FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE AND DEEP LEARNING TECHNIQUES

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ABSTRACT

The present study insights on the fundamentals of artificial intelligence and deep learning along with their applications. There has been increased usage of internet and computer based applications which has resulted in expansion of newer and advanced tools for developing systems and processes to solve different problems. Among which artificial intelligence and deep learning techniques are associated with different domains and in this manuscript, there is brief discussion on its principles and characteristics.

Keywords: *Artificial intelligence, Deep learning, IoT, Machine learning*

INTRODUCTION

In this article, we discuss the origin of AI, fundamentals of AI and deep learning techniques, and then discuss how the limits of machine learning lead data scientists. We will keep all these technologies in the context of practical clinical set of examples and show how AI can act as a tool to support and amplify human cognitive functions for physicians delivering care to increasingly complex patients. The aim of this article is to provide the reader with a basic understanding of the fundamentals of AI. Its purpose is to demystify this technology for practising surgeons so they can better understand how and where to apply it. Even the demand coincides with the increase of deep learning approaches in almost each and every field of application target which are related to computer vision, including semantic segmentation or maybe in scene understanding (1-4).

ARTIFICIAL INTELLIGENCE AND DEEP LEARNING?

The dreams of forming many certain forms of intelligence that mimic our selves are away long existed, while many of them we can see in science fiction, over recent times we have been gradually making progress in building advanced intelligent machines that perform every task just like our humans. This forms of work done comes under artificial intelligence, deep learning one of a branch of AI, with the aim that is specified as moving machine learning closer to its original goals. The path which it pursues is a best attempt to mimic the activity in many layers of neurons, which is about 80 % wrinkly of the brain where the thinking has occurred. Generally in a human brain, there are almost 100 billion neurons and 100 t0 1000 trillion synapses. The fundamentals of artificial intelligence introduces the foundations of the present-day AI and gives information about recent developments in AI such as constraint satisfaction problems, adversarial, search and the game theory, statistical learn theory, automated planning, intelligent agents, information retrieval, natural languages, speech processing, and machine vision. Mostly particularly on the development of new algorithms and models in a field of computer science referred to as machine learning (5,6).

MACHINE LEARNING – ALGORITHMS THAT GENERATE ALGORITHMS

The algorithms are a step by step of instructions used to solve a problem. Algorithms were developed by programmers to instruct computers in many tasks, are the building blocks of the advanced digital world we observe today. Computer algorithms organize enormous amounts of data into information and services, on considering the basics of certain instructions and rules. It's an important topic to understand, because in machine learning, learning algorithms – not computer programmers – create the rules. Here Instead of programming the computer every step by step, this form of approach gives the computer instructions that allow it to learn from the given data without new step-by-step instructions which are by the programmer. This tells us computers can be used for new, much-complicated tasks that could not be manually programmed. some things like photo recognition applications for the visually impaired, or translating pictures into speech. The foremost basic process of machine learning is to give training data to a learning algorithm. Given the learning algorithm then generates a new set of rules, which are based on inferences from the data. This is a new form of generating a new algorithm, formally referred to as the machine learning model. By using many different training data, Here the same learning algorithm could be used to generate different models. For example, some type of learning algorithm could be used to teach the computer how to translate languages or predict the stock market. Lately Inferring new instructions from data is the core strength of machine learning. Finally, this highlights the critical role of data, the more data available to train the algorithm, the more it learns. In fact, there were many recent advances in AI have not been due to radical innovations in learning algorithms, but rather by the most enormous amount of data enabled by the Internet (7-10).

HOW MACHINES LEARN:

Although the machine learning model may apply a collection of different techniques, the methods for learning can hardly be categorized as three general types:

Supervised learning: learning algorithm is given labelled data and the desired output. example, pictures of car labelled "cars" will help the algorithm identify the rules to classify pictures of cars

Unsupervised learning: data given to the learning algorithm is unlabeled, and the algorithm is said to identify patterns in the input data. Example, the recommendation system of an e-commerce website here the learning algorithm discovers very likely items often bought together.

