www.jpis.az

15 (2)
2024

Implementation of artificial intelligence by using Amazon web services to improve services in e-government

Mohammad Ali Al Qudah[1], **Leyla Muradkhanli**[2], **Mutaz Mohammed Abuhashish**[3]

[1, 2, 3] Department of Computer Science, Khazar University, Baku, Azerbaijan

[1] Directorate of Information Technology and Electronics Transformation, Jordan

[2]Department of Information Technology, Baku Higher Oil School, Baku, Azerbaijan
[2] Institute of Control Systems, Baku, Azerbaijan

[3] College of Engineering and Information Technology, Al Azhar University, Palestine, Gaza

[1] mohammad.ali@khazar.org ; [2] leyla.muradkhanli@bhos.edu.az ; [3] mutaz.mohammed@khazar.org

[1]https://orcid.org/0000-0002-5031-6375; [2]https://orcid.org/0000-0001-6149-4698;

ARTICLE INFO

http://doi.org/10.25045/jpis.v15.i2.08

Article history:
Received 09 January 2024
Received in revised form
10 March 2024
Accepted 15 May 2024

Keywords:
artificial intelligence
Amazon Web Services
e-government
machine learning
deep learning
enhance the quality
services

ABSTRACT

The implementation of artificial intelligence has the scope to revolutionize e-government services by enhancing the quality of life for citizens, enhancing operational efficiency, and enabling groundbreaking applications. There is a possibility that this can be achieved through technical improvements. A wide range of artificial intelligence technologies and services are offered by Amazon Web Services, which has the potential to alter how e-government services are provided. The purpose of this abstract is to study the revolutionary potential of artificial intelligence by utilizing Amazon Web Services and to highlight the benefits and possibilities that it provides to the field of e-government. The utilization of artificial intelligence in conjunction with Amazon Web Services has the potential to significantly enhance the quality of e-government services by reducing inefficiencies, enabling the development of creative applications, and enabling the customization of experiences. With the assistance of the artificial intelligence tools and services offered by Amazon Web Services, the public sector can take advantage of the revolutionary power of artificial intelligence while also ensuring that responsible and ethical practices are followed.

1. Introduction

Due to the reliance on human elements, particularly citizens and service recipients, the government sector in certain countries has experienced the least impact from the significant advancements in AI systems in recent years. This is primarily because government decision-makers must abide by specific policies. Nevertheless, in recent years, there has been a significant surge in the popularity of open electronic platforms, with several governments using chatbots as a contributing factor. The area of AI is now growing and having a significant influence on state and municipal governments (Alqudah, 2021a). It is also undergoing extensive testing. As an example, the San Diego County Sheriff's Office used a chatbot to provide crucial information to police officers while they were in their vehicles. The cops communicate with the call center staff to get the car's plate number or authenticate a suspect's file. Captivity is a voice-activated assistant designed for police to use in their automobiles. It can pull criminal records and other information from databases instantly. Additionally, it reduces the amount of time contact center personnel spend on mundane activities, enabling them to concentrate on more complex information inquiries. The use of AI in this context relies on the integration

of cloud computing, which combines data, cognitive services, and edge computing to provide prompt responses by police (Alqudah & Muradkhanli, 2021b).

Undoubtedly, AI has transcended its confinement to a particular segment of society and has now become universally accessible. It has permeated numerous aspects of our daily lives, subjecting them to a swift technological invasion. This invasion has initiated a significant qualitative advancement in electronic government applications and their integration with AI. The concern of AI replacing people and digital programmers replacing non-AI-assisted electronic applications has significantly escalated due to the way current technologies are being handled. Considering the information provided, we may pose the following primary inquiry: What are the primary advantages and obstacles to using AI in e-government? AI refers to the field of computer science that focuses on creating intelligent machines capable of doing tasks that typically require human intellect.

What are the definitions of machine learning (ML), and deep learning (DL)? What impact does AI have on the electronic system?

The significance of the research: The significance of the present research lies in the fact that AI is a contemporary technology that has become indispensable for enhancing efficiency and accessing new prospects, hence enabling commercial organizations to gain a competitive edge. Contemporary applications of information technologies are increasingly incorporating the functionalities of AI into fundamental aspects of electronic applications. This involves emphasizing the significance of diverse AI models and systems in the development of electronic applications, as well as achieving the study's objectives. Researchers choose certain topics to satisfy their intellectual curiosity and clarify any ambiguities around certain difficulties. Our research successfully accomplishes many objectives, including emphasizing the concept of AI and its various applications. AI has significance in the electronic stack since it plays a crucial role in enhancing several aspects of e-government offering suggestions to enhance and facilitate the involvement of AI in advancing electronic procedures inside e-government applications. Methodology:

To address the issue of this research, we mostly used the descriptive and analytical strategy, since it is often regarded as the most suitable method for examining many social and humanitarian subjects. The research uses a diverse range of sources and references for investigation, including books, periodicals, memoranda, reports, and other relevant materials. The use of the Internet significantly enhanced the research.

