**INTRODUCTION**

Articial 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 results in an ever-growing number of domains. For example, AI have tremendously advanced the areas of computer vision [1], medical applications [2], natural language processing [3], reinforcement learning [4], and several other domains. AI can be defined as the ability of a computer to imitate the intelligence 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 \_eld that falls at the intersections of several other domains, including Machine Learning [5], Deep Learning [6], Natural Languages Processing [3], Context Awareness [7], and Data Security and Privacy [8]. Figure 1 illustrates the intersections and relationship of the AI \_eld with related \_elds.

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 hasnever faced before. ML algorithms are enabled by training a 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 de\_ned 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 as stochastic gradient descent (SGD) [9]. Deep learning algorithms, inspired by the neural networks in the human brain, are built with a large number of hierarchical articial 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 a nonlinear 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 [10]. First, given the recent and rapid advances in the deep learning domain, it is becoming more dif\_cult to \_nd experts of this technology who are capable of developing ef\_cient and reliable AI applications, especially in third world countries. Second, the development lifecycle 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 speci\_c 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-government trust, transparency, and other technical dif\_culties related to developing and implementing secure systems.