ISSN: 3006-4023 (Online), Vol. 2, Issue 1
Journal of Artificial Intelligence General Science (JAIGS)

journal homepage: **https://ojs.boulibrary.com/index.php/JAIGS**

# Exploring the Applications of Artificial Intelligence across Various Industries

**Md. Mafiqul Islam**

Department of Information Science and Library Management, University of Rajshahi, Bangladesh

**Abstract**

*Many disciplines, such as computer vision and natural language processing (NLP), find broad applications for artificial intelligence (AI) and machine learning (ML). We will give a brief history of edge detection in this post, which is an essential method for emphasizing important characteristics in a wide range of computer vision applications. We will also explore the transformative potential of transformer-based deep learning models in improving natural language processing applications. In addition, we will present two current research initiatives that demonstrate the creative uses of AI in business negotiation and the pharmaceutical industry. Furthermore, for this journal issue, we have carefully chosen five papers that are pertinent to these topics.*

*Keywords: self-attention, transformer, artificial intelligence, edge detection, machine learning, and natural language processing*

*Article Information:*
*Article history: Received: 12/01/2024 Accepted: 12/01/2024 Online: 07/02/2024 Published: 07/02/2024*
*Corresponding author: Md.Mafiqul Islam Email: mafiqbdsl2964@gmail.com*

## Introduction:

Artificial Intelligence (AI) stands at the forefront of modern technological advancements, revolutionizing industries across the globe. With its ability to analyze vast amounts of data, recognize patterns, and make intelligent decisions, AI has become a cornerstone in numerous sectors. From healthcare to finance, manufacturing to retail, the applications of AI are diverse and impactful. This exploration delves into the transformative influence of AI across various industries, highlighting its innovative solutions, efficiency enhancements, and potential for shaping the future of work and business operations.

## Objectives:

Objective 1: Investigate the specific applications of Artificial Intelligence (AI) in key industries such as healthcare, finance, manufacturing, retail, and more.

Objective 2: Analyze the impact of AI on efficiency, productivity, decision-making processes, and customer experiences within different sectors.

Objective 3: Identify emerging trends, challenges, and opportunities associated with the integration of AI technologies across diverse industries, paving the way for future advancements and strategic implementations.

## AI in Natural Language Processing and Computer Vision Domains

AI enables computers and systems to extract meaningful information from digital photos, videos, and other visual inputs and conduct actions or make decisions based on the low-level visual stimulus for computer vision-based applications. Thanks to AI and ML, machines are now able to see, observe, and comprehend just like humans do.
Another area of artificial intelligence (AI) that focuses on assisting machines in comprehending human speech and writing is called natural language processing, or NLP. NLP is used in a variety of real-world applications, such as: • Voice-activated assistants, such as Alexa and Siri.
• Chatbots for customer support that respond to inquiries.
• Sifting through resumes to find experience and skills indicated in order to streamline the hiring process.
• Error-correcting tools and writing simplification recommendations.
• Language models that use the text's previous characters to predict what will be typed next.
The following introduces one computer vision topic and two ongoing NLP-based research applications.

### Edge Detection

Edge detection is one of several issues covered in computer vision and image processing research. It is useful in many areas, including object recognition, medical screening, and satellite imaging. It is an image processing technique that locates edges or boundaries in a digital image with discontinuities that present the image's most important contour in a global view. Sturdy edge-based form features offer computer vision applications more tangible analysis.
Conventional edge detection techniques use threshold-based techniques to distinguish between edge and nonedge pixels after creating hand-crafted features based on low-level visual signals. Conventional approaches yield outcomes that are object-level devoid of meaning. Convolutional neural network-based methods are now widely used in the field of image processing. Holistically nested edge detection (HED) [1] is a popular and effective framework for deep

network-based edge detection. Along the network pathway, it performs deep super-vision and generates five intermediate side outputs. The final fused output performs within a 2% deviation from human eyesight. Since then, a number of methods have been developed that use a comparable design to increase accuracy. The primary goals of these initiatives are to strengthen deep supervision strategies and raise the caliber of intermediate outputs. These methods, however, combine intermediate layers without taking into account the relevance of edges in a hierarchical manner within each side output. The network is faced with this conundrum: in order to incorporate desired features, it must receive a large amount of unwanted data, and vice versa. As a result, the output frequently lacks some important boundaries and has higher noise and thick borders.

The essential Scale-Invariant Salient Edge (SISE) can be found and extracted as a subset of each side output using the Scale-Invariant Salient Edge Detection (SISED) framework [2], which addresses this problem without adding to the network's complexity. The main function of SISED is the normalized Hadard Product, which is a multiplicative operation used to suppress features with poor scale expression and boost features that are mutually agreed upon across multiscale side outputs. In order to improve the edge findings and achieve state-of-the-art efficiency, SISED computes the edge importance hierarchically.