2. Related work

A wide variety of departments within the government make use of AI. It is possible to use it to promote public policy goals (in sectors such as emergency services, health, and social care) as well as to aid the public in interacting with the government (for instance, via the use of virtual assistants). According to the Harvard Business Review, "Applications of AI to the public sector are broad and growing, with early trials around the world." Using AI in governance is not a new concept, according to Hila Myhr, who works at the Ash Centre for Democratic Governance and Innovation at Harvard University. In the late 1990s, the United States Postal Service began using automated ways to recognize handwriting on envelopes to distribute mail in an automated fashion. The use of AI in government offers several major advantages, including the reduction of the potential for corruption and the enhancement of efficiency, which may result in cost savings (for instance, by lowering the number of front offices). On the other hand, there are also risks that may result from its use. Many countries are exploring the potential of AI to improve their operations and services; however, not all AI technologies are suitable for every government service or process, considering that transparency and accountability remain top concerns in the public sector.

Gil Garcia, Director of the Centre for Technology in Government (CTG UAlbany), and Professor Yi Long from Shanghai University of Political Science and Law, in a new article published in the International Journal of E-Government Research (IJEGR), analyzed the AI processes that are currently used in China to manage government services and whether other forms of automation could be better options for ensuring transparency. According to Phys.com, Garcia and Long were responsible for writing the article. According to Gil Garcia, "There are many kinds of AI technologies and applications, each of which has its own set of benefits and drawbacks."

An intriguing government invention that is based on AI is the "Smart Screening and Approval" (SEA) program, which is now being implemented in China and is fast expanding across the country.

SEA was first introduced by Guangxi Province in 2017, and it has several distinctive characteristics. One of these characteristics is the ability to apply for a

government service (for instance, beginning a company) using the online application system. Additionally, the system uses encrypted rules to automatically filter and approve applications to make progress and get results immediately.

Gil Garcia, a professor of public administration, policy, and international affairs at the Rockefeller School of Public Affairs and Policy, continues by saying, "It is important to understand the potential of SEA, but also the challenges governments face when using innovators in AI in comparison to traditional forms of service delivery." Additionally, Gil-Garcia and Yi propose that hybrid techniques are something that governments should take into consideration based on their findings. Gil Garcia said that it is possible to integrate, for instance, ML for verification procedures with expert systems, which are simple to audit, to arrive at conclusive findings about instances.

The researchers also propose a categorization of services. This classification considers the degree of automation and transparency of procedures that are necessary for performing various kinds of services. Gil Garcia continued by saying, "This is not something that is exclusive to China because governments from all over the world are increasingly using AI-based systems, and very little is known about the potential benefits and challenges that these systems may present for governments and society."

However, traditional face-to-face services also offer some advantages, such as the fact that the customer perceives the outcomes as being more effective. This is especially true in regions where internet services are not accessible. For instance, government personnel may demand bribes from applicants to complete their paperwork. is incongruous with the internet.

3. Artificial Intelligence vs Machine Learning vs Deep Learning

3.1. AI and ML are two types of intelligent software solutions that influence how past, current, and future technology is designed to emulate more human qualities

AI is an umbrella term for different strategies and technologies we can use to make machines more like humans. AI includes anything from smart assistants, like Alexa, to robotic vacuum cleaners and self-driving cars (Alqudah et al., 2023). ML is one of many other branches of AI. ML is the science of developing algorithms and statistical models that computer systems use to perform complex tasks without explicit instructions. Systems rely on patterns and heuristics instead. Computer systems use ML algorithms to process large amounts of historical data and identify data patterns. While ML is AI, not all AI activity is ML and we conclude such as (Alqudah & Muradkhanli, 2021a).

Basically, AI is a technical solution, system, or device that aims to mimic human intelligence to perform tasks while repeatedly improving itself based on the information it collects.

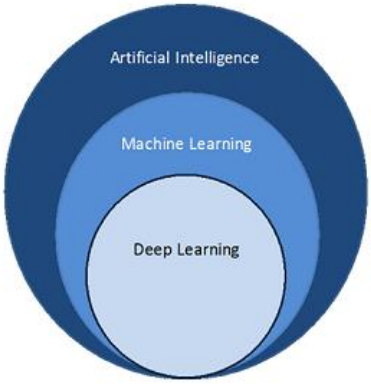

Fig. 1. The relation between ML, DL and AI.

ML is a subset of AI that focuses on building a software system that can learn or improve performance based on the data it consumes. This means that every ML solution is an AI solution, but not all AI solutions are ML solutions, as Fig.1 shows the relation between ML, DL and AI (ML and AI - Amazon Web Services, n.d.)

AI algorithms enable computers to learn and make predictions or decisions without being explicitly programmed. Artificial neural networks that are capable of learning and making complex decisions based on large amounts of data. Despite the growing use of these phrases, a significant number of individuals still see themselves as characters in a science fiction film. Let's streamline the process and attempt to provide a concise

description for each phrase using just one line.

AI refers to computer operations that imitate human decision-making processes by using acquired knowledge and data (Sun & Medaglia, 2019; Wong et al., 2013).

The concept of AI originated in the 1950s, coinciding with the emergence of technological advancements and computational powers in machines. The objective was straightforward: to surpass the utilization of the computer just for computational purposes and instead use it to facilitate decision-making.

