Novel system for online User data verification and comparison from E-Government using AI

[1]Jayababu Yasarapu,[2]Pendyala Manish Kumar,[3]Geeta Vijaya Kumar,[4]Yerramsetti Srinivasa Rao

Department of CSE, PRAGATI Engineering College(Autonomous), Surampalem, A.P, India.

ABSTRACT

Artificial Intelligence (AI) has recently advanced the state-of-art results in an ever-growing number of domains. However, it still faces several challenges that hinder its deployment in the e-government applications–both for improving the e- government systems and the e- government-citizens interactions. In this paper, we address the challenges of e- government systems and propose a framework that utilizes AI technologies to automate and facilitate e-government services. Specifically, we first outline a framework for the management of e-government information resources. Second, we develop a set of deep learning models that aim to automate several e- government services. Third, we propose a smart e-government platform architecture that supports the development and implementation of AI applications of e- government. Our overarching goal is to utilize trustworthy AI techniques inadvancing the current state of e- government services in order to minimize processing times, reduce costs, and improve citizens' satisfaction.
INDEX TERMS Artificial intelligence,deep learning, E-government, web services.

INTRODUCTION

Artificial Intelligence (AI) has been around for some decades in several theoretical forms and complicated systems; however, only recent advances in computational powers and big data have enabled AI to achieve outstanding resultsin an ever-growing number of domains. For example, AI have tremendously advanced the areas of computer vision, medical applications, natural language processing, reinforcement learning, and several other domains.AI can be defined asthe ability of a computer to imitate theintelligence of human behavior while improving its own performance. AI is not only robotics, rather an intelligent behavior of an autonomous machine that describes the brain of the machine and not its body; it can drive a car, play a game, and perform diverse sophisticated jobs. AI is a field that falls at the intersections of several other domains, including Machine Learning, Deep Learning, Natural Languages Processing, Context Awareness, and Data Security and Privacy. Figure 1 illustrates the intersections andrelationship of the AI field with relatedfields.

Machine Learning (ML) is the ability of an algorithm to learn from prior data in order to produce a smart behavior and make correct decisions in various situations that

it has never faced before. ML algorithms are enabled by training computational model, which is the process of exposing an algorithm to a large dataset (e.g., citizens' demographics) in order to predict future behaviors (e.g., employment rates).The process of learning from prior datasets is known as a supervised learning. Unlike traditional ML algorithms, Deep Learning, a subfield of ML, has emerged to outcome the limitations of prior ML algorithms. Deep learning can be defined as a mapping function that maps raw input data (e.g., a medical image)to the desired output (e.g., diagnosis) by minimizing a loss function using some optimization approach, such asstochastic gradient descent (SGD). Deeplearning algorithms, inspired by the neural networks in the human brain, are built with a large number of hierarchical artificial neural networks that map the raw input data (inserted at the input layer) to the desired output (produced at the output layer) through a large number of layers (known as hidden layers), and thus the name deep learning. The hidden layers are responsible for the actual mapping process, which is a series of simple but nonlinear mathematical operations (i.e., a dot product followed by an on linear process). The main advantage of deep learning is that it does not require feature engineering.

Despite the fact that deep learning has improved the state-of-art results in several domains, it is still evident that e- government applications face several challenges regarding adapting deep learning. First, given the recent and rapid advances in the deep learning domain, it is becoming more difficult to and experts of this technology who are capable of developing efficient and reliable AI applications, especially in third world countries. Second, the development life cycle of AI projects, specially deep learning, has introduced a new set of development challenges. In particular, traditional software development focuses on meeting a set of required functional and non-functional requirements; in contract, deep learning development focuses on optimizing a specific metric based on a large set of parameters, which is done in a unsystematic search approach. Third, integrating AI and deep learning applications in e-government services requires strong policies and measures on data security and privacy. However, there are still challenges that hinder the creation of concrete standards for data security and privacy, including citizen-governmenttrust, transparency, and other technical difficulties related to developing and implementing secure systems.

