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## Impact and usage of AI in public sector

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### Abstract

The utilization of AI is reshaping the operations of government agencies, bringing about valuable insights and streamlining routine tasks to enhance services provided to the public. This research paper investigates the transformative potential of Artificial Intelligence (AI) within the public sector, exploring its capacity to revolutionize governmental services. It explores a range of approaches in which AI can be leveraged to enhance government services, including the automation of processes, augmentation of decision-making processes, and facilitation of improved data accessibility. Additionally, the paper addresses the obstacles associated with the implementation of AI in the public sector, encompassing concerns related to privacy, costs, and limited expertise. Ultimately, it delves into the potential advantages derived from the adoption of AI within the government sector, such as heightened efficiency, enhanced customer service, and improved decision-making capabilities.

**Keywords:** Artificial intelligence, public sector, machine learning, deep learning, government

### 1. Introduction

The rise of artificial intelligence (AI) has brought about a paradigm shift in our interaction with technology. With its successful integration across various sectors, including healthcare and finance, AI is now making significant inroads into the public sector. This presents a transformative opportunity for governments to enhance their relationship with citizens by delivering more efficient services and improving decision-making processes. This research paper thoroughly explores the potential of AI in the public sector, with a primary focus on understanding the advantages and challenges associated with its implementation. Furthermore, it delves into the present state of AI adoption in the public sector and offers insights into potential future applications. Ethical considerations pertaining to AI in the public sector are also critically examined, emphasizing the necessity for governments to establish robust policies and regulations to ensure responsible and ethical use of AI technologies. By scrutinizing the potential of AI in the public sector, this research paper aims to provide a comprehensive understanding of how AI can be leveraged to enhance public services and decision-making. AI represents a dynamic and ever-evolving technology that possesses the capability to revolutionize the interactions between governments and their citizens. By automating mundane tasks such as data entry and document processing, AI liberates government employees to focus on more intricate responsibilities. Furthermore, AI enables the analysis of extensive data sets, providing governments with valuable insights into the diverse needs of their citizens. The personalization of services is another compelling aspect of AI, as it empowers governments to offer tailored advice and support to individuals based on their unique requirements. Ultimately, AI facilitates informed decision-making processes for governments by leveraging data-driven insights.

The immense potential of AI in the public sector is accompanied by various challenges during its implementation. To effectively harness AI's capabilities, governments must ensure the accuracy and currency of the extensive data required by AI systems. Moreover, they have the responsibility to safeguard AI systems from malicious actors and use the collected data responsibly. Transparency and accountability of AI systems are paramount, with governments taking the initiative to educate citizens about data usage practices. Ethical considerations are vital as well, demanding that AI systems are not employed to discriminate against specific groups. Although the current state of AI in the public sector is nascent, ongoing exploration reveals numerous promising applications. AI streamlines tedious tasks such as document processing and data entry while delivering personalized services to citizens. Its capacity to analyze vast data sets offers governments valuable insights into citizen needs, ultimately enhancing decision-making processes.

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Despite the vast potential of AI in the public sector, its implementation necessitates responsibility. Governments must prioritize secure AI systems, shielding them against malicious threats. Simultaneously, governments should address ethical implications, avoiding discrimination and ensuring equitable use. Ultimately, the development of policies and regulations is crucial to ensure the responsible deployment of AI in the public sector. In conclusion, AI possesses the power to revolutionize the interaction between governments and citizens, offering enhanced services and improved decision-making. However, responsible implementation is paramount, necessitating secure, transparent, and accountable AI systems. Ethical considerations must be integrated, and policies need to be developed to ensure the responsible utilization of AI. This research paper aims to explore the potential of AI in the public sector, facilitating a comprehensive understanding of how it can optimize public services and decision-making processes <sup>[1]</sup>.

