This study provided a content analysis of studies aiming to disclose how artificial intelligence (AI) has been applied to the education sector and explore the potential research trends and challenges of AI in education. A total of 100 papers including 63 empirical papers (74 studies) and 37 analytic papers were selected from the education and educational research category of Social Sciences Citation Index database from 2010 to 2020. The content analysis showed that the research questions could be classified into development layer (classification, matching, recommendation, and deep learning), application layer (feedback, reasoning, and adaptive learning), and integration layer (affection computing, role-playing, immersive learning, and gamification). Moreover, four research trends, including Internet of Things, swarm intelligence, deep learning, and neuroscience, as well as an assessment of AI in education, were suggested for further investigation. However, we also proposed the challenges in education may be caused by AI with regard to inappropriate use of AI techniques, changing roles of teachers and students, as well as social and ethical issues. The results provide insights into an overview of the AI used for education domain, which helps to strengthen the theoretical foundation of AI in education and provides a promising channel for educators and AI engineers to carry out further collaborative research.

Artificial intelligence (AI) is developing and its application is spreading at an alarming rate, and AI has become part of our daily lives. As a matter of fact, AI has changed the way people learn. However, its adoption in the educational sector has been saddled with challenges and ethical issues. The purpose of this study is to analyze the opportunities, benefits, and challenges of AI in education. A review of available and relevant literature was done using the systematic review method to identify the current research focus and provide an in-depth understanding of AI technology in education for educators and future research directions. Findings showed that AI's adoption in education has advanced in the developed countries and most research became popular within the Industry 4.0 era. Other challenges, as well as recommendations, are discussed in the study.

As of 2021, more than 30 countries have released national artificial intelligence (AI) policy strategies. These documents articulate plans and expectations regarding how AI will impact policy sectors, including education, and typically discuss the social and ethical implications of AI. This article engages in thematic analysis of 24 such national AI policy strategies, reviewing the role of education in global AI policy discourse. It finds that the use of AI in education (AIED) is largely absent from policy conversations, while the instrumental value of education in supporting an AI-ready workforce and training more AI experts is overwhelmingly prioritized. Further, the ethical implications of AIED receive scant attention despite the prominence of AI ethics discussion generally in these documents. This suggests that AIED and its broader policy and ethical implications—good or bad—have failed to reach mainstream awareness and the agendas of key decision-makers, a concern given that effective policy and careful consideration of ethics are inextricably linked, as this article argues. In light of these findings, the article applies a framework of five AI ethics principles to consider ways in which policymakers can better incorporate AIED’s implications. Finally, the article offers recommendations for AIED scholars on strategies for engagement with the policymaking process, and for performing ethics and policy-oriented AIED research to that end, in order to shape policy deliberations on behalf of the public good.

Method: A narrative synthesis and a systematic literature review were conducted in this review article. The literature and information were obtained from various books and research articles on EBSCO, Google Scholar, Scopus, Web of Science, and ScienceDirect. The inclusion criteria were studies that clearly defined artificial intelligence in the education sector, were published and written in English and were peer-reviewed. Five independent reviewers assessed search results, extracted data, and set the studies’ quality to summarise and report the findings.  
  
Result: Artificial intelligence has already entered the education sector. Implementing artificial intelligence is a strategic and critical factor in educational development. Furthermore, artificial intelligence is increasingly being used as a digital assistant. They assist teachers and students in various ways, including giving students access to a wide range of learning materials based on their specific learning needs and subjects. However, some risks are associated with artificial intelligence advancements, such as safety, security, and privacy concerns. As a result, artificial intelligence technologies positively and negatively affect the education sector.  
  
Conclusion: Artificial intelligence technologies have positive and negative effects on education. Thus, it is critical to prioritise artificial intelligence in education and implement appropriate strategies to meet teachers' and students' needs and expectations through AI technologies. As a result, academic performance will be excellent.  
  
Recommendation & Implication: Qualitative research, such as interviews, or quantitative analysis, such as online questionnaires, may be developed in the future to provide more explanations and explicit findings. The implications could be applied to school administrators, teachers, and students to understand better and implement appropriate strategies to improve educational performance through AI.

Artificial Intelligence (AI) is reshaping the world in profound ways; some of its impacts are certainly beneficial but widespread and lasting harms can result from the technology as well. The integration of AI into various aspects of human life is underway, and the complex ethical concerns emerging from the design, deployment, and use of the technology serves as a reminder that it is time to revisit what future developers and designers, along with professionals, are learning when it comes to AI. It is of paramount importance to train future members of the AI community, and other stakeholders as well, to reflect on the ways in which AI might impact people’s lives and to embrace their responsibilities to enhance its benefits while mitigating its potential harms. This could occur in part through the fuller and more systematic inclusion of AI ethics into the curriculum. In this paper, we briefly describe different approaches to AI ethics and offer a set of recommendations related to AI ethics pedagogy.

As addressed by Stephen Yang in his ICCE 2019 keynote speech (Yang, 2019), precision  
education is a new challenge when applying artificial intelligence (AI), machine learning, and learning analytics  
to improve teaching quality and learning performance. The goal of precision education is to identify at-risk  
students as early as possible and provide timely intervention on the basis of teaching and learning experiences  
(Lu et al., 2018). Drawing from this main theme of precision education, this special issue advocates an in-depth  
dialogue between cold technology and warm humanity, in turn offering greater understanding of precision  
education. For this special issue, thirteen research papers that specialize in precision education, AI, machine  
learning, and learning analytics to engage in an in-depth research experiences concerning various applications,  
methods, pedagogical models, and environments were exchanged to achieve better understanding of the  
application of AI in education

With the increasing use of Artificial Intelligence (AI) technologies in education, the number of published studies in the field has increased. However, no large-scale reviews have been conducted to comprehensively investigate the various aspects of this field. Based on 4,519 publications from 2000 to 2019, we attempt to fill this gap and identify trends and topics related to AI applications in education (AIEd) using topicbased bibliometrics. Results of the review reveal an increasing interest in using AI for educational purposes from the academic community. The main research topics include intelligent tutoring systems for special education; natural language processing for language education; educational robots for AI education; educational data mining for performance prediction; discourse analysis in computer-supported collaborative learning; neural networks for teaching evaluation; affective computing for learner emotion detection; and recommender systems for personalized learning. We also discuss the challenges and future directions of AIEd.

In light of fast-growing popular, political and professional discourses around AI in education, this article outlines five broad areas of contention that merit closer attention in future discussion and decision-making. These include: (1) taking care to focus on issues relating to 'actually existing' AI rather than the overselling of speculative AI technologies; (2) clearly foregrounding the limitations of AI in terms of modelling social contexts, and simulating human intelligence, reckoning, autonomy and emotions; (3) foregrounding the social harms associated with AI use; (4) acknowledging the value-driven nature of claims around AI; and (5) paying closer attention to the environmental and ecological sustainability of continued AI development and implementation. Thus, in contrast to popular notions of AI as a neutral tool, the argument is made for engaging with the ongoing use of AI in education as a political action that has varying impacts on different groups of people in various educational contexts.

Engineering education is constantly evolving to keep up with the latest technological developments and meet the changing needs of the engineering industry. One promising development in this field is the use of generative artificial intelligence technology, such as the ChatGPT conversational agent. ChatGPT has the potential to offer personalized and effective learning experiences by providing students with customized feedback and explanations, as well as creating realistic virtual simulations for hands-on learning. However, it is important to also consider the limitations of this technology. ChatGPT and other generative AI systems are only as good as their training data and may perpetuate biases or even generate and spread misinformation. Additionally, the use of generative AI in education raises ethical concerns such as the potential for unethical or dishonest use by students and the potential unemployment of humans who are made redundant by technology. While the current state of generative AI technology represented by ChatGPT is impressive but flawed, it is only a preview of what is to come. It is important for engineering educators to understand the implications of this technology and study how to adapt the engineering education ecosystem to ensure that the next generation of engineers can take advantage of the benefits offered by generative AI while minimizing any negative consequences.

Artificial intelligence (AI) is rapidly transforming various industries, including education. AI is being used in educational management  
to enhance the learning process, improve student outcomes, and streamline administrative tasks. This research work aims to explore the  
application of AI in educational management, including its benefits and challenges. The research work employs a systematic review  
methodology, examining the literature on AI in educational management. The study finds that AI has several advantages, including  
improving student engagement, personalization of learning, and cost-effectiveness. However, AI also poses several challenges, such as  
ethical concerns, potential biases, and the need for re-skilling the workforce. The research concludes that AI has an enormous capacity  
to improve educational management, but it must be deployed with care and caution.

Using artificial intelligence (AI) to its transformative advantage, the smart vision initiative represents a paradigm shift in the diagnostics and treatment of diabetic retinopathy. The primary aim of this initiative is to address all forms of diabetic retinopathy using cutting-edge AI techniques, including deep neural networks and machine learning. These advanced algorithms are designed for rapid and precise diagnosis, enabling swift interventions to prevent visual impairment by identifying intricate patterns that are invisible to the human eye. Through the identification of complex patterns that are invisible to the human eye, these algorithms guarantee quick and accurate diagnosis. This early detection is crucial as it allows for immediate care, significantly reducing the risk of irreversible vision loss. The smart vision initiative sets the stage for a future where diabetic retinopathy no longer leads to blindness, offering a brighter, clearer, and safer optical future for those affected by the condition.

The way healthcare is provided could be completely changed by the application of artificial intelligence (AI) and computer vision (CV). AI-enhanced computer vision can be applied to medical picture analysis, disease detection, patient health monitoring, surgical assistance, drug discovery acceleration, and the creation of individualized treatment programs. Improved diagnosis, lower costs, personalized treatment, better patient outcomes, and quicker drug discovery are all advantages of employing AI-assisted computer vision in healthcare. However, the application of these technologies also presents difficulties in terms of data privacy, bias, and legal matters. The sorts of computer vision utilized in healthcare systems are discussed in this chapter, including medical image analysis, disease diagnosis, movement and gait analysis, surgical support, behavioral analysis, and medication discovery. The difficulties of employing computer vision in healthcare are also covered in the chapter, including data privacy concerns, bias, legal concerns, a lack of accessibility, and the complexity of biological systems. Overall, AI-assisted computer vision holds immense promise for revolutionizing healthcare systems by enabling quicker and more accurate diagnosis, enhancing patient outcomes, and cutting costs. To make sure that these technologies are used in an ethical and responsible manner, it is crucial to address the issues related to them.

Agriculture is the ultimate imperative and primary source of origin to furnish domestic income for multifarious countries. The disease caused in plants due to various pathogens like viruses, fungi, and bacteria is liable for considerable monetary losses in the agriculture corporation across the world. The security of crops concerning quality and quantity is crucial to monitor disease in plants. Thus, recognition of plant disease is essential. The plant disease syndrome is noticeable in distinct parts of plants. Nonetheless, commonly the infection is detected in distinct leaves of plants. Computer vision, deep learning, few-shot learning, and soft computing techniques are utilized by various investigators to automatically identify the disease in plants via leaf images. These techniques also benefit farmers in achieving expeditious and appropriate actions to avoid a reduction in the quality and quantity of crops. The application of these techniques in the recognition of disease can avert the disadvantage of origin by a factious selection of disease features, extraction of features, and boost the speed of technology and efficiency of research. Also, certain molecular techniques have been established to prevent and mitigate the pathogenic threat. Hence, this review helps the investigator to automatically detect disease in plants using machine learning, deep learning and few shot learning and provide certain diagnosis techniques to prevent disease. Moreover, some of the future works in the classification of disease are also discussed.

The sphere of artificial intelligence (AI) technology is quite wide. There are many individual and collaborative AI-based technologies available. One of them is computer vision technology. Computer vision is also related to other technologies: Machine learning (ML), deep learning (DL), artificial neural networks, etc. Computer vision is applied in many different areas. One of the areas where it has been widely applied in recent times is healthcare. In healthcare, various algorithms in the aforementioned technologies are used to obtain meaningful information from medical images. In this chapter, the concept of computer vision, its fields of application, and its application in healthcare are reviewed. Also, the example of tumor detection by computer vision in a MATLAB environment is considered.

Inverse gas chromatography (IGC) has emerged as a highly sensitive, adaptable, and effective technology for material analysis. Through employing thermochemical approaches, IGC provides crucial insight into physicochemical information of materials such as dispersive surface free energy, Gibbs surface energy components and Guttamann Lewis acid-base parameters. In this comprehensive review, we delve into the historical background, instrumentation, and diverse applications of IGC. Researchers and practitioners will find valuable information on the selection and description of numerous models used in IGC experiments. The applications of IGC span various domains, including polymers, medicines, minerals, surfactants, and nanomaterials. Furthermore, IGC facilitates the measurement of important parameters such as sorption enthalpy and entropy, surface energy components (dispersive and specific), co/adhesion work, glass transition temperature, surface heterogeneity, miscibility, solubility parameters, and specific surface area. These insights contribute to a deeper understanding of material behavior and aid in the design and optimization of advanced materials. Moreover, the integration of computer vision and image processing techniques with IGC has enhanced our understanding of materials intricate surface texture, roughness, and related properties. This convergence of IGC with computer vision and artificial intelligence (AI) presents exciting opportunities for future exploration of chemical materials, opening new avenues for research and discovery. This paper not only provides a comprehensive overview of IGC, its techniques, and applications but also highlights the synergistic potential of combining IGC with AI and computer vision. The informative content and insights presented here will benefit researchers, scientists, and professionals in the field of advanced materials, enabling them to leverage IGC and AI for innovative materials discovery and development.

