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Using Machine Learning and Artificial Intelligence to Automate Digital Government Services

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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 citizen's interactions. In this project, address the challenges of e-government systems and propose a framework that utilizes AI technologies to automate and facilitate-government services. Specifically, first outline framework for the management of e-government information resources. Second, develop asset of deep learning models that aim to automate several e-government services. Third, propose a smart e-government platform architecture that supports the development and implementation of AI applications of e-government. Over arching goal is to utilize trustworthy AI techniques in advancing the current state of e-government services in order to minimize processing times, reduce costs, and improve citizens 'satisfaction.

Keywords *– Cloud, Melanoma Detection, Deep Learning Networks*

1. INTRODUCTION

Artificial Intelligence (AI) has a rich and multifaceted history that spans several decades, from its inception in theoretical forms to its current state as a transformative force in the world of technology and beyond. The remarkable strides witnessed in AI in recent years are primarily attributed to the confluence of two critical factors: the exponential growth in computational power and the explosion of big data. These advancements have ushered in a new era for AI, enabling it to achieve unparalleled success across an ever-expanding spectrum of domains, including computer vision, medical applications, natural language processing, reinforcement learning, and numerous others. At its core, AI can be defined as the embodiment of a computer's ability to replicate and even surpass human intelligence while continuously enhancing its own performance. It is vital to dispel the common misconception that AI is synonymous with robotics. Rather, AI represents the cognitive capabilities of autonomous machines, focusing on the brain rather than the body. These intelligent systems can undertake a wide range of tasks, from driving cars and mastering intricate games to executing complex and diverse jobs that were once the sole purview of human expertise.

What makes AI particularly fascinating is its status as a multidisciplinary field that stands at the intersections of various other domains, each contributing to its development and application. Among these domains, Machine Learning (ML), Deep Learning, Natural Language Processing, Context Awareness, and Data Security and Privacy are pivotal in shaping the trajectory of AI. Together, these areas form a dynamic ecosystem that empowers AI systems to achieve remarkable feats, paving the way for groundbreaking innovations in the world of technology and beyond.

Machine Learning (ML) serves as the cornerstone of AI, providing algorithms with the capacity to learn from historical data and subsequently make intelligent decisions in novel and uncharted situations. The process of teaching an algorithm to recognize patterns and make informed choices is fundamentally rooted in exposing it to substantial datasets, a practice known as supervised learning. This data-driven approach fundamentally distinguishes AI from mere automation, allowing it to transcend pre-programmed rules and adapt to ever-evolving circumstances. To comprehend the profound impact that AI has had on society, it is essential to embark on a journey through its historical evolution.

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AI's roots can be traced back to the mid-20th century when pioneering figures such as Alan Turing and John McCarthy laid the theoretical foundations for intelligent machines. Turing's concept of a universal machine and McCarthy's introduction of the term "artificial intelligence" set the stage for decades of exploration and experimentation.

In the early years, AI predominantly focused on Symbolic AI, characterized by the encoding of human knowledge and rules into computer programs. Expert systems, such as MYCIN for medical diagnosis and Dendral for chemical analysis, exemplified this early AI era. However, these systems were limited in their ability to handle uncertainty and adapt to new scenarios, leading to stagnation and disappointment. This period of disillusionment became known as the "AI winter." Funding and interest in AI dwindled as the field grappled with the limitations of symbolic reasoning and rule-based systems. Progress was slower than initially anticipated, causing many to question the feasibility of creating truly intelligent machines. Amidst the challenges of the AI winter, a paradigm shift was underway. Researchers began to explore Machine Learning as an alternative approach, where algorithms could learn from data rather than relying on explicit programming of rules. This shift, combined with advances in computational capabilities and the availability of massive datasets, marked the inception of a renaissance in AI.

The resurgence of Machine Learning breathed new life into the field, and it was further accelerated by the advent of Deep Learning. This subset of ML introduced neural networks with multiple layers, enabling the processing of complex data types such as images and natural language. Breakthroughs in deep neural networks, including convolutional neural networks (CNNs) for computer vision and recurrent neural networks (RNNs) for sequential data, ushered in a new era of AI capabilities. The implications of this renaissance were profound. AI's applications spanned across domains, with computer vision achieving unprecedented levels of accuracy in image recognition tasks. In the realm of medical applications, AI showcased its potential in diagnosing diseases from medical images and predicting patient outcomes. Natural language processing enabled machines to comprehend and generate human language, paving the way for virtual assistants and chatbots. Reinforcement learning, a branch of AI focused on decision-making, found success in areas like autonomous driving and game playing, with AlphaGo's victory over a world champion Go player serving as a milestone achievement.