Currently, governments around the world are leveraging Artificial Intelligence (AI) to streamline operations and automate tasks. Various notable applications of AI in the public sector are outlined below. AI algorithms are employed to analyze crime data, predicting areas prone to criminal activities, thereby enabling efficient deployment of police resources. This approach aids in reducing crime rates and enhancing public safety. For instance, the New Orleans Police Department utilizes a predictive policing system that utilizes historical crime data to identify high-crime regions and allocate officers accordingly. AI is utilized to identify fraudulent activities in government programs, such as welfare and unemployment benefits. By analyzing extensive <sup>[2]</sup>.

Datasets, AI systems can swiftly detect patterns of fraud and flag suspicious behavior for further investigation. The US government, for instance, has implemented AI-powered fraud detection systems to identify and prevent fraudulent activities in programs like Medicaid and the Supplemental Nutrition Assistance Program (SNAP). In urban areas, AI is deployed to optimize traffic flow, manage public transportation, and improve energy efficiency. Singapore's government, for example, has implemented a smart traffic system that utilizes AI and IoT technology to analyze real-time traffic data and adjust traffic light timings, alleviating congestion. AI is leveraged to analyze medical data, assisting in diagnoses, treatment planning, and drug development. Notably, the US Food and Drug Administration (FDA) has approved AI-powered systems to aid in diagnosing certain types of cancer, including breast cancer. AI is utilized to detect and respond to cyber threats, including hacking attempts and malware <sup>[4]</sup>. Through the analysis of network traffic and identification of malicious activity patterns, AI systems can promptly identify and counter cyber-attacks, safeguarding government networks and sensitive information. AI is employed to analyze satellite imagery and social media data for efficient response to natural disasters like hurricanes and earthquakes. The US Federal Emergency Management Agency (FEMA), for example, employs AI-powered systems to analyze satellite imagery, enabling swift and effective response in identifying damaged areas. Automating tax compliance processes, such as filing and auditing, is facilitated through AI. By analyzing vast amounts of data, AI systems can rapidly identify patterns of tax evasion and flag suspicious

activities for further investigation. AI is instrumental in enhancing the delivery of public services, including education and housing. The UK government, for instance, employs an AI-powered system that employs machine learning algorithms to match job seekers with suitable employment opportunities, effectively reducing unemployment rates. AI is used in the public sector to process and comprehend substantial volumes of unstructured data, encompassing news articles, social media posts, and government documents. This enables governments to identify patterns and trends in public sentiment, facilitating more effective response to public concerns. Furthermore, AI is utilized to analyze social media posts, call center data, and customer feedback to gauge public sentiment regarding government policies and services. Governments can then identify areas of negative public sentiment and take corrective measures to improve their policies and services. Lastly, AI is utilized to personalize and optimize the delivery of government services. For instance, it can recommend job training programs to unemployed individuals based on their skills and experience, ensuring that services are tailored to their specific needs and reach those who require them the most. In summary, the implementation of AI empowers governments to automate repetitive tasks, process large volumes of data, and make well-informed decisions. This contributes to improving the efficiency, effectiveness, and cost-effectiveness of government operations.

### Problem Formulation

Governments face challenges in reaching the intended beneficiaries with their policies, including those aimed at addressing unemployment and promoting women empowerment. The inability to accurately identify the target audience leads to the formulation of general schemes that often fall short of their desired outcomes. Several factors contribute to this issue, such as the high population density in India and the significant developmental disparities between rural and urban areas. Both rural and urban regions experience unemployment, although the causes may differ. Rural unemployment often stems from limited opportunities and low education levels, while urban unemployment is linked to a lack of industry and economic growth. Rural areas tend to have higher unemployment rates compared to urban areas, and the availability of government schemes and job opportunities also varies between these regions, with more opportunities typically found in urban areas <sup>[3]</sup>.

Consequently, there are significant gender disparities and limited opportunities for women. Many parts of India have restricted access to education and training for women, which restricts their employment prospects and earning potential. Although the government has introduced various policies to address these issues, the specific challenges can vary across different geographic regions. It is crucial to implement separate policies tailored to the needs of each region. However, the government has faced difficulties in accomplishing this due to the immense population size, which makes it physically challenging to gather precise survey data on regional demands. Artificial Intelligence can play a crucial role in overcoming these obstacles.