Computers must be beyond the mere calculation of judgements based on present facts. They must advance by considering several possibilities to get a more precise and deliberate result. However, the practical implementation of this goal needs extensive study and invention spanning many decades. A basic kind of AI involves the development of rule-based systems or expert systems. Nevertheless, the emergence of enhanced computational capabilities in the 1980s led to a transformative impact of ML on the potential of AI (Mitrou, 2018).

AI software employs ML and DL to enhance company efficiency via decision making and automation. AI has the potential to revolutionize an organization's operations by enabling predictive modelling, generating reports, and automating processes, resulting in enhanced efficiency and precision. OCI serves as the underlying infrastructure for cloud-based data management, using AI and ML (Marda, 2018).

ML refers to the computational processes that enable computers to make conclusions based on data. ML is a branch of AI that empowers computers to acquire knowledge and skills beyond their initial programming.

Rule-based judgements are effective for less complex scenarios characterized by explicit variables. The computer-simulated game of chess relies on a set of rule-based judgements, considering factors such as the presence and locations of pieces on the board, as well as whose turn it is. The issue lies in the fact that all these scenarios need a certain degree of control. At a certain juncture, the capacity to make judgements only relying on variables and if/then rules becomes ineffective (Fei & Wang, 2019).

The concept of ML emerged in the 1980s, proposing that an algorithm could analyze extensive datasets and draw conclusions based on the obtained outcomes. For instance, when a ML algorithm is provided with substantial amounts of credit card transactions along with if/then rules to detect fraud, it can subsequently commence recognizing additional factors that contributed to a pattern, such as instances when an account made purchases during unconventional hours or at stores situated in diverse geographical locations (Burrell, 2016; Silva Araújo et al., 2019).

To start the identification of patterns, it is necessary to have extensive data sets. However, whereas datasets containing easily recognizable alphanumeric letters, well-defined data formats, and correct syntax may assist the algorithm in question, other more complex tasks such as facial recognition in images pose challenges. In the year 2000, there was a significant advancement in technology, which included the development of a learning approach that imitated the functioning of the human brain.

DL refers to the computational methods that enable computers to tackle very intricate issues. DL is a kind of ML that enables computations in neural networks with several layers.

DL is powered using layers of neural networks, which are algorithms that are loosely modeled on the way the human brain works. Training with large amounts of data is what forms the nerve in a neural network. The result is a DL model that processes new data as soon as it is trained. DL models take information from multiple data sources and analyze that data in real time, without the need for human intervention. In DL, graphics processing units (GPUs) are optimized for training models because they can handle multiple computations at the same time (Alqudah et al., 2023; Li et al., 2019; Salamah et al., 2022; Schmidhuber, 2015).

DL is what drives many AI technologies that can improve automation and analytical tasks. Most people encounter DL every day when browsing the Internet or using mobile phones. Among countless other applications, DL is used to create YouTube video captions, perform speech recognition on phones and smart speakers, provide facial recognition for photographs, and enable self-driving cars. As data scientists and researchers tackle more complex DL projects — DL frameworks — this type of AI will only become a larger part of our daily lives (ML and AI - Amazon Web Services, n.d.).

3.2. Comparison between deep learning and neural networks

DL refers to neural networks that consist of several layers.

Neural networks process input data, such as pictures or sound, by transmitting the data via

linked layers of nodes. When data is sent via a layer, each individual node inside that layer executes elementary operations on the information and selectively transmits the outcomes to other nodes. Each successive layer of the network is dedicated to extracting higher-level features compared to the previous layer, ultimately leading to the generation of the output (Phung & Rhee, 2019; Schmidhuber, 2015).

Hidden layers are located between the input layer and the output layer. The distinction between neural networks and DL lies in the number of hidden layers they possess. While a simple neural network typically has one or two hidden layers, a DL network might consist of several levels, ranging from dozens to even hundreds. Augmenting the quantity of distinct layers and nodes has the potential to enhance the precision of the network. Nevertheless, an increased number of layers may need a greater number of parameters and processing resources for the model.

DL employs a hierarchical structure of neural networks to categorize data, with each layer consisting of input units that accept unprocessed information. For instance, if a neural network undergoes training using bird photographs, it may then be used to identify bird images. Increased layering enhances precision in outcomes, enabling finer discrimination between crowds and nerves as opposed to discerning between crowds and chickens. Deep neural networks, the foundation of DL algorithms, consist of several hidden layers positioned between input and output nodes. This architecture enables them to accomplish intricate data classifications. Training a DL model requires the use of extensive data sets. The accuracy of the system will improve in direct proportion to the amount of data it gets. To achieve successful classification of fresh bird photographs, it is necessary to provide a substantial number of bird images, preferably in the thousands (Alqudah et al., 2023).

Training a DL model in neural networks requires a significant number of resources. At that point, the neural network receives an input, which undergoes processing in hidden layers using weights (parameters that signify the intensity of connection between inputs) that were adjusted during training. Subsequently, the model generates a prediction. The weights are modified based on the training inputs to enhance the accuracy of predictions. Training DL models with huge datasets is a time-consuming process, highlighting the need for high-performance computers.

GPUs are specifically optimized for executing data arithmetic operations and are engineered to provide rapid performance for extensive matrix arithmetic tasks. GPUs are most suitable for the concurrent execution of complex ML and DL tasks. Consequently, ML systems that are engaged in extensive computations on substantial quantities of organized or unorganized input, such as images and text, outperform others in video processing.