At present, the application of Artificial Intelligence (AI) in industrial control, smart home and other fields has received good response. However, AI technology has certain requirements for computer performance, and also faces problems in network security, data analysis, human-computer interaction, etc. At present, the visual platform of embedded system has achieved remarkable results in practical applications, but its development has been seriously hampered by problems such as low overall development efficiency and unstable system performance. This paper designed an EP Vision System (VS) based on AI technology. The platform combined the embedded hardware design with the Support Vector Machine (SVM) algorithm to realize the intelligent robot interaction and target detection functions. The test results showed that when other conditions were the same, students and experts had 83.5% and 90% positive evaluations of System X, and 16.5% and 10% negative evaluations respectively. However, their positive evaluation of System Y only accounted for 19% and 4%, while the negative evaluation accounted for 81% and 96%. The proportion of positive evaluation of System X was much higher than that of System Y, which indicated that System X can meet the actual application requirements and improve the system recognition efficiency to a certain extent. It showed the positive relationship between AI technology and EP VS.

installed on the modern intelligent vehicles. Many Artificial Intelligence based foundation models have been proposed for smart sensing to recognize the known object classes in the new but similar scenarios. However, it is still challenging for the foundation models of smart sensing to detect all the object classes in both seen and unseen scenarios. This letter aims at pushing the boundary of smart sensing research for intelligent vehicles. We first summarize the current widely-used foundation models and the foundation intelligence needed for smart sensing of intelligent vehicles. We then explain Sora-based Parallel Vision to boost the foundation models of smart sensing from basic intelligence (1.0) to enhanced intelligence (2.0) and final generalized intelligence (3.0). Several representative case studies are discussed to show the potential usages of Sora-based Parallel Vision, followed by its future research direction.

The application of AI and machine learning, particularly the vision transformer method, in bacterial detection presents a promising solution to overcome limitations of traditional methods, offering faster and more accurate detection of disease-causing bacteria like E. coli and salmonella in water, crucial for human survival, with ongoing research to further assess its effectiveness in microbiology. This research introduces a revolutionary positional self-attention transformer model for the classification of bacterial colonies. Leveraging the proven success of transformer architectures in various domains, we enhanced the model's performance by integrating a positional self-attention mechanism. We presented a novel approach for bacterial colony classification utilizing a positional self-attention transformer model. This allows the model to effectively capture spatial relationships and patterns within bacterial colonies, contributing to highly accurate classification results. We trained the model on a substantial dataset of bacterial images, which ensures its robustness and generalization to diverse colony types. The proposed model adeptly captured the spatial relationships and sequential patterns inherent in bacterial colony images, allowing for more accurate and robust classification. The proposed model demonstrated remarkable performance, achieving an accuracy of 98.50% in the classification of bacterial colonies. This novel approach surpasses traditional methods by effectively capturing intricate spatial relationships within microbial structures, offering unprecedented accuracy in discerning subtle morphological variations. The model's adaptability to diverse colony shapes and arrangements marks a significant advancement, promising to redefine the landscape of bacterial colony classification through the lens of state-of-the-art deep learning techniques. The high classification accuracy attained by the model, suggests its potential for practical applications in the early diagnosis of infectious diseases and the development of targeted treatments. The findings of this study underscore the effectiveness of incorporating positional self-attention in transformer models for image-based classification tasks, particularly in the domain of bacterial colony analysis.

Autonomous vehicle is a typical high-tech comprehensive application, including scene perception, optimization calculation, multi-level assisted driving and other functions, using computer vision, sensors, information fusion, information communication, high-performance computing, artificial intelligence and automatic control and other technologies. In these technologies, computer vision, as a direct entry point to data processing, is an integral part of autonomous driving. Secondly, it brings revolutionary changes to the future transportation system. The application of image processing and computer vision in autonomous driving plays a key role in enabling vehicles to perceive and understand the surrounding environment and achieve intelligent decision-making and control. Therefore, in combination with the application of computer vision and artificial intelligence in automatic driving, this paper expounds the image processing technology in automatic driving, including camera and sensor technology, image acquisition and preprocessing, feature extraction and object detection, so as to discuss the application of computer vision algorithm in automatic driving. The research on lane keeping and recognition, obstacle detection and avoidance, traffic signal and sign recognition is of great practical significance.

Medical image segmentation is a crucial task in computer vision, playing a pivotal role in applications such as diagnostics, treatment planning, and medical research. The present study explores a wide range of methodologies employed in the field of medical research to achieve image segmentation. These techniques range from traditional approaches based on thresholding, edge detection, region-based and clustering, to modern artificial intelligence methods, particularly deep learning techniques. The strengths and limitations of each method are thoroughly examined. This paper focuses on analyzing various architectures used for medical image segmentation, specifically evaluating their performance. It aims to delve deeply into the different segmentation methods, offering a comparative perspective on their effectiveness. Furthermore, This document delves into the most recent technological progress in segmentation, emphasizing major breakthroughs capable of transforming the precision and productivity of analyzing medical images. Through an exhaustive compilation and detailed critique of the results obtained by employing a range of segmentation strategies, the study presents the outcomes of multiple approaches, accompanied by an in-depth analysis of the strengths and weaknesses inherent to the various techniques applied to medical image segmentation. This research enhances the comprehension of how these methods can be applied within the medical sector, especially in the area of computer vision.

This paper introduces a study employing artificial intelligence (AI) to utilize computer vision algorithms for detecting human emotions in video content during user interactions with diverse visual stimuli. The research aims to unveil the creation of software capable of emotion detection by leveraging AI algorithms and image processing pipelines to identify users' facial expressions. The process involves assessing users through images and facilitating the implementation of computer vision algorithms aligned with psychological theories defining emotions and their recognizable features. The study demonstrates the feasibility of emotion recognition through convolutional neural networks (CNN) and software development and training based on facial expressions. The results highlight successful emotion identification; however, precision improvement necessitates further training for contexts with more diverse images and additional algorithms to distinguish closely related emotional patterns. The discussion and conclusions emphasize the potential of A.I. and computer vision algorithms in emotion detection, providing insights into software development, ongoing training, and the evolving landscape of emotion recognition technology. Further training is necessary for contexts with more diverse images, alongside additional algorithms that can effectively distinguish between facial expressions depicting closely related emotional patterns, enhancing certainty and accuracy.

The face is the most essential part of the human body, and because of its distinctive traits, it is crucial for recognizing people. Facial recognition technology (FRT) is one of the most successful and fascinating technologies of the modern times. The world is moving towards contactless FRT after the COVID-19 pandemic. Due to its contactless biometric characteristics, FRT is becoming quite popular worldwide. Businesses are replacing conventional fingerprint scanners with artificial intelligence—based FRT, opening up enormous commercial prospects. Security and surveillance, authentication/access control systems, digital healthcare, photo retrieval, etc., are some sectors where its use has become essential. In the present communication, we presented the global adoption of FRT, its rising trend in the market, utilization of the technology in various sectors, its challenges and rising concerns with special reference to India and worldwide.

Recent technological developments have enabled computers to identify and categorize facial expressions to determine a person’s emotional state in an image or a video. This process, called “Facial Expression Recognition (FER)”, has become one of the most popular research areas in computer vision. In recent times, deep FER systems have primarily concentrated on addressing two significant challenges: the problem of overfitting due to limited training data availability, and the presence of expression-unrelated variations, including illumination, head pose, image resolution, and identity bias. In this paper, a comprehensive survey is provided on deep FER, encompassing algorithms and datasets that offer insights into these intrinsic problems. Initially, this paper presents a detailed timeline showcasing the evolution of methods and datasets in deep facial expression recognition (FER). This timeline illustrates the progression and development of the techniques and data resources used in FER. Then, a comprehensive review of FER methods is introduced, including the basic principles of FER (components such as preprocessing, feature extraction and classification, and methods, etc.) from the pro-deep learning era (traditional methods using handcrafted features, i.e., SVM and HOG, etc.) to the deep learning era. Moreover, a brief introduction is provided related to the benchmark datasets (there are two categories: controlled environments (lab) and uncontrolled environments (in the wild)) used to evaluate different FER methods and a comparison of different FER models. Existing deep neural networks and related training strategies designed for FER, based on static images and dynamic image sequences, are discussed. The remaining challenges and corresponding opportunities in FER and the future directions for designing robust deep FER systems are also pinpointed.

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Facial recognition is a well-established and popular field in Computer Vision, especially with advancements in deep learning and data sets. Deep facial recognition has made significant progress and is widely applied in real-world scenarios. A complete facial recognition system involves three main components: facial recognition, orientation, and representation. This system detects faces, aligns them to a standard view, and extracts features for recognition using deep convolutional neural networks. This article provides a detailed overview of the latest advancements in these areas, showing how deep learning has greatly enhanced their abilities. Object detection in machine vision is a challenging area that requires significant improvements. While image classification accuracy is nearing 2.25%, surpassing human performance, object detection algorithms are still in the early stages. Current algorithms achieve only 40.8 MAPS on modern objects, so careful dataset selection is crucial for optimal results.

Facial recognition technology (FRT) is one of several artificial intelligence (AI)-based technologies used during the COVID-19 pandemic to control the spread of the virus. As planning for future pandemics is currently underway, this technology is envisioned as an efficient tool to track infected individuals and collect real-time surveillance data. When properly used, FRT can support governments’ strategies to implement public health surveillance, which is defined in the literature as ‘the systematic collection, storage, usage, and dissemination of personal information to identify an outbreak and mitigate the spread of disease’.  
Nonetheless, FRT presents some ethical and legal challenges, such as its use without ensuring consent from the individuals under surveillance, the protection of biometric data collected through surveillance, and the risk of using this information for other purposes besides public health. Despite being widely deployed in countries such as Russia and China, for pandemic purposes and beyond, western jurisdictions are much more reluctant to adopt it.

During the COVID-19 pandemic, Delhi, India, faced a pressing issue where approximately 1,500 COVID-19-positive patients went missing. In public health emergencies, such as pandemics, natural disasters, or other calamities, hospitals, and medical centres experience a sudden influx of patients, and hospital management faces difficulties in keeping track of patients, especially when they need to be moved between facilities or when new temporary healthcare facilities are set up. As a consequence of these challenges, there can be an increase in missing person cases. Patients may be inadvertently separated from their families. The human face is a unique biometric system that can determine the age, gender, mood, of an individual, and even identity for verification purposes. Harbouring the power of deep learning and artificial intelligence, one of the most important applications of computer vision is Patient Identification. In this study, we have proposed a state-of-the-art patient face detection model using a twofold model that uses MTCNN short for “multi-task cascaded convolution neural network” for face detection and alignment purposes with a FaceNet Convolutional Neural Network (CNN) a renowned face embedding algorithm finally with KNN algorithm as a classifier to get an accuracy of 97.1%. Also, to ensure public safety during the pandemic we have constituted a Resnet34 model for mask detection trained on the Face Mask Detection dataset with an accuracy of 97%. This study not only addresses the immediate challenges of patient identification and safety during crises but also carries implications for broader healthcare applications. The proposed models offer promising avenues for enhancing patient care and security.

Well-being is one of the pillars of positive psychology, which is known to have positive effects not only on the personal and professional lives of individuals but also on teams and organizations. Understanding and promoting individual well-being is essential for staff health and long-term success, but current tools for assessing subjective well-being rely on time-consuming surveys and questionnaires, which limit the possibility of providing the real-time feedback needed to raise awareness and change individual behavior. This paper proposes a framework for understanding the process of non-verbal communication in teamwork, using video data to identify significant predictors of individual well-being in teamwork. It relies on video acquisition technologies and state-of-the-art artificial intelligence tools to extract individual, relative, and environmental characteristics from panoramic video. Statistical analysis is applied to each time series, leading to the generation of a dataset of 125 features, which are then linked to PERMA (Positive Emotion, Engagement, Relationships, Meaning, and Accomplishments) surveys developed in the context of positive psychology. Each pillar of the PERMA model is evaluated as a regression or classification problem using machine learning algorithms. Our approach was applied to a case study, where 80 students collaborated in 20 teams for a week on a team task in a face-to-face setting. This enabled us to formulate several hypotheses identifying factors influencing individual well-being in teamwork. These promising results point to interesting avenues for research, for instance fusing different media for the analysis of individual well-being in teamwork.

Face recognition has a very important role in various applications, from security, surveillance to authentication. For safety most of the household is having CC cameras such that they could recognize the persons from it. These CCTV are allocated for having safety and to know who visited their houses. In few highly secured places where allowance to any unknown intruder is strictly prohibited. Thereby, this paper deals with a system which could recognize the face of the intruder through surveillance camera using ML and AI based algorithms. The design specified is successfully implemented using HOG feature extraction and SVM classification algorithms and it classifies the faces for a video stream given as input. The major objective entitled to this paper is to recognize the faces of people from the video by HOG feature extractor and classify them using SVM and train the machine to tell who is the person working for the organization and who are the intruder.

The growing population also leads to a growing consumer base which increases the load and resources to cater the needs of the day-by-day increasing consumers. Just as technology is being used to solve all the problems so why not this one. The idea is to make a more convenient and advanced super market experience, where there are no cashiers or lines so that we can shop hassle free. This project implements Artificial Intelligence and Internet of Things to automate a supermarket for better efficiency. A person just needs to walk in after scanning their QR code through the app with their unique ID on it. It will record the customer's presence in the shop. The shopping carts and baskets have sensors on them, which can detect the product entering or being taken out. The products are placed on shelves which have pressure sensors to detect if any product is picked up. These shelves are closed and they only open with your shopping cards. When you reach the counter, you only have swipe your card again and money will be deducted from your account according to your purchase and a receipt will be given. We look forward to provide this technology to various super market chains in the country and abroad and help them implement it with a nominal one time investment.

