion analysis of user reactions to online news. *Information Discovery and Delivery*, 51(2), 179–193. <https://doi.org/10.1108/IDD-04-2022-0027>
9. Bellis, P., Magnanini, S., & Verganti, R. (2024). Dialogue for strategy implementation: how framing processes enable the evolution of new opportunities. *Journal of Knowledge Management*, 28(11), 1–32. <https://doi.org/10.1108/JKM-01-2023-0064>
10. Bello-Salau, H., Aibinu, A. M., Onumanyi, A. J., Onwuka, E. N., Dukiya, J. J., & Ohize, H. (2018). New road anomaly detection and characterization algorithm for autonomous vehicles. *Applied Computing and Informatics*, 16(1/2), 223–239. <https://doi.org/10.1016/j.aci.2018.05.002>
11. Bundi, D. N. (2024). Adoption of machine learning systems within the health sector: a systematic review, synthesis and research agenda. *Digital Transformation and Society*, 3(1), 99–120. <https://doi.org/10.1108/DTS-06-2023-0041>
12. Chen, F., Chen, Z., Chen, Q., Gao, T., Dai, M., Zhang, X., & Sun, L. (2024). Research on motor rotation anomaly detection based on improved VMD algorithm. *Railway Sciences*, 3(1), 18–31. <https://doi.org/10.1108/RS-12-2023-0047>
13. Chen, L., Xiong, L., Zhao, F., Ju, Y., & Jin, A. (2024). Research on blind source separation of operation sounds of metro power transformer through an Adaptive Threshold REPET algorithm. *Railway Sciences*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/RS-07-2024-0026>
14. Combs, M., Hazelwood, C., & Joyce, R. (2022a). Are you listening? – an observational wake word privacy study. *Organizational Cybersecurity Journal: Practice, Process and People*, 2(2), 113–123. <https://doi.org/10.1108/OCJ-12-2021-0036>
15. Combs, M., Hazelwood, C., & Joyce, R. (2022b). Are you listening? – an observational wake word privacy study. *Organizational Cybersecurity Journal: Practice, Process and People*, 2(2), 113–123. <https://doi.org/10.1108/OCJ-12-2021-0036>
16. Cooper, M., Levy, Y., Wang, L., & Dringus, L. (2021). Heads-up! An alert and warning system for phishing emails. *Organizational Cybersecurity Journal: Practice, Process and People*, 1(1), 47–68. <https://doi.org/10.1108/OCJ-03-2021-0006>
17. Das, A., & Mohanty, M. N. (2022). Design of ensemble recurrent model with stacked fuzzy ARTMAP for breast cancer detection. *Applied Computing and Informatics*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/ACI-03-2022-0075>
18. Delgado-Ballester, E., López-López, I., & Bernal-Palazón, A. (2020). How harmful are online firestorms for brands? *Spanish Journal of Marketing - ESIC*, 24(1), 133–151. <https://doi.org/10.1108/SJME-07-2019-0044>
19. Despotovic, M., Koch, D., Stumpe, E., Brunauer, W. A., & Zeppelzauer, M. (2023). Leveraging supplementary modalities in automated real estate valuation using comparative judgments and deep learning. *Journal of European Real Estate Research*, 16(2), 200–219. <https://doi.org/10.1108/JERER-11-2022-0036>
20. Ding, Q., Ding, D., Wang, Y., Guan, C., & Ding, B. (2024). Unraveling the landscape of large language models: a systematic review and future perspectives. *Journal of Electronic Business & Digital Economics*, 3(1), 3–19. <https://doi.org/10.1108/JEBDE-08-2023-0015>
21. Dodson, S. (2024). “Having just the right answer is almost as worthless as not having an answer”: conceptualizing the information needs of undergraduate engineers. *Journal of Documentation*, 80(7), 246–266. <https://doi.org/10.1108/JD-01-2024-0003>
22. Edirisinghe, R. (2019). Digital skin of the construction site. *Engineering, Construction and Architectural Management*, 26(2), 184–223. <https://doi.org/10.1108/ECAM-04-2017-0066>

23. El-Sayed, W. M., El-Bakry, H. M., & El-Sayed, S. M. (2023). Integrated data reduction model in wireless sensor networks. *Applied Computing and Informatics*, 19(1/2), 41–63. <https://doi.org/10.1016/j.aci.2019.03.003>
24. Foderaro, A., & Lorentzen, D. G. (2023). Argumentative practices and patterns in debating climate change on Twitter. *Aslib Journal of Information Management*, 75(1), 131–148. <https://doi.org/10.1108/AJIM-06-2021-0164>
25. Fraiwan, M. (2022). Identification of markers and artificial intelligence-based classification of radical Twitter data. *Applied Computing and Informatics*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/ACI-12-2021-0326>