Artificial Intelligence (AI) is increasingly utilized in government policies to enhance efficiency and decision-making. Governments leverage AI to analyze data and forecast future trends, such as crime patterns, natural

disasters, and economic indicators. This enables proactive problem-solving and informed decision-making<sup>[5]</sup>. AI is also employed to automate repetitive tasks, including paperwork processing, responding to common queries, and detecting fraudulent activities. This streamlines processes and enhances the delivery of government services<sup>[6]</sup>. Furthermore, AI is used by governments to monitor surveillance footage and analyze large datasets to identify and prevent potential security threats. However, one significant area where AI can greatly assist is in enabling governments to make informed policy decisions for the betterment of their citizens.

### Proposed Methodology

Our model utilizes neural networks to predict the employment values of males and females in either the urban or rural sectors. The training data for this model consists of openly available government employment data, specifically focusing on the total number of males and females employed in different states within urban and rural areas. By

leveraging this neural network, we can effectively classify employment values into their respective sectors. This code implementation enables us to gain insights into the disparities between employment values in urban and rural regions, ultimately informing policy decisions related to employment<sup>[7]</sup>.

The application of this neural network model extends to women empowerment as well. By accurately and reliably predicting the employment values of males and females in urban and rural sectors, it becomes possible to identify areas where women may be underrepresented or face disadvantages in employment. This insight allows for targeted interventions and policies to improve women's employment opportunities. Furthermore, the neural network can uncover areas for improvement within the existing system, such as policies or practices that hinder women's employment. With the aid of AI, by providing a more accurate and reliable method of predicting employment values, we can strive towards ensuring equal opportunities for women in the workforce.