Autonomous vehicles (AVs) are expected to reshape future transportation systems, and decision making is one of the critical modules toward high-level automated driving. To overcome those complicated scenarios that rule-based methods could not cope with well, data-driven decision-making approaches have aroused more focus. The datasets to be used in developing data-driven methods dramatically influence the performance of decision making; hence, it is necessary to have a comprehensive insight into the existing datasets. From the aspects of collection sources, driving data can be divided into vehicle-, environment-, and driver-related data. This study compares the state-of-the-art datasets of these three categories and summarizes their features, including sensors used, annotation, and driving scenarios. Based on the characteristics of the datasets, this survey also discusses potential applications of datasets on various aspects of AV decision making, assisting researchers in finding appropriate ones to support their own research. The future trends of AV dataset development are summarized.

Accurate trajectory tracking is unrealistic in real-world scenarios, however, which is commonly assumed to facilitate motion planning algorithm design. In this paper, a safe and reliable motion planning and control framework is proposed to handle the tracking errors caused by inaccurate tracking by coordinating the motion planning layer and controller. Specifically, motion space is divided into safe regions and risky regions by designing the movement restraint size dependent on tracking error to construct the repulsive potential field. The collision-free waypoint set can then be obtained by combining global search and the proposed waypoint set filtering method. The planned trajectory is fitted by an optimization-based approach which minimizes the acceleration of the reference trajectory. Then, the planned trajectory is checked and modified by the designed anti-collision modification to ensure safety. Using invertible transformation and adaptive compensation allows the transient trajectory tracking errors to be limited within the designed region even with actuator faults. Because tracking error is considered and margined at the planning level, safety and reliability can be guaranteed by the coordination between the planning and control levels under inaccurate tracking and actuator faults. The advantages and effectiveness of the proposed motion planning and control method are verified by simulation and experimental results.

How would people distribute risks of autonomous vehicles (AVs) in everyday road traffic? The rich literature on the ethics of autonomous vehicles (AVs) revolves around moral judgments in unavoidable collision scenarios. We argue for extending the debate to driving behaviors in everyday road traffic where ubiquitous ethical questions arise due to the permanent redistribution of risk among road users. This distribution of risks raises ethically relevant questions that cannot be evaded by simple heuristics such as “hitting the brakes.” Using an interactive, graphical representation of different traffic situations, we measured participants’ preferences on driving maneuvers of AVs in a representative survey in Germany. Our participants’ preferences deviated significantly from mere collision avoidance. Interestingly, our participants were willing to take risks themselves for the benefit of other road users, suggesting that the social dilemma of AVs may be mitigated in risky environments. Our research might build a bridge between engineers and philosophers to discuss the ethics of AVs more constructively.

Artificial intelligence is one of the emerging technologies that simulate human intelligence in machines by programming it to think like human beings and mimic their actions. An autonomous vehicle can function itself and carry out necessary functions without any human involvement. This innovative technology may provide increased passenger safety, less congested roads, congestion reduction, optimum traffic, lower fuel consumption, less pollution, and better travel experiences. Autonomous vehicles play a vital role in industry, agriculture, transportation, and military applications. The autonomous vehicle's activities are supported by sensor data and a few artificial intelligence systems. Artificial intelligence is the collection of data, path planning, and execution in autonomous vehicles that require some machine learning techniques that are a part of artificial intelligence. But this comes with some privacy issues and security concerns. Security is an important concern for autonomous vehicles. The issues of cybersecurity while incorporating artificial intelligence in autonomous vehicles will be covered in this article, along with the growing technology of self-driving automobiles.

Throughout the last decades, the number of vehicles on the road has steadily increased due to the rising demand for urban mobility and contemporary logistics. Two of the many detrimental effects of more vehicles on the road, which also impede economic development, are increased traffic congestion and traffic accidents. The issues mentioned above can be significantly resolved by making vehicles smarter by reducing their reliance on humans. Over the past century, various nations have conducted extensive research that has fueled the automation of road vehicles. The development of autonomous vehicle (AV) technologies is currently being pursued by all significant motor manufacturers worldwide. Undoubtedly, the widespread use of autonomous cars is more imminent than we realize given the development of artificial intelligence (AI). In order for AVs to perceive their surroundings and make the right decisions in real time, AI has emerged as a crucial component. This development of AI is being driven by the growth of big data from numerous sensing devices and cutting-edge computing resources. We must first examine AI's development and history in order to comprehend its functions in AV systems.

The future sustainability of the global automotive industry will be greatly affected by the fourth industrial revolution and the evolution of artificial intelligence (AI). The “new normal” is projected to be driven by new industry standards including an increasingly autonomous self-driving technology, amended safety standards, more complex insurance regulations, adaptive social resistance to technological change, city infrastructure requirements with a digital divide, and disruptive business innovation based on strategic input supply partnerships with open-source AI. In this chapter, the key factors of the autonomous vehicles (AVs) are analyzed using AI developments in radar and laser technology, commercial risk factors, self-driving consumer behavior, city infrastructure constraints, and social adaptations to new technology. The future trajectory of the AV industry is expected to be an interplay between commercial, social, risk, infrastructure, and regulatory mechanisms with various impacts on the industry’s stakeholders. This study predicts that the most likely sustainable scenario for the AV industry is that it will be driven by: (1) AI’s pulsed laser LiDAR (Light Detection and Ranging) with a sufficient loop frequency and GPS bi-directional cloud technology requirement, (2) pooled insurance in contrast to individual liability, (3) smart city infrastructure with expected sharp digital divide across transport regions leading to more regional inequality, and (4) customers who strongly prefer a human controlled semi-autonomous vehicle rather than complete machine autonomy.

The future of autonomous vehicles lies in the convergence of human-centric design and advanced AI capabilities. Autonomous vehicles of the future will not only transport passengers but also interact and adapt to their desires, making the journey comfortable, efficient, and pleasant. In this paper, we present a novel framework that leverages Large Language Models (LLMs) to enhance autonomous vehicles' decision-making processes. By integrating LLMs' natural language capabilities and contextual understanding, specialized tools usage, synergizing reasoning, and acting with various modules on autonomous vehicles, this framework aims to seamlessly integrate the advanced language and reasoning capabilities of LLMs into autonomous vehicles. The proposed framework holds the potential to revolutionize the way autonomous vehicles operate, offering personalized assistance, continuous learning, and transparent decision-making, ultimately contributing to safer and more efficient autonomous driving technologies.

The potential for connected automated vehicles is multifaceted, and automated advancement deals with more of Internet of Things (IoTs) development enabling artificial intelligence (AI). Early advancements in engineering, electronics, and many other fields have inspired AI. There are several proposals of technologies used in automated vehicles. Automated vehicles contribute greatly toward traffic optimization and casualty reduction. In studying vehicle autonomy, there are two categories of development available: high-level system integrations like new-energy vehicles and intelligent transportation systems and the other involves backward subsystem advancement like sensor and information processing systems. The Advanced Driver Assistance System shows results that meet the expectations of real-world problems in vehicle autonomy. Situational intelligence that collects enormous amounts of data is considered for high-definition creation of city maps, land surveying, and quality checking of roads as well. The infotainment system of the transport covers the driver's gesture recognition, language transaction, and perception of the surroundings with the assistance of a camera, Light Detection and Ranging (LiDAR), and Radio Detection And Ranging (RADAR) along with localization of the objects in the scene. This chapter discusses the history of autonomous vehicles (AV), trending research areas of artificial intelligence technology in AV, state-of-the-art datasets used for AV research, and several Machine Learning (ML)/Deep Learning (DL) algorithms constituting the functioning of AV as a system, concluding with the challenges and opportunities of AI in AV.

Artificial intelligence is now a necessary component for both production and service systems in recent years, as technology has become a vital aspect of daily life. Automated driving vehicles operate autonomously, also known as driverless cars that can operate without a human driver. Research on autonomous vehicles has substantially advanced in recent years. Artificially intelligent autonomous vehicles are the current need of the society. Although some people might be apprehensive to give a computer control of their vehicle, automated driving technologies have the potential to make roads safer. Self-driving automobiles can address environmental issues as well as safety-related ones. Unlike humans, computers do not really have difficulty keeping attention when driving. Additionally, by responding appropriately, an automated car can prevent accidents to potentially dangerous events on the road. Self-driving technology has many advantages, one of which will make more easily accessible means of transport to people who are unable to drive. For a variety of reasons, such as inexperience, incapacity, or age, many people are unable to operate a vehicle. These individuals can travel considerably more safely and independently. Therefore, we will explore the architectures of both software and hardware of autonomous cars in this chapter, as well as their parts, benefits, and future developments.

The advent of autonomous vehicles has heralded a transformative era in transportation, reshaping the landscape of mobility through cutting-edge technologies. Central to this evolution is the integration of Artificial Intelligence (AI) and learning algorithms, propelling vehicles into realms of unprecedented autonomy. This paper provides a comprehensive exploration of the evolutionary trajectory of AI within autonomous vehicles, tracing the journey from foundational principles to the most recent advancements. Commencing with a current landscape overview, the paper delves into the fundamental role of AI in shaping the autonomous decision-making capabilities of vehicles. It elucidates the steps involved in the AI-powered development life cycle in vehicles, addressing ethical considerations and bias in AI-driven software development for autonomous vehicles. The study presents statistical insights into the usage and types of AI/learning algorithms over the years, showcasing the evolving research landscape within the automotive industry. Furthermore, the paper highlights the pivotal role of parameters in refining algorithms for both trucks and cars, facilitating vehicles to adapt, learn, and improve performance over time. It concludes by outlining different levels of autonomy, elucidating the nuanced usage of AI and learning algorithms, and automating key tasks at each level. Additionally, the document discusses the variation in software package sizes across different autonomy levels

Human-AI interaction has become an important focus in the development of more responsive and humane technology. In this context, the use of artificial empathy strategies is of particular interest due to its potential in improving customer experiences affectively and socially. This research aims to explore the optimization of human-AI interactions through the application of artificial empathy strategies in improving affective and social customer experiences. The research approach used is qualitative by reviewing various studies and related literature. The data sources used are journals, articles and books that are relevant to the research topic. From the research results, it was found that the implementation of artificial empathy strategies in human-AI interactions has great potential to improve the quality of interactions and customer experiences. The use of technologies such as natural language processing, emotion recognition, and sentiment analysis can enable AI to respond more precisely and sensitively to user needs and emotions.

Empathy computing is an emerging research field that integrates artificial intelligence (AI) and big data technology to predict, identify, simulate, and generate human empathy. This field builds upon psychological studies in terms of concepts, measurements, neural foundations, and applications of empathy, and employs innovative computing approaches for analyzing and simulating empathy. This article critically reviews current research on empathy computing and discusses its future directions from a psychological perspective, with the aim of facilitating foundational research and practical applications in this field.  
The current research on empathy computing can be categorized into four themes based on different purposes and methods. On one hand, empathy computing primarily aims to analyze and comprehend empathy using computers. This endeavor can be further divided into two categories: (1) individual empathy assessment, which focuses on analyzing individual empathetic traits, and (2) empathetic content classification, which focuses on analyzing empathetic features in texts rather than individuals. On the other hand, research also focuses on simulating and expressing empathy through computing, which includes (3) the design of empathetic response systems and (4) the development of generative empathetic dialogue systems. The former provides users with a limited number of predefined rule-based responses and feedback to express empathy, while the latter utilizes AI to automatically generate a wide range of empathetic dialogues without relying on predefined rules. These four research streams are relatively independent yet complementary. Moreover, as research progresses, new directions will continue to emerge, such as improving the empathic capabilities of computers through brain-computer interface technology.  
Although research on empathy computing is still in its early stages, it has shown potential for innovative applications in scenarios such as mental health, education, business services, and public management. With the increasing prevalence of artificial intelligence, these fields, which involve substantial interpersonal interactions, are positioned to become the primary domains for human-computer interaction. As a result, they emerge as the key application scenarios for empathy computing. In the realm of mental health, empathy computing can assist in automatically evaluating and enhancing therapists' empathetic abilities. Additionally, it can provide personalized empathetic support and guidance through AI-driven chatbots. In the field of education, empathy computing can facilitate the learning process by employing empathetic AI tutors. Within the business sector, it enables organizations to deliver tailored customer experiences, thereby enhancing satisfaction and fostering loyalty through the generation of empathic dialogues. In public management, empathy computing can be used to generate empathetic discourse to counteract negative speech. Additionally, it facilitates policymakers to respond empathetically to citizens' needs and inquiries, thereby fostering trust between the government and the public. These four scenarios illustrate the vast potential applications of empathy computing. However, due to concerns related to safety and ethics, complete reliance on computers to perform empathetic tasks is currently not feasible. Instead, a collaboration between humans and computers is necessary.  
Empathy computing represents a transformative frontier, not only providing methods to measure and analyze empathy automatically on a larger scale but also enriching the theoretical landscape of empathy research. It extends traditional studies on empathy in interpersonal relationships to explore its emerging manifestations in human-AI relationships. This expansion raises novel questions about the universality of empathy and its potential evolution in human-computer interaction. Empathy computing holds the promise of serving as a cornerstone for a unified theory of empathy that encompasses diverse relationship dynamics, ranging from human-human to human-machine interactions and beyond. It is beneficial for comprehensively understanding empathy and effectively promoting it in the context of an intelligent society.  
Future research should focus on developing integrated theoretical models of empathy computing, establishing reliable psychological and behavioral datasets of empathy-related characteristics, and validating and refining empathy computing research through a human-centered approach. Psychologists play indispensable roles in leading, evaluating, and optimizing research and practice in this field. The collaboration of scholars in psychology and computer science is imperative to ensure that AI learns empathy effectively and ethically, thereby fostering people’s wellbeing in the forthcoming intelligent society.