To build, train, and deploy ML models on high-performance cloud infrastructure, try Oracle Cloud Infrastructure Data Science. Data scientists can build and train DL models in much less time using NVIDIA GPUs in laptop sessions. They can also determine how many computer and storage resources they need to handle projects of any size without worrying about provisioning or maintaining infrastructure. Moreover, OCI Data Science accelerates the process of creating models by simplifying data science tasks such as accessing data, defining algorithms, and interpreting the model (ML and AI - Amazon Web Services, n.d.).

4. AI technology has the capability to assist organizations

The fundamental tenet of AI is to replicate and surpass the way people comprehend and engage with the surrounding environment. It is rapidly becoming the foundation of innovation. AI, which utilizes various ML techniques to identify data patterns and generate predictions, may enhance your organization by offering a more thorough comprehension of the abundant data at hand. Utilizing forecasts to mechanize exceedingly intricate operations Furthermore, beside the customary duties. With on-demand cloud services, we can build, operate, and manage AI (Alqudah, 2021b). Learning jobs can be created, run, and managed from the AWS cloud (*Machine Learning and Artificial Intelligence - Amazon Web Services*, n.d.).

1. ***Several ML solutions are applicable to a wide range of organizations***

- Customer segmentation is categorizing consumers based on their behavior, preferences, and attributes to enhance sales and marketing efforts.
- Fraud detection refers to the process of identifying and resolving typical transactions.
- Sentiment analysis involves aggregating consumer comments to inform product strategy and marketing decisions.

2. ***Below are the AI solutions that apply to most organizations***

- Chatbots are suitable for customer service inquiries.
- Speech recognition is great for turning meetings into written minutes.
- Computer vision does well in biometric recognition systems.

3. ***Can AWS support AI and ML requirements as seen in Fig.2. AWS cloud***

- AWS offers a wide range of services to help build, operate, and integrate AI and ML (AI/ML) solutions at any size, complexity, or use case.
- Amazon Sage Maker is a complete platform for building ML solutions from the ground up. Sage Maker provides a full suite of pre-built ML models, computer and storage capabilities, and a fully managed environment.

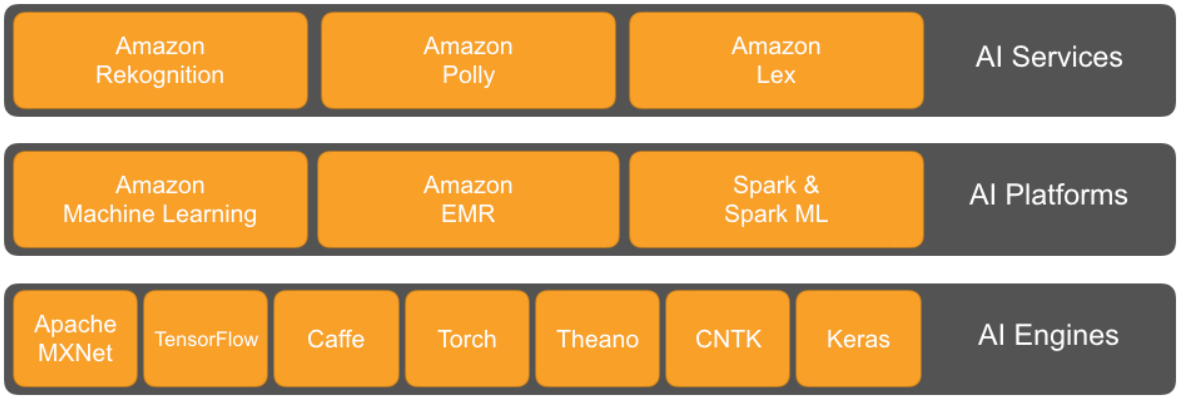

Fig. 2.AWS support AI and ML

For AI, we can use AWS services to build AI solutions from scratch or integrate pre-built AI services with our solution (Dubé et al., 2018).

4.1. Advantages of artificial intelligence

AI can offer a multitude of advantages to many industries.

1. Solving intricate problems. AI technology utilizes DL networks and ML to effectively address complex issues, exhibiting a level of intellectual capability on par with humans. AI's ability to detect patterns, recognize information, and provide answers allows it to efficiently handle large amounts of data. AI can provide significant advantages in various domains, including fraud detection, medical diagnostics, and corporate analytics.

2. Enhance operational effectiveness. AI technology can operate continuously without any decline in performance, unlike humans. Put simply, AI can flawlessly execute manual jobs. By delegating repetitive and mundane tasks to AI, we can allocate human resources to more strategic parts of the organization. AI can reduce the amount of labor required while also making it easier to do all tasks related to the organization.

3. Improve decision-making. AI is the ability to use ML algorithms to quickly analyze large amounts of data, surpassing the speed at which any human can do so. AI platforms possess the capability to discern patterns, scrutinize data, and offer direction. AI utilizes data to generate predictions, hence providing recommendations for optimal future actions.