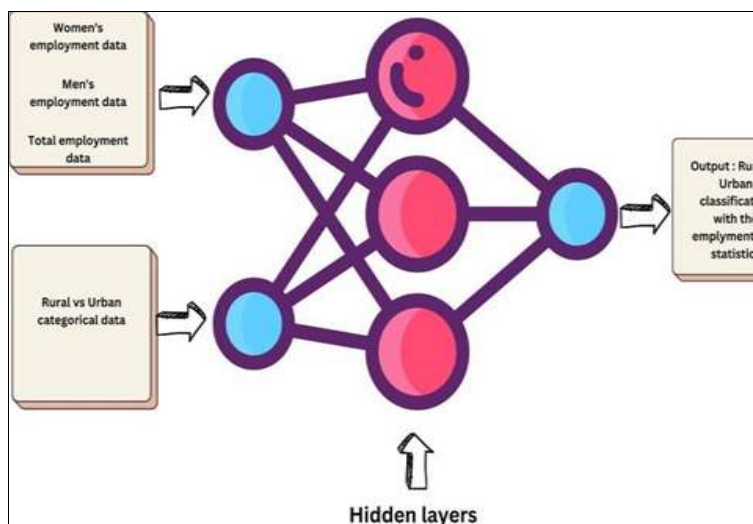


Fig 1: Neural Network proposed model

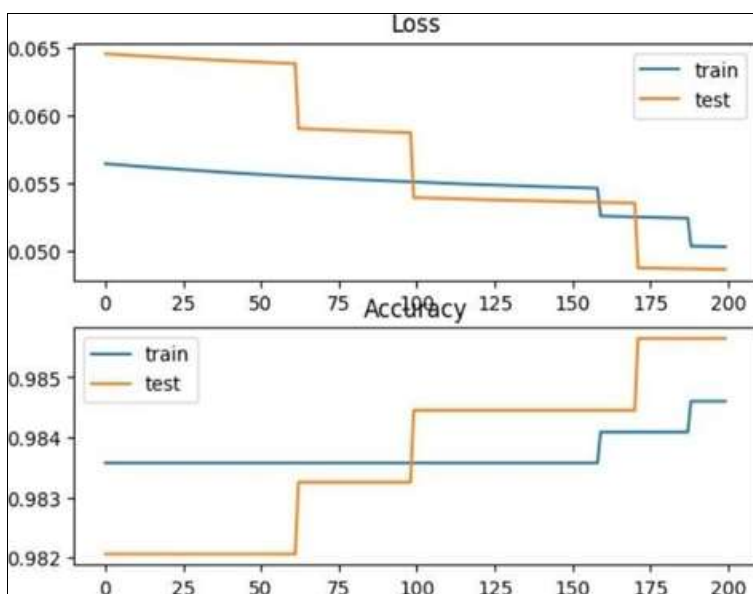


Fig 2: Loss and accuracy of proposed model

When it comes to evaluating the performance of our model, we observe that as the number of epochs increases during

training, the accuracy of the model also increases while the loss simultaneously decreases. This indicates that the model

is effectively learning and making more accurate predictions over time <sup>[8]</sup>.

The neural network architecture we have employed consists of several key components:

1. **Input Layer:** The input layer receives the data that is to be processed by the artificial neural network. In the context of a public sector application, this data could include various factors such as crime statistics, demographic information, or financial data.
2. **Hidden Layers:** The hidden layers perform the actual computations within the neural network. These layers consist of artificial neurons inspired by the neurons in the human brain. Each neuron receives inputs, processes them using activation functions, and passes the output to the next layer. The number of hidden layers and the number of neurons in each layer can be adjusted to optimize the performance of the neural network.
3. **Output Layer:** The output layer generates the final prediction or decision based on the data processed by the hidden layers. For instance, in a public sector application, the output layer may produce predictions regarding crime rates in specific areas or decisions about resource allocation.
4. **Training:** To train the artificial neural network, a large dataset is used as input along with corresponding output data. During training, the neural network's weights are adjusted using techniques like back propagation, enabling the network to make accurate predictions or decisions based on the input data.
5. **Evaluation:** Once the artificial neural network is trained, it is evaluated using a separate dataset to assess its performance. This evaluation helps gauge how well the model generalizes to new, unseen data.
6. **Deployment:** After successful training and evaluation, the artificial neural network can be deployed in the public sector application. It then becomes capable of analyzing vast amounts of data in real time, making predictions or decisions to support decision-making processes.

Indeed, artificial neural networks (ANNs) have found extensive applications in the public sector, contributing to more accurate predictions and informed decision-making. Their utilization extends to diverse areas such as fraud detection, risk assessment, public safety, healthcare, and transportation.

#### A. Natural Language Processing (NLP)

Natural Language Processing (NLP) is a branch of artificial intelligence (AI) that focuses on enabling machines to comprehend and interpret human language. Within the public sector, NLP offers valuable applications, particularly in automating customer service tasks and analyzing extensive textual data to uncover trends and patterns in public sentiment.

- **Automation:** NLP holds the potential to automate routine and repetitive tasks within the public sector, such as data entry, document analysis, and customer service. This can yield cost savings and enhance operational efficiency. For instance, NLP can automatically extract data from various documents like forms, contracts, and reports, obviating the need for manual data entry and resulting in significant time and

resource savings.

- **Decision-Making:** NLP's data analysis capabilities enable the exploration of vast datasets to derive insights that facilitate informed decision-making <sup>[9]</sup>. By leveraging NLP, the public sector can analyze public opinion on specific issues, gaining valuable insights into citizens' perspectives. This, in turn, aids policy formulation and helps meet the needs of the populace more effectively.
- **Natural Language Understanding:** NLP's proficiency in understanding spoken conversations and natural language enhances customer service experiences by delivering more accurate responses to inquiries. Moreover, it contributes to refining voice recognition systems, such as those employed in call centers, ensuring higher accuracy and improved customer interactions.