This study was conducted to investigate the empathy between human chatbot interactions among computer science students at Uppsala University, Sweden. This was done by exploring how participants perceive anthropomorphic chatbots as machines or humans, the existence of verbal abuse during human chatbot interactions, and the expectation of chatbot helpfulness depending on gender dynamics. A semi-structured interview methodology with five students was conducted for qualitative data collection. The collected data was manually analyzed using thematic analysis. The results of this study found that there is empathy in human chatbot interaction, regardless of whether participants perceive anthropomorphic chatbots as humans or machines. However, the level of empathy is generally low as participants frustrate when they are dissatisfied with the response of chatbots and exit the chatbots without expressing their frustration, and they usually forget their frustration and come again with other questions another time. The study also shows that participants might expect more help and politeness if chatbots are more likely to be female.

From ELIZA to Alexa, Conversational Agents (CAs) have been deliberately designed to elicit or project empathy. Although empathy can help technology better serve human needs, it can also be deceptive and potentially exploitative. In this work, we characterize empathy in interactions with CAs, highlighting the importance of distinguishing evocations of empathy between two humans from ones between a human and a CA. To this end, we systematically prompt CAs backed by large language models (LLMs) to display empathy while conversing with, or about, 65 distinct human identities, and also compare how different LLMs display or model empathy. We find that CAs make value judgments about certain identities, and can be encouraging of identities related to harmful ideologies (e.g., Nazism and xenophobia). Moreover, a computational approach to understanding empathy reveals that despite their ability to display empathy, CAs do poorly when interpreting and exploring a user’s experience, contrasting with their human counterparts.

Interactive software agents, such as chatbots, are progressively being used in the area of health and well-being. In such applications, where agents engage with users in interpersonal conversations for, e.g., coaching, comfort or behavior-change interventions, there is an increased need for understanding agents’ empathic capabilities. In the current state-of-the-art, there are no tools to do that. In order to understand empathic capabilities in interactive software agents, we need a precise notion of empathy. The literature discusses a variety of definitions of empathy, but there is no consensus of a formal definition. Based on a systematic literature review and a qualitative analysis of recent approaches to empathy in interactive agents for health and well-being, a formal definition—an ontology—of empathy is developed. We present the potential of the formal definition in a controlled user-study by applying it as a tool for assessing empathy in two state-of-the-art health and well-being chatbots; Replika and Wysa. Our findings suggest that our definition captures necessary conditions for assessing empathy in interactive agents, and how it can uncover and explain trends in changing perceptions of empathy over time. The definition, implemented in Web Ontology Language (OWL), may serve as an automated tool, enabling systems to recognize empathy in interactions—be it an interactive agent evaluating its own empathic performance or an intelligent system assessing the empathic capability of its interlocutors.

Advances in the performance of large language models (LLMs) have led some researchers to propose the emergence of theory of mind (ToM) in artificial intelligence (AI). LLMs can attribute beliefs, desires, intentions, and emotions, and they will improve in their accuracy. Rather than employing the characteristically human method of empathy, they learn to attribute mental states by recognizing linguistic patterns in a dataset that typically do not include that individual. We ask whether LLMs' inability to empathize precludes them from honoring an individual's right to be an exception, that is, from making assessments of character and predictions of behavior that reflect appropriate sensitivity to a person's individuality. Can LLMs seriously consider an individual's claim that their case is different based on internal mental states like beliefs, desires, and intentions, or are they limited to judging that case based on its similarities to others? We propose that the method of empathy has special significance for honoring the right to be an exception that is distinct from the value of predictive accuracy, at which LLMs excel. We conclude by considering whether using empathy to consider exceptional cases has intrinsic or merely practical value and we introduce conceptual and empirical avenues for advancing this investigation.

In a world increasingly driven by AI systems, controversial use cases for AI that significantly affect people’s lives become more likely scenarios. Hence, increasing awareness of AI bias that might affect underprivileged groups becomes an increasing challenge. As Virtual Reality has previously been shown to increase empathy through immersive perspective-taking, we conducted a laboratory study in which participants were confronted with a biased Wizard of Oz AI while embodying personas that varied widely in their ability to achieve high financial credit scores due to their age and gender. We found that participants embodying personas in VR felt significantly more empathy toward the characters they embodied and rated the AI as significantly less fair compared to a baseline condition in which they imagined to be these characters. Furthermore, we investigate differences between embodied personas and discuss qualitative results to gain insight into the participant’s mental model creation.

In the evolving landscape of financial decision-making, this study delves into the intricate relationships among Emotional Intelligence (EI), Artificial Intelligence (AI), and Investment Decisions (ID). By scrutinizing the direct influence of human emotional intelligence on investment choices and elucidating the mediating role of AI in this process, our research seeks to unravel the complex interplay between minds and machines. Through empirical analysis, we reveal that EI not only directly impacts ID but also exerts its influence indirectly through AI-mediated pathways. The findings underscore the pivotal role of emotional awareness in investor decision-making, augmented by the technological capabilities of AI. It suggests that most investors are influenced by the identified emotional intelligence when making investment decisions. Furthermore, AI substantially impacts investors' decision-making process when it comes to investing; nevertheless, AI partially mediates the relationship between emotional intelligence and investment decisions. This nuanced understanding provides valuable insights for financial practitioners, policymakers, and researchers, emphasizing the need for holistic strategies that integrate emotional and technological dimensions in navigating the intricacies of modern investment landscapes. As the synergy between human intuition and artificial intelligence becomes increasingly integral to financial decision-making, this study contributes to the ongoing discourse on the symbiotic relationship between minds and machines in investments

Empathy is a specific moral aspect of human behavior. The global workplace, and thereby a consideration of employee stakeholders, includes unique behavioral and ethical considerations, including a consideration of human empathy. Further, the human aspects of workplaces are within the domain of human resources and managerial oversight in business organizations. As such, human emotions and interactions are complicated by daily work related expectations, employee/employer interactions and work practices, and the outcomes of employees’ work routines. Business ethics, human resources, and risk management practices are endemic aspects within workplaces. Increasingly, the understanding of models of AI-reliant business practices underscores the need for the consideration of the ethical aspects of AI impacts on employees in the workplace. This paper explores a systematic ethical lens of the opportunities and the risks of AI ideation, development, and deployment in business-employee relations practices beyond a compliance mindset, and that introduces a further set of workplace considerations. Empathy is concerned with human intentions. As such, attributive ethical indications of the role of AI in the workplace and its impacts on employees is necessary. Moreover, this paper uses a cognitive lens of empathy and focuses on artificial morality related to the ethical concerns, implications, and practices of AI development, deployment, and workplace practices that may impact employees in a variety of business aspects.

Implementing empathy to healthcare chatbots is considered promising to create a sense of human warmth. However, existing research frequently overlooks the multidimensionality of empathy, leading to an insufficient understanding if artificial empathy is perceived similarly to interpersonal empathy. This paper argues that implementing experiential expressions of empathy may have unintended negative consequences as they might feel inauthentic. Instead, providing instrumental support could be more suitable for modeling artificial empathy as it aligns better with computer-like schemas towards chatbots. Two experimental studies using healthcare chatbots examine the effect of empathetic (feeling with), sympathetic (feeling for), and behavioral-empathetic (empathetic helping) vs. non-empathetic responses on perceived warmth, perceived authenticity, and their consequences on trust and using intentions. Results reveal that any kind of empathy (vs. no empathy) enhances perceived warmth resulting in higher trust and using intentions. As hypothesized, empathetic, and sympathetic responses reduce the chatbot's perceived authenticity suppressing this positive effect in both studies. A third study does not replicate this backfiring effect in human-human interactions. This research thus highlights that empathy does not equally apply to human-bot interactions. It further introduces the concept of ‘perceived authenticity’ and demonstrates that distinctively human attributes might backfire by feeling inauthentic in interactions with chatbots.

With the rapid development of artificial intelligence, there is an increasing number of industries relying on the accuracy and efficiency of deep learning algorithms. But due to the inexplicability and black box effect of deep neural networks, we can only obtain results without knowing the applied reasoning behind them. That engenders scepticism and resistance from some quarters of deep learning-based technologies. In the context of emotion analysis used in business and public opinion monitoring, it is sometimes difficult for decision-makers to trust the outcome without explanation from the supposedly emotionless machines. There are mathematical-based explanation methods, and they often generalise emotion analysis as a classification task. Still, emotion should be different from other task categories because the generation of emotion involves human-specific factors and logic. This paper proposes an emotion analysis explanation framework that is grounded in psychological theories focusing on the stimulus from classic emotion theories. This proposed framework emphasises considering the cause and trigger of emotions as the explanation for the deep learning-based emotion analysis, and it includes two main components: the extraction of the emotion cause and the visualisation of emotion-triggering words.

Artificial intelligence chatbots have invaded the tourism industry owing to their low cost and high efficiency. However, the influence of emotional expressions of chatbots on service outcomes has not received much attention from researchers. Drawing upon expectancy violations theory, we explored how emotional expressions of chatbots affect customer satisfaction using three experiments in the context of tourist attraction recommendations. Chatbots' expressions of concern for customers can improve customer satisfaction by reducing expectancy violations. In particular, customer's goal orientation, the human-likeness of chatbot's avatars, and the relationship type between customers and chatbots can moderate the negative relationship between emotional expression and expectancy violation. These findings advance research on the emotional expressions of chatbots and provide critical insights for deploying chatbots in customer service in the tourism industry.

This chapter presents a systematic review on the relationship between artificial intelligence and emotions in education in Latin America and the Caribbean. The PRISMA systematic review methodology was used to describe the state of the situation of research on this topic, taking into account theories, methodologies, countries, and educational levels. Fifteen published articles were finally selected, focusing on Brazil and Colombia, university level, students as unit of analysis, methodologies based on facial recognition, psychology and software combined. It is hoped to deepen the research in other disciplines, with other theories and methodologies.

This paper introduces a study employing artificial intelligence (AI) to utilize computer vision algorithms for detecting human emotions in video content during user interactions with diverse visual stimuli. The research aims to unveil the creation of software capable of emotion detection by leveraging AI algorithms and image processing pipelines to identify users' facial expressions. The process involves assessing users through images and facilitating the implementation of computer vision algorithms aligned with psychological theories defining emotions and their recognizable features. The study demonstrates the feasibility of emotion recognition through convolutional neural networks (CNN) and software development and training based on facial expressions. The results highlight successful emotion identification; however, precision improvement necessitates further training for contexts with more diverse images and additional algorithms to distinguish closely related emotional patterns. The discussion and conclusions emphasize the potential of A.I. and computer vision algorithms in emotion detection, providing insights into software development, ongoing training, and the evolving landscape of emotion recognition technology. Further training is necessary for contexts with more diverse images, alongside additional algorithms that can effectively distinguish between facial expressions depicting closely related emotional patterns, enhancing certainty and accuracy.

Since the 1950s, a significant number of clinical cases have confirmed the effectiveness of art in rehabilitation therapy and psychological interventions. With the advancement of artificial intelligence technology, AI painting software based on the Stable Diffusion algorithm model enables image creation through prompts and feedback. Therefore, whether AI painting software can positively impact human emotions becomes a critical factor for its application in art therapy. This study tracks and measures the emotional changes in patients before and after using the AI painting software Stable Diffusion WebUI using emotional vocabulary measurement methods. According to the experimental data of this project, artificial intelligence painting can leave a positive impression on human emotions. This result opens a new window for the integration of artificial intelligence with art therapy research. On one hand, it allows for the in-depth development of guided artificial intelligence painting software specifically designed as a dedicated tool for art therapy a form of AI software for artistic healing. On the other hand, it encourages further research into the effectiveness of traditional painting versus AI-assisted painting in art therapy, aiming to explore the underlying principles and mechanisms of art therapy.

INTRODUCTION: In recent years, there has been a convergence between Artificial Intelligence and neuroscience, particularly in studying the brain and developing treatments for neurological disorders. Artificial neural networks and deep learning provide valuable insights into neural processing and brain functioning. Recent research tries to explain how neural processes influence an individual's happiness. OBJECTIVES: To evaluate the interaction between neuroscience and happiness based on the advances in Artificial Intelligence. METHODS: A bibliometric analysis was performed with articles from the Scopus database in 2013-2023; likewise, the VOSviewer was used for information processing. RESULTS A total of 603 articles were obtained, and it is evident that the most significant scientific production is centered in the United States (184), United Kingdom (74), and China (73). Three clusters are generated from the Co-occurrence - Author Keywords analysis. The first cluster, red, is related to Artificial Intelligence applications for predicting happiness; the second cluster, green, is associated with Artificial Intelligence tools in neuroscience; and the third cluster, blue, is related to neuroscience in psychology. CONCLUSION: Neuroscience research has made significant leaps in understanding mental processes such as emotions and consciousness. Neuroscience has encountered happiness and is opening up to an approach that seeks evidence to understand people's well-being supported by Artificial Intelligence.

The pursuit of biologically inspired cognitive architectures (BICA) has driven significant advancements in artificial intelligence (AI) and artificial general intelligence (AGI). However, most existing BICA models lack a critical aspect of human intelligence: emotions and feelings. This research explores the development and implementation of an emotion-integrated cognitive architecture that mimics human emotional processing within a computational framework. Our proposed architecture, Emotion-Integrated Cognitive Architecture (EICA), is inspired by the latest findings in cognitive psychology, neurobiology, neuroscience and affective computing. EICA aims to integrate emotional processing into the core of the AI system, enabling robust, flexible, and adaptable AI agents that can respond to complex and dynamic environments with human-like emotional intelligence. The EICA model leverages advances in brain imaging and recording techniques to draw insights from the neural basis of emotions in humans. The architecture incorporates emotion-generating, recognition, and regulation mechanisms, allowing AI agents to perceive, interpret, and respond to emotions in themselves and others. We present the concept of EICA, including its modular structure and interaction with other cognitive components. We also provide case studies showcasing EICA's successful implementation in various AI applications, such as virtual assistants and adaptive robotics. This research represents a significant step towards achieving the BICA Challenge by advancing the computational replication of human emotional intelligence. By integrating emotions and feelings into AI systems, we move closer to realizing the full potential of bi-directional understanding between artificial and biological intelligences.