4. Automation processes. ML can train AI to improve its accuracy and speed in task execution. By automating certain tasks, we can enhance operational efficiency and relieve employees of burdensome or monotonous work. Similarly, we can use AI automation to direct employee resources towards more complex and creative tasks. Streamlining business processes through automation, as depicted in Fig. 3

4.2. Practical applications of artificial intelligence

AI has a wide range of uses. While it's not an exhaustive list, here's a collection of examples that highlight various AI use cases.

1. Process documents intelligently

Intelligent Document Processing (IDP) can extract usable data from unstructured documents. For instance, it may transform unstructured data from sources like PDFs, photos, and emails into a more organized format that businesses can use. IDP uses AI methods such as computer vision, DL and natural language processing (NLP) for data extraction, classification, and validation.

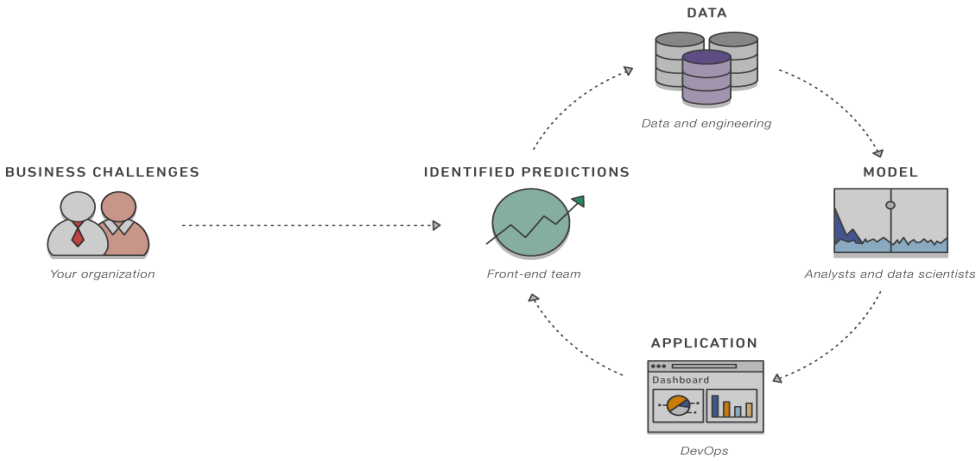

Fig. 3. Business process automation.

2. Monitor application performance. Application performance monitoring (APM) refers to the use of software tools and telemetry data to monitor the functionality of critical business applications. AI-powered APM technologies utilize past data to anticipate issues in advance. Additionally, it can promptly address issues by providing engineers with practical and efficient solutions. This method ensures optimal application performance by effectively resolving bottlenecks.

3. Predictive maintenance. AI-augmented predictive maintenance utilizes extensive datasets to detect possible problems that may lead to the failure or disruption of operations, systems, or services. Predictive maintenance allows companies to take proactive measures to address expected issues before they occur, thereby reducing operating downtime and preventing any disruptions.

4. Medical research. Medical research utilizes AI to enhance processes, automate repetitive tasks, and evaluate large amounts of data. Medical research can employ AI technology to streamline the entire drug discovery and development process, transcribe medical information into textual format, and accelerate the pace of new product launches.

5. Business analytics. Business analytics leverages AI to gather, manipulate, and evaluate intricate data sets. AI analytics can forecast future values, understand the underlying reasons behind data, and streamline time-consuming procedures.

5. Key AI technologies

DL neural networks are the foundational components of AI approaches. It emulates the cognitive process occurring in the human brain. The brain consists of many neurons that work together to process and analyze information. DL neural networks utilize artificial neurons to collectively process information (Alqudah, 2021a; Zisserman, 2014; Venugopalan et al., 2014). Each artificial neuron, often referred to as a ganglion, employs mathematical computations to interpret data and address complex difficulties. This DL technology can tackle problems or simplify tasks that typically require human cognitive talents. We can create different AI approaches by utilizing a range of training techniques for DL neural networks. In this discussion, we will explore some fundamental approaches that depend on neural networks.

1. Natural language processing. NLP can understand, analyze, and extract meaning from text by using advanced DL algorithms. People generate text with high effectiveness, making NLP a desirable tool for tasks like document summarization, chatbot automation, and sentiment analysis.

2. Computer vision. Computer vision uses DL methodologies to extract data and make discerning observations from films and images. Through the application of computer vision, a computer is capable of comprehending images in a manner akin to human understanding. Computer vision can be employed to surveil web content for indecent photographs, identify faces, and categorize image particulars. Monitoring the surroundings and making rapid decisions are crucial in the operation of autonomous vehicles.

3. Generative artificial intelligence. Generative AI refers to AI systems that can generate new content and elements based on basic textual instructions, such as images, videos, text, and audio. Generative AI, unlike its predecessors,

goes beyond data analysis by utilizing DL and vast datasets to generate creative outputs of exceptional quality and innovation, comparable to those created by humans. Although it allows for innovative creative uses, there are concerns about bias, harmful content, and intellectual property. Generative AI is a significant advancement in AI's capacity to produce novel content and elements that resemble humans' creative processes.

4. Speech recognition. DL models are employed by speech recognition software to analyze human speech, recognize words, and ascertain significance. Neural networks can transform spoken language into written text and identify the emotional characteristics of the speaker's voice. Speech recognition can be utilized in various technologies, such as virtual assistants and call center software, to accurately detect the intended meaning of spoken words and execute relevant actions.