Objective of the project:

Artificial Intelligence (AI) has recently advanced the state-of-art results in an ever-growing number of domains. However, it still faces several challenges that hinder its deployment in the e-government applications both for improving the e- government systems and the e- government-citizens interactions. In this paper, we address the challenges of e- government systems and propose a framework that utilizes AI technologies to automate and facilitate e-government services. Specifically, we first outline a framework for the management of e- government information resources. Second, we develop a set of deep learning models that aim to automate several e-government services. Third, we propose a smart e-government platform architecture that supports the development and implementation of AI applications of e-government. Our overarching goal is to utilize trustworthy AI techniques in advancing the current state of e- government in order to minimize processing times, reduce costs, and improve citizens' satisfaction. services in order to minimize processing times, reduce costs, and improve citizens' satisfaction

LITERATURE SURVEY

Deep Residual Learning for Image Recognition Deeper neural networks aremore difficult to train. We present a residual learning framework to ease the training of networks that are substantially deeper than those used previously. We explicitly reformulate the layers as learning residual functions with reference to the layer inputs, instead of learning unreferenced functions. We provide comprehensive empirical evidence showing that these residual networks are easier to optimize, and can gain accuracy from considerably increased depth. On the ImageNet dataset we evaluate residual netswith a depth of up to 152 layers—8× deeper than VGG nets [40] but still having lower complexity. An ensemble of these residual nets achieves 3.57% error on the ImageNet test set. This result won the 1st place on the ILSVRC 2015 classification task. We also present analysis on CIFAR- 10 with 100 and 1000 layers. The depth of representations is of central importance for many visual recognition tasks. Solely due to our extremely deep representations, we obtain a 28% relative improvement on the COCO object detection dataset. Deep residual nets are foundations of our submissions to ILSVRC & COCO 2015 competitions1 , where we also won the 1st places on the tasks of ImageNet detection, ImageNet localization, COCO detection, and COCO segmentation.
Seven-layer deep neural network based on sparse autoencoder for voxelwisedetection of cerebral microbleed Seven- layer deep neural network based on sparse autoencoder for voxelwise detection ofcerebral microbleed

Translating Videos to Natural LanguageUsing Deep Recurrent Neural Networks Solving the visual symbol groundingproblem has long been a goal of artificial intelligence. The field appears to beadvancing closer to this goal with recent breakthroughs in deep learning for natural language grounding in static images. In this paper, we propose to translate videos directly to sentences using a unified deep neural network with both convolutional and recurrent structure. Described video datasets are scarce, and most existing methods have been applied to toy domains with a small vocabulary of possible words. By transferring knowledge from 1.2M+ images with category labels and 100,000+ images with captions, our method is able to create sentence descriptions of open- domain videos with large vocabularies. We compare our approach with recent work using language generation metrics, subject, verb, and object prediction accuracy, and a human evaluation.
Mastering the game of Go with deep neural networks and tree search
The game of Go has long been viewed as the most challenging of classic games for artificial intelligence owing to itsenormous search space and the difficulty of evaluating board positions and moves. Here we introduce a new approach to computer Go that uses ‘value networks’ to evaluate board positions and ‘policy networks’ to select moves. These deep neural networks are trained by a novel combination of supervised learning from human expert games, and reinforcement learning from games of self-play. Without any lookahead search, the neural networks play Go at the level of state-of-the-art Monte Carlo tree search programs that simulate thousands of random games ofself-play. We also introduce a new search algorithm that combines Monte Carlo simulation with value and policy networks. Using this search algorithm, our program AlphaGo achieved a 99.8% winning rate against other Go programs, and defeated the human European Go champion by 5 games to 0. This is the first time that a computer program has defeated a human professional player in the full-sized game of Go, a feat previously thought to be at least a decade away.