Network news is an important way for netizens to get social information. Massive news information hinders netizens to get key information. Named entity recognition technology under artificial background can realize the classification of place, date and other information in text information. This article combines named entity recognition and deep learning technology. Specifically, the proposed method introduces an automatic annotation approach for Chinese entity triggers and a Named Entity Recognition (NER) model that can achieve high accuracy with a small number of training data sets. The method jointly trains sentence and trigger vectors through a trigger-matching network, utilizing the trigger vectors as attention queries for subsequent sequence annotation models. Furthermore, the proposed method employs entity labels to effectively recognize neologisms in web news, enabling the customization of the set of sensitive words and the number of words within the set to be detected, as well as extending the web news word sentiment lexicon for sentiment observation. Experimental results demonstrate that the proposed model outperforms the traditional BiLSTM-CRF model, achieving superior performance with only a 20% proportional training data set compared to the 40% proportional training data set required by the conventional model. Moreover, the loss function curve shows that my model exhibits better accuracy and faster convergence speed than the compared model. Finally, my model achieves an average accuracy rate of 97.88% in sentiment viewpoint detection.

This paper firstly researches English text emotion expression and information communication, classifies English text emotion expression and information communication according to the human emotion-value relationship, and summarizes the characteristics of English emotion expression and information communication. Secondly, using artificial intelligence technology, it is proposed to construct an analysis model for English text emotion and information communication using the BiLSTM neural network. To deal with the characteristics of English text quickly and efficiently, it is necessary to encode the emotional information of English text, and based on encoding, the BiLSTM neural network is applied to extract the emotional features of English text and solve the problem of the loss of emotional features through the loss function. Then, the crawler tool is used to obtain the dataset from the Chinese English module under the MOOC of Chinese universities, and the evaluation indexes are set according to the model’s performance, followed by the experimental analysis of the English text emotion expression and information conveyance. The results show that compared with the original CNN, LSTM, and T-LSTM, the BiLSTM-based neural network performs better in the task of text emotion expression and information conveyance, with the accuracy rate staying above 0.925, and the effect on the English dataset is a bit better than that on the Chinese dataset. This study aims to enhance English teaching and communication between Chinese and foreign cultures.

Multimodal Emotion Recognition in Conversations (ERC) aims to identify the emotions conveyed by each utterance in a conversational video. Current efforts encounter challenges in balancing intra- and inter-speaker context dependencies when tackling intra-modal interactions. This balance is vital as it encompasses modeling self-dependency (emotional inertia) where speakers' own emotions affect them and modeling interpersonal dependencies (empathy) where counterparts' emotions influence a speaker. Furthermore, challenges arise in addressing cross-modal interactions that involve content with conflicting emotions across different modalities. To address this issue, we introduce an adaptive interactive graph network (IGN) called AdaIGN that employs the Gumbel Softmax trick to adaptively select nodes and edges, enhancing intra- and cross-modal interactions. Unlike undirected graphs, we use a directed IGN to prevent future utterances from impacting the current one. Next, we propose Node- and Edge-level Selection Policies (NESP) to guide node and edge selection, along with a Graph-Level Selection Policy (GSP) to integrate the utterance representation from original IGN and NESP-enhanced IGN. Moreover, we design a task-specific loss function that prioritizes text modality and intra-speaker context selection. To reduce computational complexity, we use pre-defined pseudo labels through self-supervised methods to mask unnecessary utterance nodes for selection. Experimental results show that AdaIGN outperforms state-of-the-art methods on two popular datasets. Our code will be available at https://github.com/TuGengs/AdaIGN.

Segmentation of tumors in ultrasound (US) images of the breast is a critical issue in medical imaging. Due to the poor quality of US images and the varying specifications of US machines, segmentation and classification of abnormalities present difficulties even for trained radiologists. The paper aims to introduce a novel AI-based hybrid model for US segmentation that offers high accuracy, requires relatively smaller datasets, and is capable of handling previously unseen data. The software can be used for diagnostics and the US-guided biopsies. A unique and robust hybrid approach that combines deep learning (DL) and multi-agent artificial life (AL) has been introduced. The algorithms are verified on three US datasets. The method outperforms 14 selected state-of-the-art algorithms applied to US images characterized by complex geometry and high level of noise. The paper offers an original classification of the images and tests to analyze the limits of the DL. The model has been trained and verified on 1264 ultrasound images. The images are in the JPEG and PNG formats. The age of the patients ranges from 22 to 73 years. The 14 benchmark algorithms include deformable shapes, edge linking, superpixels, machine learning, and DL methods. The tests use eight-region shape- and contour-based evaluation metrics. The proposed method (DL-AL) produces excellent results in terms of the dice coefficient (region) and the relative Hausdorff distance H3 (contour-based) as follows: the easiest image complexity level, Dice = 0.96 and H3 = 0.26; the medium complexity level, Dice = 0.91 and H3 = 0.82; and the hardest complexity level, Dice = 0.90 and H3 = 0.84. All other metrics follow the same pattern. The DL-AL outperforms the second best (Unet-based) method by 10–20%. The method has been also tested by a series of unconventional tests. The model was trained on low complexity images and applied to the entire set of images. These results are summarized below. (1) Only the low complexity images have been used for training (68% unknown images): Dice = 0.80 and H3 = 2.01. (2) The low and the medium complexity images have been used for training (51% unknown images): Dice = 0.86 and H3 = 1.32. (3) The low, medium, and hard complexity images have been used for training (35% unknown images): Dice = 0.92 and H3 = 0.76. These tests show a significant advantage of DL-AL over 30%

Artificial intelligence (AI) has emerged as a transformative force in various sectors, including medicine and healthcare. Large language models like ChatGPT showcase AI’s potential by generating human-like text through prompts. ChatGPT’s adaptability holds promise for reshaping medical practices, improving patient care, and enhancing interactions among healthcare professionals, patients, and data. In pandemic management, ChatGPT rapidly disseminates vital information. It serves as a virtual assistant in surgical consultations, aids dental practices, simplifies medical education, and aids in disease diagnosis. A total of 82 papers were categorised into eight major areas, which are G1: treatment and medicine, G2: buildings and equipment, G3: parts of the human body and areas of the disease, G4: patients, G5: citizens, G6: cellular imaging, radiology, pulse and medical images, G7: doctors and nurses, and G8: tools, devices and administration. Balancing AI’s role with human judgment remains a challenge. A systematic literature review using the PRISMA approach explored AI’s transformative potential in healthcare, highlighting ChatGPT’s versatile applications, limitations, motivation, and challenges. In conclusion, ChatGPT’s diverse medical applications demonstrate its potential for innovation, serving as a valuable resource for students, academics, and researchers in healthcare. Additionally, this study serves as a guide, assisting students, academics, and researchers in the field of medicine and healthcare alike.

Artificial neural networks have emerged as computationally plausible models of human language processing. A major criticism of these models is that the amount of training data they receive far exceeds that of humans during language learning. Here, we use two complementary approaches to ask how the models’ ability to capture human fMRI responses to sentences is affected by the amount of training data. First, we evaluate GPT-2 models trained on 1 million, 10 million, 100 million, or 1 billion words against an fMRI benchmark. We consider the 100-million-word model to be developmentally plausible in terms of the amount of training data given that this amount is similar to what children are estimated to be exposed to during the first 10 years of life. Second, we test the performance of a GPT-2 model trained on a 9-billion-token dataset to reach state-of-the-art next-word prediction performance on the human benchmark at different stages during training. Across both approaches, we find that (i) the models trained on a developmentally plausible amount of data already achieve near-maximal performance in capturing fMRI responses to sentences. Further, (ii) lower perplexity—a measure of next-word prediction performance—is associated with stronger alignment with human data, suggesting that models that have received enough training to achieve sufficiently high next-word prediction performance also acquire representations of sentences that are predictive of human fMRI responses. In tandem, these findings establish that although some training is necessary for the models’ predictive ability, a developmentally realistic amount of training (~100 million words) may suffice.

This study examines the ethical challenges and regulatory dynamics of Artificial Intelligence (AI) in relation to data integrity and its influence on social dynamics. Employing a cross-sectional survey approach, primary data was collected from 650 AI practitioners across various sectors, encompassing developers, data scientists, ethicists, and policymakers. The study investigated the correlations between regulatory compliance, ethical awareness, professional training, and experience in AI practice with the effectiveness of AI implementation and data integrity. The findings revealed a strong positive correlation between higher levels of regulatory compliance and perceived effectiveness in AI implementation, as well as between AI ethics awareness and data integrity assurance. Moreover, a significant relationship was observed between professional training in AI and its positive impact on social dynamics. However, experience in the AI field, while positively correlated, showed a weaker link to data integrity, indicating that experience alone is insufficient for ensuring effective AI practices. The study highlights the importance of ethical considerations, regulatory frameworks, and professional training in shaping AI development and its societal implications. The need for dynamic, adaptable, and inclusive regulatory frameworks that can align AI practices with societal values and ethical norms is emphasized. Future research directions include exploring AI ethics and regulation in diverse cultural contexts and the impact of emerging technologies like quantum computing on AI ethics.

Advances in artificial intelligence (AI) create an increasing similarity between the performance of AI systems or AI-based robots and human communication. They raise the questions:  
1. whether it is possible to communicate with, understand, and even empathically perceive artificial agents;  
2. whether we should ascribe actual subjectivity and thus quasi-personal status to them beyond a certain level of simulation;  
3. what will be the impact of an increasing dissolution of the distinction between simulated and real encounters.  
(1) To answer these questions, the paper argues that the precondition for actually understanding others consists in the implicit assumption of the subjectivity of our counterpart, which makes shared feelings and a we-intentionality possible. This assumption is ultimately based on the presupposition of a shared form of life, conceived here as �conviviality.�  
(2) The possibility that future artificial agents could meet these preconditions is refuted on the basis of embodied and enactive cognition, which links subjectivity and consciousness to the aliveness of an organism.  
(3) Even if subjectivity is in principle impossible for artificial agents, the distinction between simulated and real subjectivity might nevertheless become increasingly blurred. Here, possible consequences are discussed, especially using the example of virtual psychotherapy. Finally, the paper makes case for a mindful appproach to the language we use to talk about artificial systems and pleads for preventing a systematic pretense of subjectivity.

This paper navigates artificial intelligences recent advancements and increasing media attention. A notable focus is placed on Eliezer Yudkowsky, a leading figure within the domain of artificial intelligence alignment, who aims to bridge the understanding gap between public perceptions and rationalist viewpoints on artificial intelligence technology. This focus analyzes his predicted course of action for artificial intelligence outlined within his unpublished paper AGI Ruin: A List of Lethalities. This is achieved by attempting to understand the concept of intelligence itself and identifying a reasonable working definition of that concept. The concept of intelligence is then applied to contemporary artificial intelligence capabilities and developments to understand its applicability to the technologies. This paper finds contemporary artificial intelligence systems are, to some extent, intelligent. However, it argues that both weak and strong artificial intelligence systems, devoid of human-defined goals, would not inherently pose existential threats to humanity, challenging the notions of artificial intelligence alignment, bringing into question the validity of Nick Bostroms Orthogonality Thesis. Furthermore, the possibility of artificial life created through the method of assembling various modules each emulating a separate mind function is discussed.

The impressive capabilities of living organisms arise from the way autonomy is materialized by their bodies. Across scales, living beings couple computational or cognitive intelligence with physical intelligence through body morphology, material multifunctionality, and mechanical compliance. While soft robotics has advanced the design and fabrication of physically intelligent bodies, the integration of information-processing capabilities for computational intelligence remains a challenge. Consequently, perception and control limitations have constrained how soft robots are built today. Progress toward untethered autonomy will require deliberate convergence in how the field codevelops new materials, fabrication methods, and control strategies for soft robots. Here, a new perspective is put forward: that researchers should use tasks alone to impose material and information constraints on soft robot design. A conceptual framework is proposed for a task-first design paradigm that sidesteps limitations imposed by control strategies. This framework allows emergent synergies between material and information processing properties of soft matter to be readily exploited for task-capable agents. Particular attention is paid to the scale dependence of solutions. Finally, an outlook is presented on emerging research opportunities for achieving autonomy in future soft robots as large as elephant trunks and as small as paramecia.

In this paper, Self-Reproduction characteristic of Artificial Life is introduced to computer animation. A Self-Reproduction model of Artificial Fish based on gene control is put forward and built. Based on Artificial Fish's phenotype, the contents of its chromosome are given. Based on this model, heredity rules are given. Artificial Fish could reproduce and grow in the virtual marine environment freely controlled by the gene model and rules. Artificial behaviors include predefined behaviors and nondeterminate behaviors. Cognitive models based on Artificial Intelligence is put forward and built to control behaviors of artificial fish in high level. Simulation program is designed and developed based on all these models built above. These made groundwork to improve the efficiency and automatic level of artificial fish animation.

In this paper, the concepts of "Life", "Artificial Life" and "Generalized Artificial Life" and the problem "Is Artificial Life true Life?" are discussed.