5.1. AI application architecture

According by the web site (*Machine Learning and Artificial Intelligence - Amazon Web Services*, n.d.) The AI architecture has four fundamental levels. Each of these layers employs distinct technology to provide a certain function. Here is a breakdown of the events that occur at each stratum. Fig. 4 presents an overview of the AI platform architecture layer.

1. First layer: data layer. AI utilizes a range of methodologies, including ML, NLP, and picture identification. Data is the core element of these technologies and serves as the AI's fundamental layer. The primary objective of this layer is to preprocess data to make it suitable for AI applications. Contemporary algorithms, particularly those rooted in DL, necessitate substantial computational resources. Thus, this layer encompasses hardware components that function as a sublayer, offering the fundamental framework for training AI models. A third-party cloud provider can access this layer as a fully managed service.

2. Second layer: ML frameworks and algorithm layer. Engineers and data scientists create customized machine-learning frameworks to meet the specific requirements of individual commercial use cases. Afterward, developers can employ existing methods and classes to easily build and train models. A few instances of these frameworks include TensorFlow, PyTorch, and scikit-learn. These frameworks are essential components of the application architecture and provide the necessary functionality for easy AI model building and training.

3. The third layer: the model layer. In the model layer, it is the application developer's responsibility to implement the AI model and train it is using data and algorithms received from the previous layer. This layer is critical for the AI system's ability to make informed decisions. These are the layer's main components:

- Model structure

Layers, neurons, and activation functions determine the architecture of the model and collectively determine its capabilities. Depending on the specific challenge and available resources, individuals have the option to select from many types of neural networks, such as feedforward neural networks, convolutional neural networks (CNNs), or other types of networks.

- Model parameters and functions

Predictions rely heavily on values learned throughout training, including the biases and weights of neural networks. Minimizing the difference between the actual and anticipated outputs is the goal of the loss function, which assesses the model's performance.

- Optimization tool

This component does parameter optimization to reduce the loss function. Different optimization techniques, such as gradient descent and the adaptive gradient algorithm.

4. Fourth layer: application layer. The application layer, sometimes referred to as the customer-facing layer, is the fourth level of the AI architecture. Programmers can program AI systems to perform specific tasks, generate information, transmit information, or make decisions based on factual data. The application layer enables communication and engagement between end users and AI systems (Dubé et al., 2018).

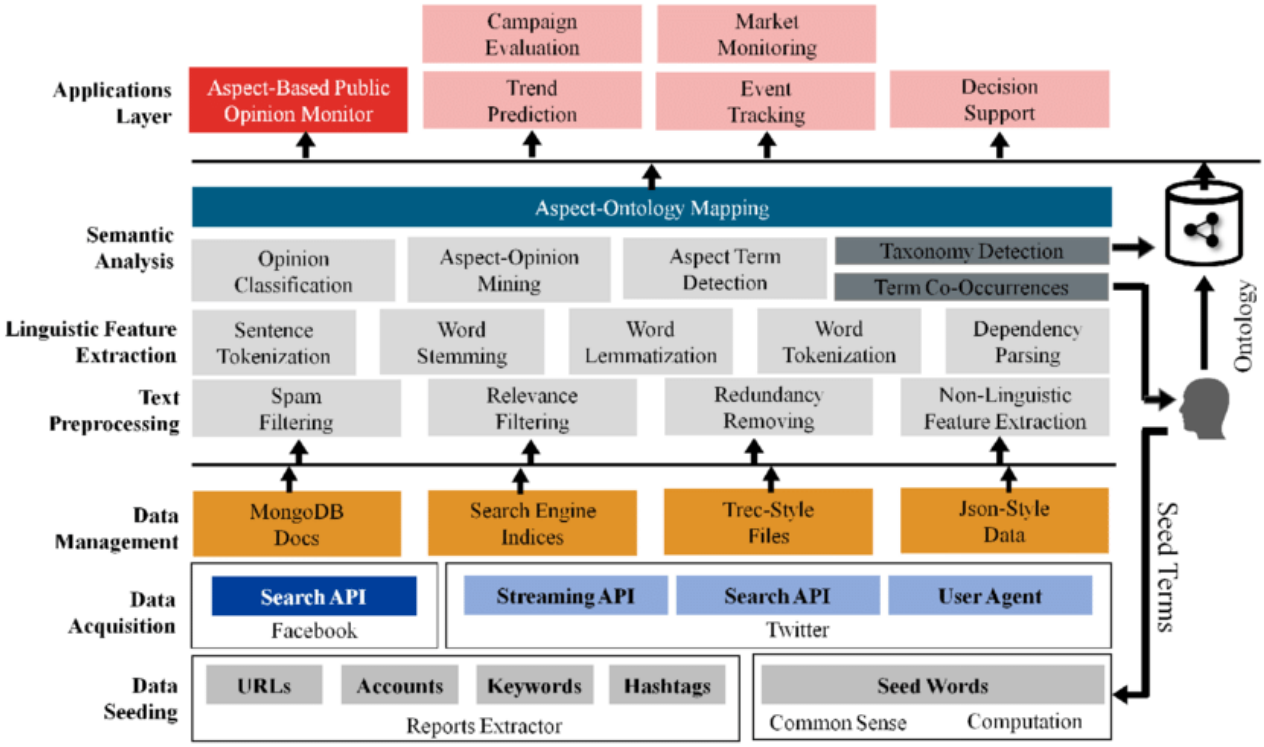

Fig. 4. Overview of AI platform architecture layer.