Large-Scale Machine Learning with Stochastic Gradient Descent
During the last decade, the data sizes have grown faster than the speed of processors. In this context, the capabilities of statistical machine learning methods is limited by the computing time rather than the sample size. A more precise analysis uncovers qualitatively different tradeoffs for the case of small-scale and large-scale learning problems. The large-scale case involves the computational complexity of the underlying optimization algorithm in non-trivial ways. Unlikely optimization algorithms such as stochastic gradient descent show amazing performance for large-scale problems. In particular, second order stochastic gradient and averaged stochastic gradient are asymptotically efficient after a single pass on the training set. IoT and AI for Smart Government: A Research Agenda The Internet of things (IoT) is the network of objects/things that contain electronics, software, sensors, and actuators, which allows these things to connect, interact, and exchange data. The users, sensors, and networks generate huge amounts of data from which governments can developapplications and gain knowledge using Artificial Intelligence (AI) techniques. Thus, IoT and AI can enable the development of valuable services for citizens, businesses, and public agencies, in multiple domains, such as transportation, energy, healthcare,education, and public safety. This guesteditorial for the special issue on IoT and AI for Smart Government, identifies the challenges involved in implementing and adopting these technologies in the public sector, and proposes a comprehensive research framework, which includes both IoT and AI elements for smart government transformation. Subsequently, the editorial provides a brief introduction of the six papers in this special issue. Finally, an agenda for future research on IoT and AI for smart government is presented, based on the proposed framework and gaps inexisting literature, supported by the papersthat were submitted to this special issue.The agenda comprises four directions i.e.,conducting domain-specific studies, goingbeyond adoption studies to examine implementation and evaluation of thesetechnologies, focusing on specificchallenges and thus quick wins, and expanding the existing set of researchmethods and theoretical foundations used. The role of trust in e-Governmenteffectiveness, operational effectiveness and user satisfaction: Lessons from Saudi Arabia in e-G2B Electronicgovernment (e-Government) systems are becoming an essentialstrategic tool in the delivery of e- Government-to-Business services (e-G2B).The purpose of this research is to exploredirect and indirect effects of trust in onlineservices on the satisfaction of the e-Government service users and otherperceptions such as e-G2B systemeffectiveness and the operational effectiveness of organizations. Based on a sample of e-G2B service users from SaudiArabia, our preliminary findings suggestthat the effects of trust on user satisfactionare mediated by e-G2B systemeffectiveness measures (e.g., System Quality, Service Quality, and Information Quality) and by operational effectiveness.In addition, we find that operational effectiveness and information quality arethe most important drivers of user satisfaction. In contrast to previous research, our results show a negative relationship between trust in online services and service quality and suggest that this finding may have importantimplications for theory and practice.
The public value of E-Government – Aliterature review
This study organizes existing research on the public value of e-government in order to investigate the current state and what value e-government is supposed to yield.

The two questions that guided the research were: (1) What is the current state of research on the public value of e- government? And (2) What value is e- government supposed to yield? Six, sometimes overlapping, values were found: Improved public services; improved administrative efficiency; Open Government (OG) capabilities; improvedethical behaviour and professionalism; improved trust and confidence in government; and improved social value and well-being. These six public value dimensions were thereafter generalized into three overarching, and also overlapping, public value dimensions of Improved Public Services, Improved Administration, and Improved Social Value. The improved public services dimension influences other dimensions. Hence, this literature study theorizes a descriptive and multidimensional framework that can improve our understanding of the public value of e- government from different viewpoints, and the overlap between them in actual e- government designs and implementations. Regarding the current state of research on the public value this study found a lack of research on the public value of e- government, especially, in the context of developing countries – and more importantly – a total absence of this kind of research in the Least Developed Countries (LDCs). There is also a lack of comparative studies at national, regional, and project level; and a lack of research onthe generative perspective.

Analysis of e-Government Strategies with Hesitant Fuzzy Linguistic Multi-Criteria Decision Making Techniques

In recent years, e-Government policies have undergone significant changesthroughout the global digital transformation. e-Government can be defined as the online delivery of government information and servicesthrough the Internet or other digital means.Diversely, e-Government is more than a new channel of delivering services for governments since it provides transparency and efficiency of administration. In 2011, two significant e-government strategy documents were prepared in Turkey. The aim of this study is twofold. First, we aim to provide an analytical tool prioritizing e-Government success factors. Second, we aim to rank e- Government strategies proposed byTurkey's ministries. For addressing these problems, Hesitant Fuzzy Linguistic (HFL) Multi-Criteria Decision Making (MCDM) technique is used. MCDM technique is applied to consider multiple success factors. Hesitant Fuzzy Linguistic Term Sets (HFLTS) technique isimplemented to represent decision makers' (DMs') preferences in complex circumstances such as uncertainty in DMs' evaluations and the difficulty aboutexpressing thoughts by numerical values. An application about e-Government adoption in Turkey is provided to illustratethe potential of the proposed technique.