#### Machine Learning (ML)

In the public sector, Machine Learning (ML) can be a powerful tool to automate processes and improve decision-making. ML is a branch of AI that allows machines to learn from data without being explicitly programmed. Public sector applications of ML include fraud detection, risk management, and predictive analytics, as well as the development of personalized services for citizens, such as healthcare or education <sup>[10]</sup>. Here are a few examples of machine learning algorithms commonly used in the public sector:

- **Decision Trees:** These are supervised machine learning algorithms that identify patterns in data and make decisions based on those patterns. Decision trees are useful in public sector applications such as fraud detection, budgeting, and resource allocation.
- **Support Vector Machines:** These are also supervised machine learning algorithms that are used to classify data. They are commonly applied in the public sector for predicting fraud, analyzing customer behavior, and identifying trends in data.
- **Naive Bayes:** Another type of machine learning algorithm, Naive Bayes is often used in the public sector to predict crime rates, forecast budget needs, and analyze customer behavior.
- **K-Means Clustering:** This is an unsupervised machine learning algorithm that identifies clusters in data. It can be used in the public sector to predict crime rates, forecast budget needs, and analyze customer behavior.
- **Random Forests:** These supervised machine learning algorithms are used to classify data, making them useful for predicting fraud, analyzing customer behavior, and identifying trends in data in the public sector.

#### Computer Vision (CV)

Within the public sector, Computer Vision, a field of AI, empowers machines to perceive and interpret visual data. Its application in this sector encompasses automating tasks like facial recognition, license plate recognition, and object detection. Moreover, Computer Vision can facilitate data analysis to uncover trends and patterns in public opinion. Let's explore some specific applications of Computer Vision in the public sector:

- **Object Detection:** Algorithms designed for object detection allow for the identification of various entities



within images or videos. In the public sector, these algorithms find utility in detecting objects such as vehicles, people, and buildings in surveillance footage. This capability aids law enforcement and security personnel in monitoring public areas and recognizing suspicious activities.

- **Facial Recognition:** Facial recognition algorithms are employed to recognize and authenticate individuals based on their facial features. In the public sector, this technology finds application in identifying individuals captured in surveillance footage or verifying the access of individuals to secure areas.
- **Image Segmentation:** Image segmentation algorithms divide images into distinct segments. In the public sector, this technology can identify and categorize objects within an image. For instance, it can be employed to discern different types of vehicles in a traffic scene or classify various plants in an agricultural field.
- **Optical Character Recognition (OCR):** OCR algorithms extract text from images. This technology is valuable in the public sector for automatically processing documents like forms, contracts, and reports. It streamlines administrative processes and reduces manual labor.
- **Motion Detection:** Motion detection algorithms are instrumental in identifying movement within videos. In the public sector, this technology aids in detecting suspicious activities within surveillance footage and identifying environmental changes like floods or fires.
- **Image Classification:** Image classification algorithms assign labels to objects within images. This capability is useful in the public sector for automatically classifying objects within surveillance footage or categorizing images of plants and animals in nature reserves.

## Robotics

In the context of the public sector, Robotics, a subdivision of AI, empowers machines to interact with their surroundings and execute physical tasks, thus facilitating automation. Robotics finds applications in various public sector domains, including disaster response, search and rescue operations, and transportation [11]. Furthermore, Robotics can facilitate the development of personalized services for citizens, such as healthcare and education. Let's explore specific areas where Robotics can be leveraged within the public sector:

- **Autonomous Vehicles:** Within the public sector, autonomous vehicles are gaining prominence as effective means to alleviate traffic congestion, enhance safety, and reduce emissions. They can transport individuals or goods while adhering to predefined routes or adapting to obstacles. Autonomous vehicles also enable the provision of public transportation services like shuttles or buses.
- **Waste Management:** Robotics can contribute to waste management in the public sector. Robots can be employed to sort and segregate recyclable materials, as well as collect and transport waste. This application aids in minimizing waste accumulation and reduces waste management costs.
- **Security:** Robotics plays a crucial role in bolstering security in the public sector. Robots can patrol public areas, detect potential threats, and promptly notify

authorities during emergencies. This enhances public safety and security.