As the AI landscape continued to evolve, it became clear that its resurgence was not a mere fleeting moment but a sustained transformation that held immense promise. This revitalized AI landscape was characterized by the diversity of its applications and the depth of its impact on society. However, it also introduced a new set of challenges and considerations, including ethical concerns and the need for robust data security and privacy measures. The synergy between AI and various fields of study underscores the interdisciplinary nature of AI's success. Machine Learning, with its data-driven approach, serves as the engine that powers AI's ability to learn and adapt. Deep Learning, a subset of ML, amplifies AI's capabilities in processing complex data, allowing it to excel in tasks like image recognition and language understanding. Natural Language Processing empowers AI to interact with humans in a more human-like manner, enabling seamless communication. Context awareness infuses AI with the ability to understand and respond to the environment, making it more adaptable and user-centric. Meanwhile, the critical domain of Data Security and Privacy ensures that AI technologies are deployed responsibly and ethically, instilling trust among users and stakeholders alike. In the subsequent sections of this exploration, we will delve deeper into the multifaceted aspects of AI, examining its far-reaching impact on society, ethical considerations that accompany its deployment, and the challenges that it confronts on the path to even greater achievements. Furthermore, we will explore the future of AI, envisioning the possibilities that lie ahead and the potential for AI to continue reshaping the world as we know it.

2. LITERATURE REVIEW

Deep residual learning for image recognition

Deeper neural networks are more 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 nets with a depth of up to 152 layers---8x deeper than VGG nets but still having lower complexity. An ensemble of these residual nets achieves 3.57% error on the ImageNet's set. This result won the 1st place on the ILSVRC 2015 classification task. We also present analysis on CIFAR-10 with 100 and 1000layers. 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 competitions, 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 auto encoder for voxel wise detection of cerebral microbleed

In order to detect the cerebral micro bleed(CMB) voxels within brain, we used susceptibility-weighted imaging to scan the subjects. Then, we used under sampling to solve the accuracy paradox caused by the imbalanced data between CMB voxels and non-CMB voxels. we developed a seven-layer deep neural network (DNN), which includes one input layer, four sparse auto encoder layers, one softmax layer, and one output layer. Our simulation showed this method achieved a sensitivity of 95.13%, a specificity of 93.33%, and an accuracy of 94.23%. The result is better than the three state-of-the-art approaches.

Translating videos to natural language using deep recurrent neural networks

Solving the visual symbol grounding problem has long been a goal of artificial intelligence. The field appears to be advancing closer to this goal with recent break throughs 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 its enormous search space and the difficulty of evaluating board positions and moves. Here we introduce a new approach to computer Go that uses‘ value net works’ 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 look a head 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 of self-play. We also introduce a new search algorithm that combines Monte Carlo simulation with value and policy networks. Using this search algorithm, our program Alpha Go 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 beat least a decade away.

3. METHODOLOGY

Despite deep learning advancements, e-government faces challenges: scarcity of experts, especially in

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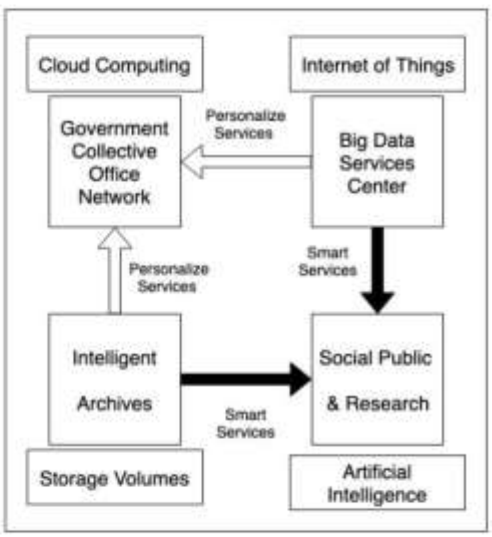
third-world nations; unique development lifecycles with metric-based optimization; and data security concerns hindered by trust, transparency, and technical difficulties in creating concrete standards.

Disadvantages:

- Still challenges that hinder the creation of concretes and adds for data security and privacy, including citizen.
- government trust, transparency, and other technical difficulties related to developing and implementing secure systems.

E-government utilizes advanced electronic techniques and web services to enhance government services for citizens and businesses. It aims to boost government



efficiency and reduce costs, benefiting economies, especially in developing countries. E-government facilitates B2B transactions, brings citizens closer to businesses (B2C), enables productive G2C, G2B, and G2G interactions, and strives for higher service quality and cost reduction.

Advantages:

- Enhance the quality and efficiency of the government services while reducing cost.

Fig.1: System architecture

MODULES:

To carry out the aforementioned project, we created the modules listed below.

- Upload Insurance Dataset
- Explore Insurance Dataset
- Run Machine Learning Algorithm
- Predict BMI Based Insurance Charges
- Predict Sentiments on Insurance

4. IMPLEMENTATION

Machine Learning:

Before we take a look at the details of various machine learning methods, let's start by looking at what machine learning is, and what it isn't. Machine learning is often categorized as a subfield of artificial intelligence, but I find that categorization can often be misleading at first brush. The study of machine learning certainly arose from research in this context, but in the data science application of machine learning methods, it's more helpful to think of machine learning as a means of building models of data.