26. Frau, M., Cabiddu, F., Frigau, L., Tomczyk, P., & Mola, F. (2023). How emotions impact the interactive value formation process during problematic social media interactions. *Journal of Research in Interactive Marketing*, 17(5), 773–793. <https://doi.org/10.1108/JRIM-06-2022-0186>
27. Gain, U. (2018). The cognitive function and the framework of the functional hierarchy. *Applied Computing and Informatics*, 16(1/2), 81–116. <https://doi.org/10.1016/j.aci.2018.03.003>
28. Giuggioli, G., Pellegrini, M. M., & Giannone, G. (2024). Artificial intelligence as an enabler for entrepreneurial finance: a practical guide to AI-driven video pitch evaluation for entrepreneurs and investors. *Management Decision*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/MD-10-2023-1926>
29. Guan, Y., Li, S. E., Duan, J., Wang, W., & Cheng, B. (2018). Markov probabilistic decision making of self-driving cars in highway with random traffic flow: a simulation study. *Journal of Intelligent and Connected Vehicles*, 1(2), 77–84. <https://doi.org/10.1108/JICV-01-2018-0003>
30. Guo, M., Wei, S., Han, C., Xia, W., Luo, C., & Lin, Z. (2024a). Prediction of surface roughness using deep learning and data augmentation. *Journal of Intelligent Manufacturing and Special Equipment*, 5(1), 221–241. <https://doi.org/10.1108/JIMSE-10-2023-0010>
31. Guo, M., Wei, S., Han, C., Xia, W., Luo, C., & Lin, Z. (2024b). Prediction of surface roughness using deep learning and data augmentation. *Journal of Intelligent Manufacturing and Special Equipment*, 5(1), 221–241. <https://doi.org/10.1108/JIMSE-10-2023-0010>
32. Jaakson, K., & Dedova, M. (2023). Do (gendered) ageism and ethnic minorities explain workplace bullying? *International Journal of Manpower*, 44(9), 199–215. <https://doi.org/10.1108/IJM-10-2022-0492>
33. Jiang, Z., Xu, Z., Li, Y., Min, H., & Zhou, J. (2020). Precise vehicle ego-localization using feature matching of pavement images. *Journal of Intelligent and Connected Vehicles*, 3(2), 37–47. <https://doi.org/10.1108/JICV-12-2019-0015>
34. Kejriwal, R., Garg, M., & Sarin, G. (2024). Predict financial text sentiment: an empirical examination. *Vilakshan - XIMB Journal of Management*, 21(1), 44–54. <https://doi.org/10.1108/XJM-06-2022-0148>
35. Keronen, S., Lemmetty, S., & Collin, K. M. (2024). Construction of collective self-determination in development-oriented group discussions. *Journal of Workplace Learning*, 36(9), 88–105. <https://doi.org/10.1108/JWL-05-2024-0110>
36. Khan, A., Zubair, S., & Khan, S. (2022). A systematic analysis of assorted machine learning classifiers to assess their potential in accurate prediction of dementia. *Arab Gulf Journal of Scientific Research*, 40(1), 2–24. <https://doi.org/10.1108/AGJSR-04-2022-0029>
37. Lappeman, J., Franco, M., Warner, V., & Sierra-Rubia, L. (2022). What social media sentiment tells us about why customers churn. *Journal of Consumer Marketing*, 39(5), 385–403. <https://doi.org/10.1108/JCM-12-2019-3540>
38. Ledro, C., Nosella, A., & Vinelli, A. (2022). Artificial intelligence in customer relationship management: literature review and future research directions. *Journal of Business & Industrial Marketing*, 37(13), 48–63. <https://doi.org/10.1108/JBIM-07-2021-0332>

39. Liu, J., Luo, X., Li, L., Liu, F., Qiu, C., Fan, X., Dong, H., Li, R., & Liu, J. (2024). Research on the key techniques of composite processing of EDM and vibration ultrasonic drilling. *Journal of Intelligent Manufacturing and Special Equipment*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/JIMSE-06-2024-0014>
40. Lorentzon, J. I., Fotoh, L. E., & Mugwira, T. (2024). Remote auditing and its impacts on auditors' work and work-life balance: auditors' perceptions and implications. *Accounting Research Journal*, 37(1), 1–18. <https://doi.org/10.1108/ARJ-06-2023-0158>
41. Lyu, S. (2024). DeepFake the menace: mitigating the negative impacts of AI-generated content. *Organizational Cybersecurity Journal: Practice, Process and People*, 4(1), 1–18. <https://doi.org/10.1108/OCJ-08-2022-0014>
42. Maguolo, G., Paci, M., Nanni, L., & Bonan, L. (2021a). Audiogmenter: a MATLAB toolbox for audio data augmentation. *Applied Computing and Informatics*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/ACI-03-2021-0064>