The search for sturdy edges is still being conducted going forward. CNNs were found to perform less well and more efficiently than the vision transformer (ViT)-based model [3] when it came to picture classification. The ViT framework may be used for edge detection because of its potent tokenized queries, self-attention mechanism, and encoding-decoding technique within transformers. For instance, the visual saliency transformer (VST) [4] presents a new paradigm for transformer-based edge detection models that may extract object contours.

## Chatbot for bert-based negotiation

Business discussions are frequently difficult because of the parties' disagreements. Certain talks can be time-consuming and detrimental, damaging corporate relationships when unanticipated unpleasant emotions arise [5]. Automating discussions with a robot—a negotiation chatbot—that makes use of the BERT framework—a framework created for natural language processing—is one way to address these issues.

Bidirectional Encoder Representations from Transformers, or BERT, is a deep learning natural language representation model [6] with strong contextual knowledge and bidirectional prediction capabilities. Pretraining and fine-tuning data are the two primary processes in this model's operation. A vast amount of unlabeled data is used to pretrained the BERT model. When further training fine-tunes the model to a particular job, it permits great performance. The BERT model trains data through two tasks: Next phrase Prediction (NSP), which is useful for the question/answer task, and MLM (Masked Language Model), which is used to predict the missing word(s) in close proximity inside a phrase.

The first stage in employing this chatbot is to fine-tune the model to the negotiating task by utilizing over a thousand bilateral negotiations that have been done in an experimental setting worldwide [7]. The MLM is then expanded to forecast if a negotiation was justified in producing a favorable or unfavorable outcome. Lastly, in a negotiating situation, the NSP is utilized to provide automatic answers to "chat" with a human counterpart. As a business representative, this BERT-based negotiation chatbot might be used to assess and predict the favorable and unfavorable climate during the negotiation and respond to the other party strategically. The intention is to assist the two sides in coming to a mutually agreeable prospective agreement.

## Pharm Bert: a language model for pharmaceutical error prediction that has been pertained

In the USA, 4.69 billion retail prescriptions are filled annually as of 2021 [8]. Nonetheless, there is still a very small amount of surveillance done on the dispensation process's service quality [9]. Aiming to address the causes of quality-related incidents, some governments and healthcare organizations implement error-reporting systems. Pharmaceutical errors, such as the use of the wrong medication, dosage, or quantity, that either reach patients (incident events) or are stopped at pharmacies (near miss events), have been gathered by these reporting systems [10].

A thorough examination of these events on a large scale is essential to identify common contributing elements that may have caused quality-related incidents [11]. Conventional data-mining technologies and the human eye may not be able to detect many common elements in retail pharmacies that contributed to an event. The development of efficient mining has increased with the advancement of deep learning in NLP, including thedomain of obtaining important hidden data from medical records.

In this study, predictions are made using BERT using transaction data related to pharmaceuticals (gathered through a

Canadian error-reported system). The event data is transformed as Natural Language tokens and fine-tuned on the pretrained BERT model in order to fit pharmaceutical data with the BERT model. When it comes to predicting whether an event will result in an incident (caught subsequently) or a near miss (caught beforehand), the trained pharm BERT model may attain an accuracy of approximately 84%. Additional features of the event, such as the stage of the incident (prescribing, transcribing, dispensing, administration, storage, and monitoring) or the category of issues the event comes under, can be predicted using this model. It is hoped that the study's findings would result in ways to lessen pharmaceutical-related mishaps and enhance patient safety.

Following up on our strengths from the previous issue [12] in assisting with the foundations of AI development and industrial applications, we have chosen five papers in these two areas. An overview of the papers in this issue that support AI education and use AI to extend and improve performance and capacities in a variety of application domains is provided in the sections that follow. Academic research papers and industrial application papers are both included in this collection.

## Clinical Trial Data Collection

The chosen paper for this category described how clinical trial data is gathered and how it may be used to the real medication development process for patients in everyday clinical settings. In the field of drug development, randomized clinical trials (RCTs) are regarded as the gold standard for obtaining regulatory approval. RCTs, however, might not be possible in specific conditions and disorders. In certain situations, results from randomized controlled trials might not apply to actual patients in standard clinical practice. In the digital age, real-world evidence (RWE) derived from diverse real-world data is becoming an increasingly significant factor in clinical decision-making and drug development. The features and distinctions between RCTs and RWE studies were then discussed, along with the collecting of real-world data and RWE and its creation. Additionally, this research [13] addressed the difficulties and constraints associated with using real-world data in RWE studies.

## Essentials for the Development of Ai

Two articles that address fundamental concerns in the advancement of artificial intelligence education and research have been chosen for this topic.