5.2. Challenges facing implementing AI.

AI encounters several obstacles that complicate its deployment. The subsequent hurdles exemplify the prevailing difficulties encountered in the implementation and utilization of AI.

1. Data digitalization. Data governance rules must comply with regulatory constraints and privacy legislation. To operationalize AI, it is important to effectively handle aspects of data quality, privacy, and security. We have a responsibility to ensure the protection and confidentiality of consumer data and privacy. To effectively handle data security, a company needs to have a comprehensive understanding of how AI models utilize and engage with client data at all levels.

2. Functioning or operation of technology. Utilizing ML to train AI requires substantial resources. For DL algorithms to operate effectively, a substantial amount of computational power is required. To effectively operate AI applications and train models, it is essential to have a strong and resilient computing infrastructure. The cost of processing power or the limited scalability of AI systems might pose challenges.

3. Constraints of data. To develop impartial AI systems, large amounts of data must be provided as input. It is important to possess sufficient storage capacity to effectively manage and analyze the training data. Similarly, it is essential to have expertise in governance and data quality procedures to guarantee the accuracy of the data utilized for training purposes.

6. Discussion

AWS offers a wide range of services, tools, and resources to fulfill your AI technology needs. AWS provides enterprises of any scale with the means to utilize AI, enabling them to develop cutting-edge technologies without the need to concern themselves with infrastructure resources (*Machine Learning and Artificial Intelligence - Amazon Web Services*, n.d.).

AWS ML and AI offers a wide range of services for developing and expanding AI applications for various use cases. Here are some examples of AWS services that can be used:

1. Amazon Code Guru Security is used to discover, monitor, and fix code vulnerabilities.
2. Amazon's fraud detection service is used to detect online fraud and improve detection models.
3. Amazon Monition is used to detect infrastructure issues before they occur.
4. Amazon Recognition is used to automate, simplify, and scale image recognition and video analysis.

5. Amazon Extract is used to extract printed text, and analyze handwriting.
6. Amazon Transcribe is used to convert speech to text.

7. Conclusion

AI offers several benefits in a variety of fields, including e-government. AI and ML are widely believed by experts to have the capacity to improve the quality of electronic services. AI offers distinct benefits such as increased competitiveness, less work, and minimized faults in electronic applications. In our endeavor to investigate the foremost opportunities and problems of AI in the realm of implementing intelligence and embracing e-government, we have arrived at numerous outcomes, including:

Initially, AI was conceptualized as theories and philosophy. It then evolved into rules and laws that govern machine intelligence and subsequently advanced into learning algorithms. However, today it has transcended its previous boundaries and is no longer confined to being solely a scientific field or a set of algorithms. Instead, it has transformed into an industrial revolution comparable to the groundbreaking inventions of the steam engine, electricity, and digital chips. The significance of using AI approaches is acknowledged for its notable influence in enhancing services, owing to their characteristic activities such as adaptability to varying wants and offering many options for dependence. One of the key benefits of AI approaches is their ability to decrease the time and cost associated with building these systems. Intelligent apps using AI assist users in breaking free from conventional practices, nevertheless there is a dearth of enthusiasm in educating users of electronic applications to use contemporary technology. Experts assert that AI systems have the capability to effectively handle and deliver superior service and work quality. This can be achieved by transforming the application management system into electronic systems that are powered by AI. Consequently, this will facilitate accurate administrative decision-making with a reduced margin of error. AI confers several advantages across diverse domains. This encompasses the concept of e-government, in which AI enables the provision of electronic services without limitations of time, location, or circumstances. Government entities that use AI have the potential to greatly mitigate fraud, waste, and abuse of AI. To begin the use of AI, it is essential to ascertain the primary domains in which this technology may be implemented inside a program. Another component pertains to guaranteeing enough quantity of data in this program to adequately train the system. Local and state governments may use candidate programs and enough data to effectively utilize current cognitive programs available in the market, therefore initiating a productive implementation of AI technology. The vendors of these technologies mostly focus on the government sector market, specifically about AI. The objective is to enhance the chatbot's telephone interaction to resemble a more authentic discussion. Presently, chatbots exhibit satisfactory performance when presented with inquiries that they comprehend and can respond to. However, this diverges from the inherent characteristics of interpersonal communication. When contacting a call center, both the employee and the caller engage in a series of question-and-answer exchanges to get clarity on the problem. Attaining a seamless conversation in which the robot engages in information exchange with the caller to comprehend their requirements is a crucial aspect of study in this domain.

Additional obstacles also emerge when the use of AI becomes more widespread. The first problem pertains to acquiring a more comprehensive understanding of the origin of certain interconnections. The distinction is in the presence of interconnections that can forecast air pollution trends and the subsequent use of these forecasts to make choices that impact the well-being and security of people, as well as significant government policies.