This work reports an experience in using an Artificial Life competitive game that simulates an artificial life environment for unstructured and informal Artificial Intelligence (AI) teaching to students from computer science engineering careers. The game consists of a simulated Petri dish where two colonies of microorganisms-software agents-must struggle to survive. To achieve this goal, the participants must implement surviving strategies for their agents, which include fighting strategies and basic reproduction rules to prevail over all the artificial environment. The technical bases of the contest as well as a description of the artificial life model are explained in detail. The pedagogical experience acquired in the contest development is discussed, as well as the resulting learning experience, which generated students enthusiasm and has helped them to develop mental models of possible AI algorithms.

﻿Fuzzy logic emerges as a powerful tool for optimizing power flow solutions, particularly in the context of deregulated power systems. By employing fuzzy logic controls, the ideal placement of distribution generators (DGs) can be determined, ensuring the reliability indices are identified through optimal power flow solutions and fuzzy logic controllers to maintain system feasibility. In a deregulated power system, strategic placement of distribution generator units plays a crucial role in minimizing power loss and enhancing overall system performance by mitigating fluctuations. To identify areas of weakness, especially within transmission companies, accessing optimal power flow algorithms becomes essential in a deregulated power system. Both transmission and distribution networks should be appropriately adjusted to alleviate congestion within the respective companies. The aggregator must assess system performance, utilizing data obtained from distribution and transmission companies within the deregulated power system.

﻿In this article, the causes of technological disturbances in electrical systems are considered, and several characteristic disadvantages of the protection and automation of elements of electrical systems are highlighted. The tendency to decrease the reliability of relay protection associated with the transition from analog to digital types of protection is substantiated. Based on the studied examples, the use of fuzzy logic in protections, the expediency of using fuzzy logic elements in protection devices, and the automation of electrical systems to identify types of short circuits are justified. This article analyzes the most common damages and presents the results of modeling an electrical system with transformer coupling, where all types of asymmetric short circuits were initiated. The dynamics of changes in the symmetrical components of short-circuit currents of the forward, reverse, and zero sequences are determined. Rules have been created for the identification of asymmetric types of short circuits. An algorithm of protection and automation operation using fuzzy logic elements has been developed. The proposed algorithm of protection and automation will reduce the time to determine the type of damage and trigger protections.

﻿Fuzzy logic-based quantification of usability expectation for an m-commerce mobile application is a process of measuring the usability of a mobile application by using fuzzy logic principles. The usability of any mobile application is used to find out the user experience of the mobile application by analyzing the user's expectations and preferences. Fuzzy logic always be the optimal choice for quantification. Fuzzy logic-based quantification of usability expectation assesses the user experience of an m-commerce mobile application by taking into account the user's needs, preferences, and expectations. Usability expectation also takes into account the ability of the user to understand and interact with the application, the degree to which the application meets the user's expectations, and the overall satisfaction with the application. This process helps to identify areas of improvement, enabling the developers to make necessary changes for a better user experience. This study presents to design of a usability metric framework and then quantifies the overall usability quality of an m-commerce mobile application with the help of fuzzy logic. The proposed usability metric framework is based on the Goal-Question-Metric (GQM) approach and is intended to provide a comprehensive and systematic approach to design metrics to assess the qualitative aspect of mobile phone applications. The framework has been developed and tested in an m-commerce context and provides a set of measurable criteria to quantify m-commerce mobile applications as per standard. The results of the evaluation can then be used to improve m-commerce mobile applications and to ensure that the user experience is optimized

﻿The performance of photovoltaic (PV) affected directly by climatic changes, The controller maintain maximum potential energy conversation to operate the pimping system at nominal conditions, fuzzy logic intelligent controllers are successfully suitable and applicable in engineering and applied science. The aim of this paper is present an experimental approach in Implementation of fuzzy logic maximum power point tracking (MPPT) with boost converter based on Arduino Mega micro-controller to maximize energy production in different weather condition applied to small scale pumping system for water and chemical fluid analyses in isolated area. The system is supplied by 20 (W) solar photovoltaic (PV) panel. This paper present a real-time MATLAB/Simulink fuzzy logic method controlling and monitoring MPPT application using an low cost Arduino Mega micro-controller combined with (LV25, LP55) sensors controlling boost converter interconnected with solar panel and plastic pump.

﻿This article employs a fuzzy logic controller (FLC) to investigate voltage stability in a PV-based DC microgrid. Several photovoltaic (PV) modules, a DC-DC converter, and loads make up the microgrid. Due to the widespread use of intermittent PV power, voltage stability is a crucial problem for DC microgrids and is difficult to accomplish. This study proposes an FLC-based voltage control technique that leverages input factors including PV output power, DC-DC converter duty cycle, and load current to identify the best course of action for preserving the system's voltage stability. The FLC's performance is assessed by simulation, and it is meant to be resilient to parameter fluctuations and uncertainties. The simulation results demonstrate that the suggested FLC-based control strategy successfully maintains the microgrid's voltage stability under a variety of operational circumstances, including changing solar irradiance and load variations. Moreover, the FLC performs better than other control methods.

﻿This article delves into the intricacies of adaptive fuzzy event-triggered formation tracking control for nonholonomic multirobot systems characterized by infinite actuator faults and range constraints. To address these issues, we leverage the power of fuzzy logic systems (FLSs) and employ adaptive methods to approximate unknown nonlinear functions and uncertain parameters present in robotic dynamics. In the course of information exploration, the problems of collision avoidance and connectivity maintenance are ever present due to limitations of distance and visual fields. In this regard, we introduce a general barrier function and prescribed performance methodology to tackle constrained range impediments effectively. Furthermore, to reduce the number of controller executions and compensate for any effect arising from infinite actuator failures, robots engage with their leader at the moment of actuator faults using fewer network communication resources yet maintain uninterrupted tracking of the desired trajectory generated by the leader. With the aid of the dynamic surface technology, we propose a decentralized adaptive event-triggering fault-tolerant (ETFT) formation control strategy. We guarantee that all signals are semi-global uniformly ultimately bounded (SGUUB). Ultimately, we demonstrate the practical feasibility of the ETFT control strategy for nonholonomic multirobot systems.

﻿Fuzzy inference systems (FISs) have been developed for many years but the use of FISs for high-dimensional problems is still a challenging task. The most frequently used T-norms for computing the firing strengths are product and minimum operators of which the former is often preferred because of its differentiability. However, for high-dimensional problems, the product T-norm suffers from the numeric underflow problem. Here, we primarily focus on addressing the problem that is associated with the use of the T-norms for designing high-dimensional FISs (HDFISs). For the product T-norm, we construct an HDFIS named HDFIS-prod, which easily escapes from the numeric underflow problem. The main novelty is that we propose an adaptive dimension-dependent membership function (DMF). For the minimum T-norm, an empirical observation led us to develop a mechanism that has the natural ability to deal with super high-dimensional problems, which results in another HDFIS named HDFIS-min. Both HDFIS-prod and HDFIS-min are tested on 18 datasets with feature dimensions varying from 1024 to 120450. The simulation results demonstrate that both of them have competitive performance on handling high-dimensional datasets.

﻿This article examines a solution to the major problems of induction machine control in order to achieve superior dynamic performance. Conventional direct torque control and indirect control with flux orientation have some drawbacks, such as current harmonics, torque ripples, flux ripples, and rise time. In this article, we propose a comparative analysis between previous approaches and the one using fuzzy logic. Results from the simulation show that the direct torque control method using fuzzy logic is more effective in providing a precise and fast response without overshooting, and it eliminates torque and flux fluctuations at low switching frequencies. The demonstrated improvements in dynamic performance contribute to increased operational efficiency and reliability in industrial applications.

﻿The main idea of this paper is the substantiation of the methodological approach to the assessment of personnel risks of enterprises based on the application of the fuzzy logic apparatus in order to identify the problems of personnel risk management and provide appropriate recommendations for their solution. The methodological basis of the study is the classic provisions and fundamental works of foreign and domestic scientists, statistical data, the results of our research into the problems of assessing personnel risks of enterprises. The methods of fuzzy set theory, comparative analysis, scientific abstraction, generalization of scientific experience of modern theoretical research, systemcomplex approach were used. The study proposed a methodological approach to assessing the level of personnel risks of an enterprise; numerical experiments were conducted on the basis of a group of construction equipment manufacturers. Analysis of the results of assessing the level of personnel risks of enterprises made it possible to identify the problems of managing personnel risks at enterprises Statement of a mathematical problem: the work considers hierarchical fuzzy data, namely: four groups of indicators for assessing the level of personnel risks (quantitative composition – F1, state of qualifications and intellectual potential – F2, staff turnover – F3, motivational system – F4), each of the indicators has a different number of fuzzy coefficients (there are twelve of them in the current work – vi , i=1÷12). Indicators are functions of fuzzy coefficients: F1 = r(v1, v2, v3); F2 = g(v4,v5, v6, v7); F3 = h(v8, v9, v10,); F4=q(v11, v12). As an output variable, there is a functional – an integrated indicator Int = f(F1, F2, F3, F4) of the personnel risk level, which, in turn, is also a fuzzy value. Here, the functions r, g, h, q, f are unknown functions of the given variables. We have expert evaluations of the change in all input data; as a rule, they vary within three terms: Low (I), Medium (G), High (E). Formalized information on each variable can be written as , then for a group of indicators we have: . Using a fuzzy system and performing calculations with its help requires the system to have the following structural elements: membership functions of input and output variables, a rule base, and an output mechanism. These structural elements are the components that will be built when designing a fuzzy system. The built mathematical model and the method of its formalization on the basis of FST make it possible to estimate the level of personnel risk at the enterprise, which enables further substantiation of a set of measures to increase the efficiency of its use. The constructed system of fuzzy logical inference can be considered intelligent as it uses elements of computational intelligence, in particular, the theory of fuzzy sets. The proposed methodological approach to assessing the level of personnel risks of enterprises based on the apparatus of fuzzy logic allows, in contrast to existing ones, to integrate the consideration of both qualitative and quantitative indicators when assessing the level of personnel risks and personnel movement indicators and to significantly increase the efficiency of decision-making under conditions of uncertainty and reduce costs in the event of adverse situations.

﻿Real-acting objects are characterized by the presence of various types of random perturbations, which significantly reduce the quality of the control process, which determines the use of modern methods of intellectual technology to solve the problem of synthesis of control systems of structurally complex dynamic objects, allowing to compensate the influence of external factors with the properties of randomness and partial uncertainty. The article considers issues of synthesis of the automatic control system of dynamic objects by applying the theory of intelligent control. In this case, a neural network based on radial-basis functions is used at each discrete interval for neuro-fuzzy approximation of the control system, allowing real-time adjustment of the regulator parameters. The radial basis function is designed to approximate functions defined in the implicit form of pattern sets. The neuro-fuzzy regulator's parameter configuration is accomplished using a genetic algorithm, enabling more efficient computation to determine the regulator's set parameters. The regulator's parameters are represented as a vector, facilitating their application to multidimensional objects. To determine the optimal tuning parameters of the neuro-fuzzy regulator, characterized by high convergence and the possibility of determining global extrema, a genetic algorithm was used. The effectiveness of the neuro-fuzzy regulator is explained by the possibility of providing quality control of the dynamic object under random perturbations and uncertainty of input data.

Easy internet access and technological advancements have resulted in information overload and a plethora of options, making decision-making extremely difficult. Recommender System (RS) is a potential solution for assisting users in making decisions by recommending or predicting product ratings. Three fundamental forms of RS that use implicit or explicit feedback for recommendation are collaborative, content-based, and hybrid filtering. Ratings are the most common form of feedback, but product descriptions, reviews, images, audios, and videos are also important and can help improve the performance of the traditional RS. These additional variables can have a significant impact on RS’s performance. Traditional RSs used approaches based on the nearest neighbor or other machine learning models, but thanks to recent advances in artificial intelligence and deep learning, RSs are now being developed using Convolutional Neural Networks (CNN), which can efficiently exploit auxiliary information. In addition to comparing CNN-based RSs on common grounds, this article provides a full examination of CNN-based RSs and how they might use various types of auxiliary information. The study also discusses data characteristics, data statistics, and auxiliary information in a variety of publicly available datasets. Different evaluation measures for RSs are also discussed, and readers are provided with interesting challenges and open research issues.

In recent years, with the continuous progress and development of science and technology, especially the continuous development of artificial intelligence, machine algorithm and other technologies, the education system has also begun to carry out more personalized content from traditional functions. Traditional education systems often adopt a one-size-fits-all approach to teaching that does not take into account the unique needs and learning styles of each student. An education system personalized and optimized by machine learning algorithms can provide customized learning materials and recommendations based on each student's learning history, interests and abilities to improve learning outcomes, and machine learning algorithms can provide real-time feedback on student performance and adjust learning plans based on feedback. This makes the learning process more dynamic and personalized. It can therefore be applied to all types of education, including language learning, mathematics, science, etc. However, improving the efficiency of machine learning algorithms depends more on the improvement of numerical optimization algorithms, so it is necessary to summarize the optimization algorithms in large-scale machine learning. This paper tries to make a detailed overview of the existing machine learning algorithms in optimizing personalized education recommendation system, and introduces the algorithm optimization process.

This paper presents a comprehensive literature review of the research and application of machine learning (ML) algorithms in recommender systems (RS). The study aims to identify recent trends, explore real-life applications, and guide researchers in positioning their research activities in this domain published in 2023 (Jan-June). The findings are categorized into different domains including education, healthcare, ML algorithms (auto-encoders and reinforcement learning), e-commerce, and digital journalism. The review highlights the enhanced recommendation accuracy, increased scalability, personalization and context awareness, diverse ML techniques, and strategies for handling cold start and data sparsity, and the foundation for future advancements in ML algorithms for RSs considering the application in manufacturing enterprises.