Tactical Steps for E-Government Development

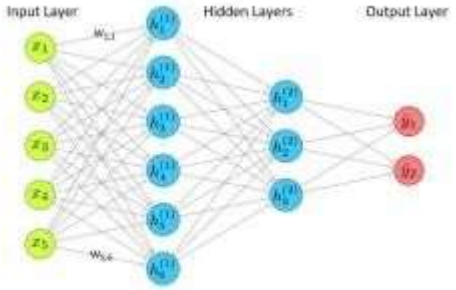
Information is a valuable commodity inthe era of globalization to be mastered in order to improve the competitiveness of an organization. This is evident from the various applications of Information and Communication Technology (ICT) that appear in some local governments. But the fact is that the utilization of ICT has not yet had a significant impact on the productivity of district government. One ofthe dominant causes is the lack of synchronization of the objectives of district governement activities with the purpose of activities undertaken by the government using Information Technology to provide services to the community (e- Government) itself. This paper discussesthe tactical steps of e-Government development based on the theory of various agencies that have implemented e- Government and will produce optimalresults.

Reinventing local governments and the e- government initiative

The Internet provides a powerful tool for reinventing local governments. It encourages transformation from the traditional bureaucratic paradigm, which emphasizes standardization, departmentalization, and operational cost-efficiency, to the "e-government" paradigm, which emphasizes coordinated network building, external collaboration,and customer services. Based on a content analysis of city Web sites and a survey of Web development officials, this article shows that many cities are already moving toward this new paradigm. These cities have adopted "one-stop shopping" and customer-oriented principles in Web design, and they emphasize external collaboration and networking in the development process rather than technocracy. The article also analyzes the socioeconomic and organizational factors that are related to cities' progressiveness in Web development and highlights future challenges in reinventing government through Internet technology.

IV. AUTOMATING E- GOVERNMENT SERVICES WITH DEEP LEARNING

Despite the existence of a plethora of e- government resources and data that could be utilized in ever-growing number of applications, data is not being utilized in a manner that facilitates and advances thecurrent e-government services using data- driven approaches. Utilizing advanced deep learning algorithms can significantly improve the current state of e-government services and systems to become more efficient and economic. In this section, we introduce several deep learning models that aim at automating several e-government services. We trained the models to high-accuracy results in the Arabic language to support e-government systems in Arabic-speaking countries. In particular, we developed deep learning models for (1) hand-written letters recognition, (2) hand-written digits recognition, and (3) Arabic sentiment classification. Each one of our trained models can be utilized in several services to automate the current systems. However, before presenting the models, we first provide the reader with a brief background on deep learning and how it works. A. DEEP LEARNING Deep learning is a subfield of machine learning that has achieved outstanding results across several domains, such as computer vision and natural language processing. Deep learning can be defined as a mapping function between raw input data and the required output. It is inspired by the brain's neural networks and thus its algorithms use artificial neural networks (also known as deep learning models) to optimize a loss function, often, using an iterative approach such as stochastic gradient descent (SGD). FIGURE 4. Deep learning architec



4. Deep learning architecture overview.

Related Work

Neural networks are organized inparticular layers divided into three categories: an input layer, hidden layers, and an output layer. Figure 4 depicts a general architecture for deep neural networks. The input layer (in Green) is responsible for entering the data to the neural network. The hidden layers 146824 VOLUME 7, 2019 O. S. Al-Mushayt: Automating E-Government Services With AI (in Blue) are responsible for transforming the data by applying a simplebut nonlinear mathematical transformation. The transformation is calculated by multiplying each input value by a corresponding weigh and then adding up these results to produce the activation value after applying an activation function to the weighted product (activation functions are used to break the linearity of the transformation). Equation 1 is a generalization of this transformation, where yˆ represents the network's output (i.e., prediction results), xi represents the input features, wi represents the weights of the synapses connecting the neurons, b represents the bias value, and the function represents an activation function.

$$\hat{y} = f(\sum_{i=1}^{n} x_i w_i + b)$$

CONCLUSION

With the recent advances in AI and deep learning technologies, more government agencies are starting to use such technologies to improve their systems and services. However, a large set of challenges hinder the adoption of such technologies, including the lack of experts,computational resources, trust, and AIinterpretability. In this paper, we introduced the definitions of artificial intelligence and e-government, briefly discussed the current state of e- government indices around the world, and then proposed our solutions to advance the current state of e-government, considering the Gulf Countries as a case study. We proposed a framework for management of government information resources that help manage the e-government lifecycle end-to-end. Then, we proposed a set ofdeep learning techniques that can help facilitate and automate several e-government services. After that, we proposed a smart platform for AI development and implementation in e-government. The overarching goal of this paper is to introduce new frameworks and platform to integrate recent advances in AI techniques in the e-government systems and services to improve the overall trust, transparency, and efficiency of e- government.

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