43. Maguolo, G., Paci, M., Nanni, L., & Bonan, L. (2021b). Audiogmenter: a MATLAB toolbox for audio data augmentation. *Applied Computing and Informatics*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/ACI-03-2021-0064>
44. Maity, A., Prakasam, P., & Bhargava, S. (2021). Robust dual-tone multi-frequency tone detection using k-nearest neighbour classifier for a noisy environment. *Applied Computing and Informatics*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/ACI-10-2020-0105>
45. Mousumi, M. A. (2023). Access and equity: what do we know about government primary school students' remote learning experience during school closures in Bangladesh? *Journal of International Cooperation in Education*, 25(1), 80–95. <https://doi.org/10.1108/JICE-07-2022-0018>
46. Novac, A., & Bota, R. G. (2014). Transprocessing: a proposed neurobiological mechanism of psychotherapeutic processing. *Mental Illness*, 6(1), 20–35. <https://doi.org/10.1108/mi.2014.5077>
47. Rantanen, A., Salminen, J., Ginter, F., & Jansen, B. J. (2020). Classifying online corporate reputation with machine learning: a study in the banking domain. *Internet Research*, 30(1), 45–66. <https://doi.org/10.1108/INTR-07-2018-0318>
48. Rigamonti, E., Colaiacovo, B., Gastaldi, L., & Corso, M. (2024). HR analytics and the data collection process: the role of attributions and perceived legitimacy in explaining employees' fear of datafication. *Journal of Organizational Effectiveness: People and Performance*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/JOEPP-06-2023-0246>
49. Rita, P., Ramos, R. F., Moro, S., Mealha, M., & Radu, L. (2021). Online dating apps as a marketing channel: a generational approach. *European Journal of Management and Business Economics*, 30(1), 1–17. <https://doi.org/10.1108/EJMBE-10-2019-0192>
50. Šandor, D., & Bačić Babac, M. (2024). Sarcasm detection in online comments using machine learning. *Information Discovery and Delivery*, 52(2), 213–226. <https://doi.org/10.1108/IDD-01-2023-0002>
51. Sibanda, V., Mpofu, K., & Trimble, J. (2021). Methodology for the design of a reconfigurable guillotine shear and bending press machine (RGS&BPM). *Journal of Engineering, Design and Technology*, 19(6), 1317–1343. <https://doi.org/10.1108/JEDT-06-2020-0254>
52. Stark, J., Reif, J. A. M., & Schiebler, T. (2022). What leaders tell and employees hear – an intention-perception model of storytelling in leadership. *Organization Management Journal*, 19(2), 72–83. <https://doi.org/10.1108/OMJ-02-2021-1156>
53. Tharwat, A. (2021). Independent component analysis: An introduction. *Applied Computing and Informatics*, 17(2), 222–249. <https://doi.org/10.1016/j.aci.2018.08.006>
54. Touahri, I. (2022). The construction of an accurate Arabic sentiment analysis system based on resources alteration and approaches comparison. *Applied Computing and Informatics*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/ACI-12-2021-0338>

55. Travassos, X. L., Avila, S. L., & Ida, N. (2021). Artificial Neural Networks and Machine Learning techniques applied to Ground Penetrating Radar: A review. *Applied Computing and Informatics*, 17(2), 296–308. <https://doi.org/10.1016/j.aci.2018.10.001>
56. Uddin, S. F., Khan, A. A., Wajid, M., Singh, M., & Alam, F. (2021a). Performance evaluation of direction-finding techniques of an acoustic source with uniform linear array. *Frontiers in Engineering and Built Environment*, 1(2), 230–242. <https://doi.org/10.1108/FEBE-09-2021-0045>
57. Uddin, S. F., Khan, A. A., Wajid, M., Singh, M., & Alam, F. (2021b). Performance evaluation of direction-finding techniques of an acoustic source with uniform linear array. *Frontiers in Engineering and Built Environment*, 1(2), 230–242. <https://doi.org/10.1108/FEBE-09-2021-0045>
58. Wolfgruber, D. (2023). I'm only joking!(?) the role of disparaging humor in the communicative constitution of inclusion/exclusion in organizations. *Equality, Diversity and Inclusion: An International Journal*, 42(9), 35–55. <https://doi.org/10.1108/EDI-08-2022-0223>
59. Xin, X., Jiao, Y., Zhang, Y., Liang, M., & Yao, Z. (2024). Research on noise reduction and data mining techniques for pavement dynamic response signals. *Smart and Resilient Transportation*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/SRT-11-2023-0013>