Smart cities represent the convergence of information and communication technologies (ICT) with urban management to improve the quality of life of city dwellers. In this context, recommender systems, tools that offer personalised suggestions to city dwellers, have emerged as key contributors to this convergence. Their successful application in various areas of city life and their ability to process massive amounts of data generated in urban environments has expedited their status as a crucial technology in the evolution of city planning. Our methodology included reviewing the Web of Science database, resulting in 130 articles that, filtered for relevancy, were reduced to 86. The first stage consisted of carrying out a bibliometric analysis with the objective of analysing structural aspects with the SciMAT tool. Secondly, a systematic literature review was undertaken using the PRISMA 2020 statement. The results illustrated the different processes by which recommendations are filtered in areas such as tourism, health, mobility, and transport. This research is seen as a significant breakthrough that can drive the evolution and efficiency of smart cities, establishing a solid framework for future research in this dynamic field.

Internet of Things (IoT) based remote healthcare applications provide fast and preventative medical services to the patients at risk. However, predicting heart disease is a complex task and diagnosis results are rarely accurate. To address this issue, a novel Recommendation System for Cardiovascular Disease Prediction Using IoT Network (DEEP-CARDIO) has been proposed for providing prior diagnosis, treatment, and dietary recommendations for cardiac diseases. Initially, the physiological data are collected from the patient’s remotely by using the four bio sensors such as ECG sensor, Pressure sensor, Pulse sensor and Glucose sensor. An Arduino controller receives the collected data from the IoT sensors to predict and diagnose the disease. A cardiovascular disease prediction model is implemented by using BiGRU (Bidirectional-Gated Recurrent Unit) attention model which diagnose the cardiovascular disease and classify into five available cardiovascular classes. The recommendation system provides physical and dietary recommendations to cardiac patients based on the classified data, via user mobile application. The performance of the DEEP-CARDIO is validated by Cloud Simulator (CloudSim) using the real-time Framingham’s and Statlog heart disease dataset. The proposed DEEP CARDIO method achieves an overall accuracy of 99.90% whereas, the MABC-SVM, HCBDA and MLbPM method achieves 86.91%, 88.65% and 93.63% respectively.

The latest effort in delivering computing resources as a service to managers and consumers represents a shift away from computing as a product that is purchased, to computing as a service that is delivered to users over the internet from large-scale data centers. However, with the advent of the cloud-based IoT and artificial intelligence (AI), which are advancing customer experience automations in many application areas, such as recommender systems (RS), a need has arisen for various modifications to support the IoT devices that are at the center of the automation world, including recent language models like ChatGPT and Bard and technologies like nanotechnology. This paper introduces the marketing community to a recent computing development: IoT-driven fog computing (FC). Although numerous research studies have been published on FC “smart” applications, none hitherto have been conducted on fog-based smart marketing domains such as recommender systems. FC is considered a novel computational system, which can mitigate latency and improve bandwidth utilization for autonomous consumer behavior applications requiring real-time data-driven decision making. This paper provides a conceptual framework for studying the effects of fog computing on consumer behavior, with the goal of stimulating future research by using, as an example, the intersection of FC and RS. Indeed, our conceptualization of the “fog-based recommender systems” opens many novel and challenging avenues for academic research, some of which are highlighted in the later part of this paper.  
Keywords: fog computing; recommender system; internet of things (IoT); edge computing; artificial intelligence (AI); software defined networks (SDNs)  
ormation as well as personal and situational data [66].

Purpose: The general purpose of the study was to investigate the effectiveness of recommender systems in knowledge discovery. Methodology: The study adopted a desktop research methodology. Desk research refers to secondary data or that which can be collected without fieldwork. Desk research is basically involved in collecting data from existing resources hence it is often considered a low cost technique as compared to field research, as the main cost is involved in executive’s time, telephone charges and directories. Thus, the study relied on already published studies, reports and statistics. This secondary data was easily accessed through the online journals and library. Findings: The findings reveal that there exists a contextual and methodological gap relating to recommender systems in knowledge discovery. The study on the effectiveness of recommender systems in knowledge discovery found that such systems played a pivotal role in facilitating users' exploration of vast information repositories, enabling them to uncover relevant resources and expand their knowledge. It found that recommender systems employing advanced algorithms and personalized techniques demonstrated higher effectiveness in generating relevant recommendations tailored to users' preferences and needs. Additionally, the study highlighted the positive correlation between user engagement metrics and knowledge discovery outcomes, emphasizing the importance of fostering active user participation in the recommendation process. Contextual information was also identified as a crucial factor influencing recommendation effectiveness. Overall, the study underscored the significance of continuous refinement and optimization of recommender system algorithms to enhance knowledge discovery outcomes for users. Unique Contribution to Theory, Practice and Policy: The Social Learning theory, Information Foraging theory and Cognitive Load theory may be used to anchor future studies on recommender systems in knowledge discovery. The study provided recommendations to enhance the efficacy of such systems. It suggested adopting hybrid recommender systems that combine collaborative and content-based filtering techniques to offer more accurate and diverse recommendations. Additionally, the study emphasized the importance of integrating contextual information into recommendation algorithms to dynamically adjust recommendations based on situational context. Furthermore, it recommended the use of explainable AI techniques to improve transparency and user understanding of recommendation processes. Maximizing user engagement through active participation and feedback was also highlighted as crucial, along with prioritizing recommendation diversity to foster exploration and serendipitous discovery of new knowledge resources.

The application of Artificial Intelligence (AI) is significantly increasing in many Human Resources (HR) functions. This research aims to understand how diverse experts from distinct organisations, such as Project Managers, Managers, Supervisors and Human Resource Managers, perceive the potential of artificial intelligence-based recommender systems to match job profiles with employee profiles. This study employs a Delphi study-based methodology specifically, organising an expert panel that provides their opinions through their ratings and comments of a set of propositions. Based on the online Delphi study results and participant opinions, this research aims to identify the challenges related to employee-job profile matching through artificial intelligence and machine learning tools in the form of recommender systems. In this study, we have delved into the various challenges of matching employee profiles to job profiles and the current problems faced by executives, human resource personnel or supervisors such as project managers in an organisation. The study also sheds light on the potential or feasibility solutions of artificial intelligence in the form of recommender systems where we also test a couple of propositions that focus on potential solutions and various challenges for matching employee profiles to job profiles in an organisation.

Facial Expression Recognition (FER) is utilized in various fields, such as education, gaming, robotics, healthcare, and others. Facial expression techniques, for instance, an interactive robot with Artificial Intelligence, recognize human faces, detect the emotions of the person it is conversing with, and then use these emotions to choose appropriate answers. One use case for face emotion detection is playing music based on the user’s mood. To do this, we can analyze the user’s facial expression to deduce their feelings. As a result, new emotion models require more investigation as existing one’s struggle to correctly measure music’s connection with facial emotion. In this paper, we implement this kind of job using Convolution Neural Network (CNN) based deep learning approach. Deep learning can more effectively analyze unstructured data, movies, and other forms of media than machine learning. In our research, we have created a real-time system that can recognize human faces, assess human emotions, and even recommend music to users. The OAHEGA and FER-2013 datasets were utilized for experimental study. We created and trained two emotion recognition models using various combinations of these datasets. The proposed model’s accuracy is 73.02%. Using our CNN model, we can predict six emotions: anger, fear, joy, neutral, sadness, and surprise. The proposed system can be utilized in different places where real-time facial recognition plays an important role.

Given the challenges of inter-domain information fusion and data sparsity in collaborative filtering algorithms, this paper proposes a cross-domain information fusion matrix decomposition algorithm to enhance the accuracy of personalized recommendations in artificial intelligence recommendation systems. The study begins by collecting Douban movie rating data and social network information. To ensure data integrity, Levenshtein distance detection is employed to remove duplicate scores, while natural language processing technology is utilized to extract keywords and topic information from social texts. Additionally, graph convolutional networks are utilized to convert user relationships into feature vectors, and a unique thermal coding method is used to convert discrete user and movie information into binary matrices. To prevent overfitting, the Ridge regularization method is introduced to gradually optimize potential feature vectors. Weighted average and feature connection techniques are then applied to integrate features from different fields. Moreover, the paper combines the item-based collaborative filtering algorithm with merged user characteristics to generate personalized recommendation lists. In the experimental stage, the paper conducts cross-domain information fusion optimization on four mainstream mathematical matrix decomposition algorithms: alternating least squares method, non-negative matrix decomposition, singular value decomposition, and latent factor model (LFM). It compares these algorithms with the non-fused approach. The results indicate a significant improvement in score accuracy, with mean absolute error and root mean squared error reduced by 12.8% and 13.2% respectively across the four algorithms. Additionally, when k = 10, the average F1 score reaches 0.97, and the ranking accuracy coverage of the LFM algorithm increases by 54.2%. Overall, the mathematical matrix decomposition algorithm combined with cross-domain information fusion demonstrates clear advantages in accuracy, prediction performance, recommendation diversity, and ranking quality, and improves the accuracy and diversity of the recommendation system. By effectively addressing collaborative filtering challenges through the integration of diverse techniques, it significantly surpasses traditional models in recommendation accuracy and variety.

Video games have been in the focus of the research and academic community for the last few years, with the study and experimentation of Artificial General Intelligence (AGI) standing out. AGI experimentation platforms allow to analyze and study, in a visual way, the behavior of different AI agents previously defined. In this work a novel game engine, called GAGI, capable of serving as an AGI experimentation platform is presented. As a game engine, GAGI is able to design and create novel 2D and 3D video games using C++ programming language. Moreover, GAGI provides the user with a unique environment for simulating and studying AI agents inside the created game. Users can deploy multiple AI agents while interacting with them in real time, improving the understanding of their interactions and behaviors. The features of the proposed software is compared against others widely-used game engines in the video games industry as well as in the research community, highlighting the advantages in terms of design capability and AI support. GAGI also offers the possibility to reproduce the experiments, opening up multiple possibilities for the research community.

Monte Carlo Tree Search (MCTS) is a pronounced empirical search algorithm for agent decision-making, especially when enhanced by Deep Learning (DL), in mastering board games that were once thought to be unconquerable. However, it does not appear to be as equally successful in the domain of real-time video games, where the simulation time limit for exploration is a crucial factor, since they are generally designed to be played by human users and hence require a significant amount of resources for simulation. We in this paper propose a surrogate-assisted MCTS approach, specifically targeting commercial real-time video games by approximating the result of gameplay with a deep-learning-based surrogate model. The key contribution of our work is that we designed a modified MCTS for video games that are both commercial and processed in real-time. Since commercial video games include considerably more complex and dynamic gameplays to satisfy their market consumers, as opposed to their non-commercial analogs, our work can be regarded as having challenged the domain unattempted by precedent studies. We validated the performance of our method by conducting a comparative experiment with other algorithms, including the traditional MCTS, under the environment of a commercial real-time video game.

﻿Whether the application of exergames in physical education (PE) courses can significantly improve student performance in PE learning is still controversial. This review explores the promoting effect of exergames on student PE learning and the conditions in which the effect of exergames can be maximized. Based on the PICOS method, two researchers independently searched the ProQuest database, EBSCO database, Web of Science (WoS) database, PubMed database, Chinese National Knowledge Infrastructure (CNKI) database, Wanfang database, and VIP database, evaluated the literature quality using the Cochrane system evaluation manual, and performed a meta-analysis of the included literature. A total of 16 randomized controlled trials involving 2962 subjects were included in this study. The meta-analysis showed that exergames effectively improved student performance in PE learning (SMD = 0.45, 95% CI: 0.27–0.63, P < 0.00001). Subgroup analysis indicated that better results could be achieved when exergames were introduced in small kindergarten classes and continued for 1–2 months.

Artificial Intelligence (AI) stands as a pivotal innovation deeply ingrained in both our daily routines and industrial operations. Its rapid evolution promises transformative impacts across various sectors, from cutting-edge industries to the lives of ordinary individuals. AI constantly updates human experiences, shaping interactions and augmenting capabilities. For instance, contemporary educational institutions leverage AI algorithms for attendance tracking via facial recognition technology. Looking ahead, the advent of autonomous vehicles represents a pinnacle of AI application, where vehicles rely entirely on AI systems for navigation, detecting traffic signals, and navigating roads.

International relations scholarship has long emphasized that popular culture can impact public understandings and political realities. In this article, we explore these potentials in the context of military-themed videogames and their portrayals of weaponized artificial intelligence (AI). Within paradoxical videogame representations of AI weapons both as insurmountable enemies that pose existential threats to humankind in narratives and as easy targets that human protagonists routinely overcome in gameplay, we identify distortions of human machine interaction that contradict real-world scenarios. These distortions revolve around videogames affording players enhanced human agency to dominate AI weapons to offer enjoyable gameplay, contradicting the same weapons being intended to diminish human agency on real-world battlefields. By leveraging the Actor-Network Theory concept of translation, we explain how these distorted portrayals of AI weapons are produced by entanglements between heterogeneous human and non-human actors that aim to make videogames mass-marketable and profitable. In so doing, we echo game studies research that calls for greater attention to the commercial and ludic dimensions of videogames so that international relations scholarship can better account for pop cultures bounded abilities to impact public understandings and political realities.

Accurately scientific disciplines, including biomechanics, genetics, ethology, and neurology, it is essential to accurately track the behavior of animals throughout studies, particularly without employing markers. However, it has proven difficult to extract precise stances from backgrounds that are always shifting. Recently, we unveiled an open-source toolset that makes use of a cutting-edge algorithm for estimating human position. With the help of this toolbox, users may train a deep neural network to accurately monitor user-defined features with tracking accuracy that rivals that of human labeling. We have added new features, including as graphical user interfaces (GUIs), efficiency improvements, and network refinement based on active learning, to this revised Python module. In order to help customers create a unique and repeatable analysis pipeline using a graphical processing unit (GPU).