Fundamentally, machine learning involves building mathematical models to help understand data. "Learning" enters the fray when we give these models tunable parameters that can be adapted to observed data; in this way the program can be considered to be "learning" from the data. Once these models have been fit to previously seen data, they can be used to predict and understand aspects of newly observed data. I'll leave to the reader the more philosophical digression regarding the extent to which this type of mathematical, model-based "learning" is similar to the "learning" exhibited by the human brain.Understanding the problem setting in machine learning is essential to using these tools effectively, and so we will start with some broad categorizations of the types of approaches we'll discuss here.

Challenges in Machines Learning:-

While Machine Learning is rapidly evolving, making significant strides with cybersecurity and autonomous cars, this segment of AI as whole still has a long way to go. The reason behind is that ML has not been able to overcome number of challenges. The challenges that ML is facing currently are −

Quality of data − Having good-quality data for ML algorithms is one of the biggest challenges. Use of low-quality data leads to the problems related to data preprocessing and feature extraction.

Time-Consuming task − Another challenge faced by ML models is the consumption of time especially for data acquisition, feature extraction and retrieval.

Lack of specialist persons − As ML technology is still in its infancy stage, availability of expert resources is a tough job.

No clear objective for formulating business problems − Having no clear objective and well-defined goal for business problems is another key challenge for ML because this technology is not that mature yet.

Issue of over fitting & under fitting − If the model is over fitting or under fitting, it cannot be represented well for the problem.

Curse of dimensionality − another challenge ML model faces is too many features of data points. This can be a real hindrance.

Difficulty in deployment − Complexity of the ML model makes it quite difficult to be deployed in real life.

5. EXPERIMENTAL RESULTS

Fig.2: Click Upload Dataset

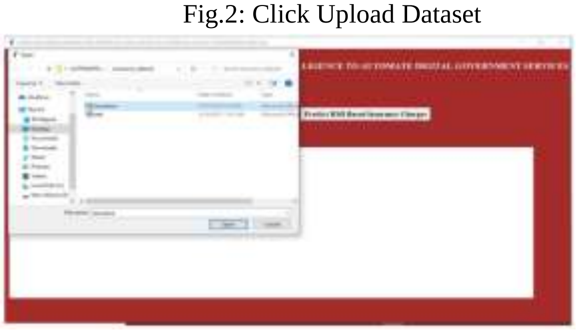


Fig.3: Load Insurance Dataset

Fig.4: Explore Insurance Dataset

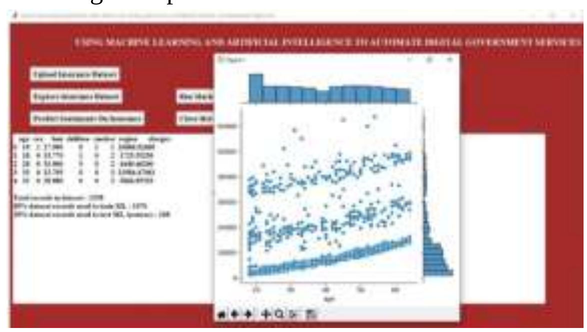


Fig.5: Run Machine Learning Algorithm

Fig.6: Accuracy score of model

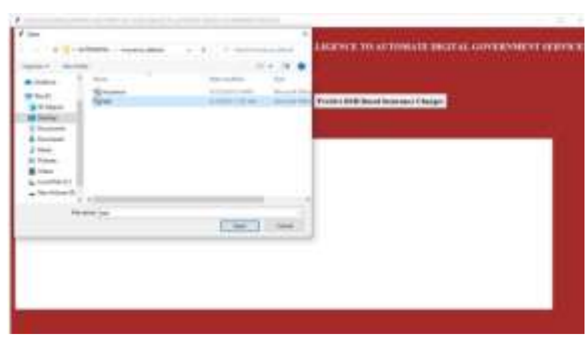


Fig.7: Predict BMI Based Insurance Charges

Fig.8: Output

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Fig.8: Predict Sentiments on Insurance

Fig.9: Output

6. 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 AI interpretability. 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 of deep 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 frame works 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.

7. FUTURE WORK

The future scope of this research envisions a transformative landscape for e-government across the Gulf Countries and beyond. As AI and deep learning continue to evolve, our proposed framework and smart platform hold the potential to revolutionize governmental systems worldwide. The prospects include the development of increasingly sophisticated AI models tailored to specific e-government services, enhancing their automation and efficiency. Furthermore, as trust and transparency are critical, ongoing research can focus on improving AI interpretability and accountability. Collaborations between governments and AI experts can bridge the skills gap and promote responsible AI adoption. Ultimately, this holistic approach promises to usher in an era of more accessible, secure, and citizen-centric e-government services on a global scale.

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