This section's first paper tackles the difficulty that exists today in developing practice questions for programming instruction, which necessitates that the teacher manually arrange a variety of learning materials. In order to assist the instructor in automatically creating new programming questions and their assessment, this study developed a semantic programming question generating paradigm. With the help of the Local Knowledge Graph and Abstract Syntax Tree, the programming question generation model was created to convert procedural and conceptual programming knowledge from textbooks into a semantic network. Regarding any particular query, the model

## Ai applications in industry

Two articles that apply big data and machine learning concepts and techniques to implement and improve various academic and industry domains were chosen for this topic.

The issue of important radar signal sorting and detection in electronic intelligence was examined in the second publication in this field. To address this issue, a hybrid strategy based on the PRI trans-form algorithm and clustering was created. This issue is not effectively resolved when using the conventional techniques based on Pulse Description Word. Three steps made up the suggested solution to the problem: first, a clustering algorithm does presorting. Next, the pulse repetition interval transform algorithm yields the estimations of each cluster's pulse repetition interval. Lastly, the correspondence between different estimates of the pulse repetition interval and important objectives is evaluated. Simulation findings shown that the suggested approach handled the complicated signal environment with noise interference and overlapping signals while also improving the time efficiency of key signal recognition [16].

In the third study in this field, automated control systems and their calibration in robotics, artificial intelligence, and industrial processes were examined. This research focuses on the precise measurement of contact high-temperature strain. An automatic calibration device for high-temperature strain gauges was established by the study. The high-temperature furnace's temperature is automatically managed by the apparatus. The high-temperature strain gauge with multiparameter calculation is made possible by the development of high-temperature strain measurement accuracy correction software, which is based on this calibration equipment. The software incorporates a compensation model for strain measurement accuracy, and the curves of creep characteristics, thermal output, zero drift, and sensitivity coefficient with temperature are obtained. The experiment measuring strain at high temperatures is conducted to confirm

## Conclusion

Artificial Intelligence has the power to unlock the full potential of IoT by enabling data-driven decision-making and continuous improvement. As AI and IoT technologies continue to evolve and intersect, they will pave the way for a future where individuals and businesses have greater control over their environments and experiences. However, addressing the challenges and ethical implications of AI deployment will be crucial in realizing its full benefits.

## References

[1]. Khan, R. A. (2023). Meta-Analysis of Cyber Dominance in Modern Warfare: Attacks and Mitigation Strategies. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *14*(03), 1051-1061. Retrieved from https://www.turcomat.org/index.php/turkbilmat/article/view/14288

[2].Ray, R. K., Linkon, A. A., Bhuiyan, M. S., Jewel, R. M., Anjum, N., Ghosh, B. P., ... & Shaima, M. (2024). Transforming Breast Cancer Identification: An In-Depth Examination of Advanced Machine Learning Models Applied to Histopathological Images. *Journal of Computer Science and Technology Studies*, *6*(1), 155-161. https://www.doi.org/10.32996/jcsts.2024.6.1.16

[3] Islam, M., & Shuford , J. . (2024). A Survey of Ethical Considerations in AI: Navigating the Landscape of Bias and Fairness. *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.27

[4] Akter, most. S. (2024). Interdisciplinary Insights: Integrating Artificial Intelligence with Environmental Science for Sustainable Solutions. *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.28

[5] khan , M. R. . (2024). Advancements in Deep Learning Architectures: A Comprehensive Review of Current Trends. *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.29

[6] Rana , M. S. ., & Shuford , J. . (2024). AI in Healthcare: Transforming Patient Care through Predictive Analytics and Decision Support Systems. *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.30

[7] Mia , M. R. ., & Shuford , J. . (2024). Exploring the Synergy of Artificial Intelligence and Robotics in Industry 4.0 Applications . *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.31
[8] Klinkenberg , D. . (2024). The Gnostic Code . *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.32

[9] Carrasco Ramírez., D. J. G. ., Islam, M. ., & Even, A. I. H. . (2024). Machine Learning Applications in Healthcare: Current Trends and Future Prospects. *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.33

[10] Islam, M. (2024). Applications of MachineLearning(ML): The real situation of the Nigeria Fintech Market. *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.34

[11] Shuford, J. . (2024). Quantum Computing and Artificial Intelligence: Synergies and Challenges. *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.35

[12] Shuford, J. (2024). Deep Reinforcement Learning Unleashing the Power of AI in Decision-Making. *Journal of Artificial Intelligence General science (JAIGS) ISSN: 3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.36

[13] Islam, M. M. . (2024). The Impact of Transfer Learning on AI Performance Across Domains . *Journal of Artificial Intelligence General Science (JAIGS) ISSN:3006-4023*, *1*(1). https://doi.org/10.60087/jaigs.v1i1.37