Providing an appropriate difficulty level in a game is critical for keeping players engaged. Dynamic Difficulty Adjustment (DDA) is a common approach for optimizing player experience by automatically modifying game aspects. This paper reviews literature addressing mechanisms for adjusting video game difficulties in response to players performance, emotions, or personality. For this purpose, we examined DDA studies using employed machine-learning techniques, player modeling approaches, data types used to assess players states, testbed game genre, and application. Journal and conference articles published up to September 2022 served as the data sources in this review. The findings reveal that most studies have shown significant effects of DDA on parameters such as enjoyment, flow, motivation, engagement, and immersion. In addition, machine-learning and player modeling techniques have recently received more attention in the DDA design. However, given the ever-increasing use of games in various domains, more research is needed to understand player preferences better to adjust game parameters efficiently. By conducting further research into players cognitive characteristics, such as visual attention, working memory, and response time, it will be possible to understand players preferences better.

Serious video games provide a immersive learning environment for agriculture by simulating real-life challenges scenarios. However, empirical evidence of their effectiveness is sparse. This scoping review follows PRISMA-ScR guidelines to summarize literature on serious video games for agricultural learning, highlighting research trends and identifying gaps. We systematically searched nine prominent research databases for papers on serious video games for agriculture learning published between January 2000 and July 2022. Two independent reviewers conducted screening, data extraction, and synthesized the collected data using a narrative approach. The initial search identified 3,297 articles, of which 0.58% ( n = 19) were included in the review. Most reviewed games were released in the last five years, with a predominant presence in the mobile platform. They commonly employed a simulation-based approach, featuring 2-D graphics and designed for single-player experiences. These games mainly target students, focusing on crop production and sustainable agriculture. Educational theories were often unspecified in the studies. Evaluation protocols primarily consisted of pilot studies, emphasizing user experience and knowledge enhancement. Positive outcomes, such as improved user experiences, knowledge, and attitude and behavior changes, were commonly observed in these studies. This study highlights advancements in using serious video games for agricultural learning over 20 years. However, it stresses the need for deeper exploration of game elements' impact on user experience and effectiveness. Creating games for underrepresented players and specific agricultural challenges is essential, as is enhancing theoretical foundations and learning approaches. Rigorous research designs are vital for assessing game effectiveness across short, medium, and long terms.

With the development of education and technology, teachers have gradually realized that games should not be just a way for students to entertain themselves. Applying games to teaching resources can achieve better teaching outcomes. However, related resources are constantly emerging on the internet. To achieve higher quality recommendations, a personalized recommendation model for educational video game resources based on knowledge graphs is proposed. Firstly, feature extraction is performed alternately on the user side and the item side. Then a hidden Markov model is introduced on the basis of the dual end neighbor algorithm. Considering the temporal nature of the user, the model is optimized. The optimized model takes into account the long-term and short-term preferences of users and mines their potential preferences. Through experimental analysis, the hit rate index value of the designed model reaches 0.7989. The normalized cumulative gain value of the broken line is 0.6045. More than 89% of users are satisfied with the recommendation of this model. The running time is 0.2863s. The constructed model can achieve efficient and high-quality recommendation of educational video game resources, providing users with a more convenient and efficient online experience.

The metaverse has emerged as an exciting new paradigm for human-computer interaction (HCI) and virtual collaboration. This paper presents a comprehensive review of the metaverse to address the gap in the existing literature where there is a lack of a survey that reviews the nature of the metaverse and its building blocks from a human-centric perspective. We first synthesize a definition of the metaverse from existing literature and delineate key affordances. We then introduce a detailed framework encompassing the metaverses nature, infrastructure technologies, and input/output technologies that facilitate multi-sensory HCI, alongside applications across diverse domains. The components within this framework are explained in depth, offering insights into the metaverses nature and the readiness level of current technologies. Based on this comprehensive analysis, we outline major open challenges and propose promising directions demanding further exploration and investigation. By clarifying the vision for the metaverse and characterizing the building blocks required to realize it, this review provides essential insights and serves as an invaluable resource for metaverse developers and researchers working to advance this transformative new medium.

The lifestyle of modern society has changed significantly with the emergence of artificial intelligence (AI), machine learning (ML), and deep learning (DL) technologies in recent years. Artificial intelligence is a multidimensional technology with various components such as advanced algorithms, ML and DL. Together, AI, ML, and DL are expected to provide automated devices to ophthalmologists for early diagnosis and timely treatment of ocular disorders in the near future. In fact, AI, ML, and DL have been used in ophthalmic setting to validate the diagnosis of diseases, read images, perform corneal topographic mapping and intraocular lens calculations. Diabetic retinopathy (DR), age-related macular degeneration (AMD), and glaucoma are the 3 most common causes of irreversible blindness on a global scale. Ophthalmic imaging provides a way to diagnose and objectively detect the progression of a number of pathologies including DR, AMD, glaucoma, and other ophthalmic disorders. There are 2 methods of imaging used as diagnostic methods in ophthalmic practice: fundus digital photography and optical coherence tomography (OCT). Of note, OCT has become the most widely used imaging modality in ophthalmology settings in the developed world. Changes in population demographics and lifestyle, extension of average lifespan, and the changing pattern of chronic diseases such as obesity, diabetes, DR, AMD, and glaucoma create a rising demand for such images. Furthermore, the limitation of availability of retina specialists and trained human graders is a major problem in many countries. Consequently, given the current population growth trends, it is inevitable that analyzing such images is time-consuming, costly, and prone to human error. Therefore, the detection and treatment of DR, AMD, glaucoma, and other ophthalmic disorders through unmanned automated applications system in the near future will be inevitable. We provide an overview of the potential impact of the current AI, ML, and DL methods and their applications on the early detection and treatment of DR, AMD, glaucoma, and other ophthalmic diseases.

With the unprecedented advancement of data aggregation and deep learning algorithms, artificial intelligence (AI) and machine learning (ML) are poised to transform the practice of medicine. The field of orthopedics, in particular, is uniquely suited to harness the power of big data, and in doing so provide critical insight into elevating the many facets of care provided by orthopedic surgeons. The purpose of this review is to critically evaluate the recent and novel literature regarding ML in the field of orthopedics and to address its potential impact on the future of musculoskeletal care.

Industry 4.0 concepts and technologies ensure the ongoing development of micro- and macro-economic entities by focusing on the principles of interconnectivity, digitalization, and automation. In this context, artificial intelligence is seen as one of the major enablers for Smart Logistics and Smart Production initiatives. This paper systematically analyzes the scientific literature on artificial intelligence, machine learning, and deep learning in the context of Smart Logistics management in industrial enterprises. Furthermore, based on the results of the systematic literature review, the authors present a conceptual framework, which provides fruitful implications based on recent research findings and insights to be used for directing and starting future research initiatives in the field of artificial intelligence (AI), machine learning (ML), and deep learning (DL) in Smart Logistics.

Machine learning (ML) is a form of artificial intelligence which is placed to transform the twenty-first century. Rapid, recent progress in its underlying architecture and algorithms and growth in the size of datasets have led to increasing computer competence across a range of fields. These include driving a vehicle, language translation, chatbots and beyond human performance at complex board games such as Go. Here, we review the fundamentals and algorithms behind machine learning and highlight specific approaches to learning and optimisation. We then summarise the applications of ML to medicine. In particular, we showcase recent diagnostic performances, and caveats, in the fields of dermatology, radiology, pathology and general microscopy.

Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) have revolutionized the field of advanced robotics in recent years. AI, ML, and DL are transforming the field of advanced robotics, making robots more intelligent, efficient, and adaptable to complex tasks and environments. Some of the applications of AI, ML, and DL in advanced robotics include autonomous navigation, object recognition and manipulation, natural language processing, and predictive maintenance. These technologies are also being used in the development of collaborative robots (cobots) that can work alongside humans and adapt to changing environments and tasks. The AI, ML, and DL can be used in advanced transportation systems in order to provide safety, efficiency, and convenience to the passengers and transportation companies . Also, the AI, ML, and DL are playing a critical role in the advancement of manufacturing assembly robots, enabling them to work more efficiently, safely, and intelligently. Furthermore, they have a wide range of applications in aviation management, helping airlines to improve efficiency, reduce costs, and improve customer satisfaction. Moreover, the AI, ML, and DL can help taxi companies in order to provide better, more efficient, and safer services to customers. The research presents an overview of current developments in AI, ML, and DL in advanced robotics systems and discusses various applications of the systems in robot modification. Further research works regarding the applications of AI, ML, and DL in advanced robotics systems are also suggested in order to fill the gaps between the existing studies and published papers. By reviewing the applications of AI, ML, and DL in advanced robotics systems, it is possible to investigate and modify the performances of advanced robots in various applications in order to enhance productivity in advanced robotic industries.

Commercial applications of artificial intelligence and machine learning have made remarkable progress recently, particularly in areas such as image recognition, natural speech processing, language translation, textual analysis, and self-learning. Progress had historically languished in these areas, such that these skills had come to seem ineffably bound to intelligence. However, these commercial advances have performed best at single-task applications in which imperfect outputs and occasional frank errors can be tolerated. The practice of anesthesiology is different. It embodies a requirement for high reliability, and a pressured cycle of interpretation, physical action, and response rather than any single cognitive act. This review covers the basics of what is meant by artificial intelligence and machine learning for the practicing anesthesiologist, describing how decision-making behaviors can emerge from simple equations. Relevant clinical questions are introduced to illustrate how machine learning might help solve them—perhaps bringing anesthesiology into an era of machine-assisted discovery.

Adaptation and innovation are extremely important to the manufacturing industry. This development should lead to sustainable manufacturing using new technologies. To promote sustainability, smart production requires global perspectives of smart production application technology. In this regard, thanks to intensive research efforts in the field of artificial intelligence (AI), a number of AI-based techniques, such as machine learning, have already been established in the industry to achieve sustainable manufacturing. Thus, the aim of the present research was to analyze, systematically, the scientific literature relating to the application of artificial intelligence and machine learning (ML) in industry. In fact, with the introduction of the Industry 4.0, artificial intelligence and machine learning are considered the driving force of smart factory revolution. The purpose of this review was to classify the literature, including publication year, authors, scientific sector, country, institution, and keywords. The analysis was done using the Web of Science and SCOPUS database. Furthermore, UCINET and NVivo 12 software were used to complete them. A literature review on ML and AI empirical studies published in the last century was carried out to highlight the evolution of the topic before and after Industry 4.0 introduction, from 1999 to now. Eighty-two articles were reviewed and classified. A first interesting result is the greater number of works published by the USA and the increasing interest after the birth of Industry 4.0.

Autoimmune diseases are chronic, multifactorial conditions. Through machine learning (ML), a branch of the wider field of artificial intelligence, it is possible to extract patterns within patient data, and exploit these patterns to predict patient outcomes for improved clinical management. Here, we surveyed the use of ML methods to address clinical problems in autoimmune disease. A systematic review was conducted using MEDLINE, embase and computers and applied sciences complete databases. Relevant papers included “machine learning” or “artificial intelligence” and the autoimmune diseases search term(s) in their title, abstract or key words. Exclusion criteria: studies not written in English, no real human patient data included, publication prior to 2001, studies that were not peer reviewed, non-autoimmune disease comorbidity research and review papers. 169 (of 702) studies met the criteria for inclusion. Support vector machines and random forests were the most popular ML methods used. ML models using data on multiple sclerosis, rheumatoid arthritis and inflammatory bowel disease were most common. A small proportion of studies (7.7% or 13/169) combined different data types in the modelling process. Cross-validation, combined with a separate testing set for more robust model evaluation occurred in 8.3% of papers (14/169). The field may benefit from adopting a best practice of validation, cross-validation and independent testing of ML models. Many models achieved good predictive results in simple scenarios (e.g. classification of cases and controls). Progression to more complex predictive models may be achievable in future through integration of multiple data types.

Drug designing and development is an important area of research for pharmaceutical companies and chemical scientists. However, low efficacy, off-target delivery, time consumption, and high cost impose a hurdle and challenges that impact drug design and discovery. Further, complex and big data from genomics, proteomics, microarray data, and clinical trials also impose an obstacle in the drug discovery pipeline. Artificial intelligence and machine learning technology play a crucial role in drug discovery and development. In other words, artificial neural networks and deep learning algorithms have modernized the area. Machine learning and deep learning algorithms have been implemented in several drug discovery processes such as peptide synthesis, structure-based virtual screening, ligand-based virtual screening, toxicity prediction, drug monitoring and release, pharmacophore modeling, quantitative structure–activity relationship, drug repositioning, polypharmacology, and physiochemical activity. Evidence from the past strengthens the implementation of artificial intelligence and deep learning in this field. Moreover, novel data mining, curation, and management techniques provided critical support to recently developed modeling algorithms. In summary, artificial intelligence and deep learning advancements provide an excellent opportunity for rational drug design and discovery process, which will eventually impact mankind.

Artificial intelligence (AI) has recently become a very popular buzzword, as a consequence of disruptive technical advances and impressive experimental results, notably in the field of image analysis and processing. In medicine, specialties where images are central, like radiology, pathology or oncology, have seized the opportunity and considerable efforts in research and development have been deployed to transfer the potential of AI to clinical applications. With AI becoming a more mainstream tool for typical medical imaging analysis tasks, such as diagnosis, segmentation, or classification, the key for a safe and efficient use of clinical AI applications relies, in part, on informed practitioners. The aim of this review is to present the basic technological pillars of AI, together with the state-of-the-art machine learning methods and their application to medical imaging. In addition, we discuss the new trends and future research directions. This will help the reader to understand how AI methods are now becoming an ubiquitous tool in any medical image analysis workflow and pave the way for the clinical implementation of AI-based solutions.