Hence, AI ought to function as a catalyst for augmenting the tasks executed by people, rather than serving as a replacement for them. Consequently, the individual in charge of making judgements using AI methods must possess knowledge about the data sources, outputs, and rationale that influenced the system's suggestion or connection.

Another problem lies in maintaining the neutrality of AI outcomes. Almaden Labs is dedicating significant effort to address the challenge of mitigating accidental bias in AI systems; however, it remains a complex problem to resolve. Local and state governments have additional obstacles when initiating AI implementation, in addition to the fundamental issues associated with AI technology. The government's adoption of AI technologies may have been delayed due to the ongoing decrease in expenditure in information technology in the government sector. The technological infrastructure

in both municipal and state governments is antiquated and has not kept up with the rapid advancements seen in the private sector.

The scarcity of data scientists in the government sector is a contributing factor to the sluggish adoption of AI technology in the same industry. In the absence of sufficient expertise or experience in developing AI solutions, local and state governments will depend on other entities to determine the optimal utilization of AI. It is important to acknowledge the apprehensions that folks have about AI. Hence, it is essential for the government to exhibit more transparency compared to the private sector when it comes to the implementation and use of AI.

References

Alqudah, M. A. (2021a). Investment Artificial Intelligence in Decision-making Processes in the Jordanian Ministry of Interior. International Journal of Innovations in Engineering Research and Technology, 8(10), 40–53.

Alqudah, M. A. (2021b). Towards the governance of government data using artificial intelligence. Available at SSRN 3992303.

Alqudah, M. A., & Muradkhanli, L. (2021a). Artificial Intelligence in Electric Government; Ethical Challenges and Governance in Jordan. Electronic Research Journal of Social Sciences and Humanities, 3, 65–74.

Alqudah, M. A., & Muradkhanli, L. (2021b). E-government in Jordan and studying the extent of the e-government development index according to the United Nations report. International Journal of Multidisciplinary: Applied Business and Education Research, 2(4), 365–375.

Alqudah, M. A., Muradkhanli, L., Muradkhanli, Z., & Salameh, A. A. (2023). Using Artificial Intelligence Applications For E-Government Services As Iris Recognition. 2023 IEEE 17th International Conference on Application of Information and Communication Technologies (AICT), 1–7. https://doi.org/10.1109/AICT59525.2023.10313183

Burrell, J. (2016). How the machine 'thinks': Understanding opacity in machine learning algorithms. Big Data & Society, 3(1), 2053951715622512.

Dubé, L., Du, P., McRae, C., Sharma, N., Jayaraman, S., & Nie, J.-Y. (2018). Convergent innovation in food through big data and artificial intelligence for societal-scale inclusive growth. Technology Innovation Management Review, 8(2).

Fei, J., & Wang, T. (2019). Adaptive fuzzy-neural-network based on RBFNN control for active power filter. International Journal of Machine Learning and Cybernetics, 10(5), 1139–1150.

Li, Y.-H., Huang, P.-J., & Juan, Y. (2019). An efficient and robust iris segmentation algorithm using deep learning. Mobile Information Systems, 2019.

Machine Learning and Artificial Intelligence - Amazon Web Services. (n.d.).

Marda, V. (2018). Artificial intelligence policy in India: a framework for engaging the limits of data-driven decision-making. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 376(2133), 20180087.

Mitrou, L. (2018). Data Protection, Artificial Intelligence and Cognitive Services: Is the General Data Protection Regulation (GDPR)'Artificial Intelligence-Proof'? Artificial Intelligence and Cognitive Services: Is the General Data Protection Regulation (GDPR)'Artificial Intelligence-Proof.

Phung, V. H., & Rhee, E. J. (2019). A high-accuracy model average ensemble of convolutional neural networks for classification of cloud image patches on small datasets. Applied Sciences, 9(21), 4500.

Salamah, A. A., Hassan, S., Aljaafreh, A., Zabadi, W. A., AlQudah, M. A., Hayat, N., Al Mamun, A., & Kanesan, T. (2022). Customer retention through service quality and satisfaction: using hybrid SEM-neural network analysis approach. Heliyon, 8(9), e10570.

Schmidhuber, J. (2015). Deep learning in neural networks: An overview. Neural Networks, 61, 85–117.

Silva Araújo, V. J., Guimarães, A. J., de Campos Souza, P. V., Rezende, T. S., & Araújo, V. S. (2019). Using resistin, glucose, age and BMI and pruning fuzzy neural network for the construction of expert systems in the prediction of breast cancer. Machine Learning and Knowledge Extraction, 1(1), 466–482.

Sun, T. Q., & Medaglia, R. (2019). Mapping the challenges of Artificial Intelligence in the public sector: Evidence from public healthcare. Government Information Quarterly, 36(2), 368–383.

Venugopalan, S., Xu, H., Donahue, J., Rohrbach, M., Mooney, R., & Saenko, K. (2014). Translating videos to natural language using deep recurrent neural networks. ArXiv Preprint ArXiv:1412.4729.

Wong, C., Guo, Z. X., & Leung, S. Y. S. (2013). Optimizing decision making in the apparel supply chain using artificial intelligence (AI): from production to retail. Elsevier.

Zisserman, A. (2014). Very deep convolutional networks for large-scale image recognition. ArXiv Preprint ArXiv:1409.1556.