- **Healthcare:** Robotics finds utility in enhancing healthcare services within the public sector. Robots can assist in medical procedures, such as surgeries, or provide support to healthcare professionals. This application contributes to cost reduction in healthcare while improving the quality of patient care.
- **Education:** Robotics can also contribute to the public sector's educational endeavors. Robots can assist in teaching students, support educators, and aid in administrative tasks. By leveraging Robotics in education, the quality of learning can be enhanced, while accessibility to education can be improved for the general public.

## Automated Decision Making (ADM)

Automated Decision Making (ADM) is an integral aspect of AI that empowers machines to autonomously make decisions, eliminating the need for human intervention. In the public sector, ADM finds application in automating diverse processes, including fraud detection, risk management, and predictive analytics. Furthermore, ADM can facilitate the provision of personalized services to citizens, such as healthcare or education. Let's delve into a specific area where ADM can be utilized within the public sector:

**Predictive Analytics:** Predictive analytics, a form of automated decision-making, leverages data and algorithms to forecast future outcomes. This technique enables the public sector to proactively anticipate potential issues and make well-informed decisions. For instance, predictive analytics can be employed to identify regions characterized by high crime rates or poverty levels, as well as to forecast the potential impact of proposed policy changes. By harnessing predictive analytics, the public sector can optimize its decision-making processes and promote effective governance.

## Challenges

The government encounters numerous challenges when integrating AI into its operations, particularly in the context of India, where several factors contribute to the complexity of implementation. One significant obstacle is the scarcity of AI-trained professionals, coupled with a lack of technical expertise among government officials, impeding the effective deployment of AI-powered solutions. Furthermore, the inadequate maintenance and deficient quality of government databases in India pose difficulties in training and developing AI models.

Transparency issues often arise during the implementation of AI systems in the public sector, making it challenging for citizens to comprehend their functioning and hold officials accountable. Ethical concerns, such as bias and accountability, also emerge with the use of AI, necessitating governments to ensure transparency, fairness, and explainability of AI systems, alongside establishing appropriate oversight mechanisms.

India currently lacks a comprehensive legal framework to regulate AI usage in the public sector, leading to confusion and uncertainty among both government officials and citizens. Moreover, AI projects demand substantial funding, which many government agencies in India lack the

resources to invest in. The presence of organizational silos among different government agencies and departments further exacerbates the issue, resulting in a lack of coordination and ineffective utilization of AI systems. Additionally, resistance from government officials, who may be hesitant to alter established processes and procedures, hampers the adoption of new technologies. These multifaceted challenges in implementing AI underscore the need for addressing skill gaps, promoting transparency, establishing regulatory frameworks, securing adequate funding, fostering interdepartmental collaboration, and cultivating a culture of openness to technological advancements among government officials.

### Future Scope

The potential of AI in the government sector is immense and wide-ranging, offering numerous benefits. By harnessing AI technologies, government operations can be streamlined, leading to enhanced efficiency, cost reduction, and improved service quality for citizens.

One prominent application of AI is automating mundane and repetitive tasks, such as data entry and document processing. By delegating these tasks to AI systems, government employees can allocate their time and expertise to more critical responsibilities. Additionally, AI can analyze vast datasets, enabling government agencies to uncover valuable trends and patterns that inform better decision-making processes.

The utilization of AI can significantly enhance the accuracy of decision-making in various domains, including the criminal justice system. AI algorithms can process large volumes of data, aiding in assessing evidence, predicting outcomes, and facilitating fairer and more informed decisions.

AI also plays a crucial role in bolstering the security of government systems. AI-powered cyber security solutions can detect and respond to cyber threats in real-time, fortifying the protection of sensitive government data and infrastructure.

Furthermore, AI has the potential to revolutionize the delivery of public services, such as healthcare, education, and transportation. AI applications can optimize resource allocation, personalize services, and enable efficient decision-making processes, ultimately improving the quality and accessibility of public services for citizens.

As AI continues to advance, its integration into the government sector holds the promise of creating a more efficient, secure, and citizen-centric governance ecosystem. However, careful considerations must be given to ethical implications, data privacy, transparency, and ensuring that AI systems align with the values and needs of the public.

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