Reinforcement learning: algorithm interacts with the most dynamic environment that provides feedback in terms of rewards and punishments

INTERNET OF THINGS (IOT)

Another buzzword that no longer remains a buzzword but has become a full-fledged technology ecosystem in itself past years. IoT essentially is connecting many latest devices and creating a virtual network where everything works seamlessly via a single monitoring centre of sorts. IoT is a large network of connected devices – all of which gather and share data about how they are used and the environments in which they are operated. This includes everything from your: mobile phones, refrigerator, washing machines (7).

With IoT, there are smart cities with optimized like:

- traffic system,
- efficient waste management and
- energy use
- Machine Learning

MACHINE LEARNING

Machine Learning, computers are programmed to learn to do something they are not programmed in them to do: they learn by newly discovering patterns and insights from data. In general forms, we have two types of learning, supervised and unsupervised. Machine learning is not new to us. there are many of the learning algorithms that

spurred new interest in the field, like neural networks, are based on decades-old research (10-12). The present t growth in AI and machine learning is tied to developments in three important areas:

Data availability: around the globe, there are over 3 billion people are online with an estimated 17 billion connected devices or sensors. which generates a large amount of data which, combined with decreasing costs of data storage, is easily available for use. Here machine learning can use this as training data for learning algorithms, developing new rules to perform increasingly complex tasks.

Computing power: many powerful computers have the ability to connect remote processing power through the Internet make it possible for machine-learning techniques that process huge amounts of data.

Algorithmic innovation: modern machine learning techniques, specifically in layered neural networks – also known as "deep learning" – have inspired new services, but is also spurring investments and research in other parts of the field.

HISTORICAL TRENDS IN DEEP LEARNING

The easiest to understand deep learning with some historical context. Rather than providing a very detailed history of deep learning, we can see a few key trends such as:

- Deep learning has had a long and rich history but has left by many names reflecting different philosophical viewpoints, and has waxed and waned in popularity.
- It becomes more useful as the amount of available training data has increased.IIt models have grown in size over time as computer hardware and software infrastructure for deep learning has improved
- It has solved increasingly complicated applications with increasing accuracy over time.

Deep learning techniques

Deep learning is capturing the attention of all of us as it is accomplishing outcomes that were not previously possible. Deep learning is a machine learning technique that teaches computers to learn by example just as we learned as a child. We see this technology in autonomous vehicles. It enables the vehicle to distinguish between different objects on the road and enables the vehicle to stop when it sees a red light. In deep learning, a computer becomes proficient at performing tasks from images, text, or sound, and can realize state-of-the-art accuracy, many times exceeding human implementation. when the term deep learning is used, it usually refers to deep artificial neural networks. Deep artificial neural networks are a set of algorithms that have set new bests inaccuracy for critical problems, such as image recognition, sound perception, and language processing. Deep learning accomplishes perception accuracy at higher levels than ever before in areas such as consumer electronics, and it is vital for safety-critical applications such as autonomous vehicles. Current developments in deep learning have improved to the point where deep learning does better than humans in performing many tasks (12).

BUILDING INTELLIGENT MACHINES

Human brain is the most incredible organ in the human body. It dictates the way we perceive every sight, sound, smell, taste, and touch. It makes us to store memories experience emotions, and even dream. Without it, we would be primitive organisms, incapable of anything other than the simplest of reflexes. The brain is, inherently, what makes us intelligent. We can observe that the infant brain only weighs a single pound, but somehow it solves problems that even our biggest, most powerful supercomputers find impossible. Within a matter of months after birth, infants can recognize the faces of their parents, discern discrete objects from their backgrounds, and even tell apart voices. In a year, there were already developed an intuition for natural physics, this can track objects even when they become partially or completely blocked, and can associate sounds with specific meanings (12).

THE MECHANICS OF MACHINE LEARNING

To tackle these classes of problems, we should have to use a very different kind of approach to performing. Many things we learn in school growing up have a lot in common with traditional computer programs. We have learn how to multiply numbers, solve equations, and take derivatives by internalizing a set of instructions. Here the things we learn at an extremely early age, the things we find most natural, are learned by example, not by formula. For example, when we were two years old, our parents did not teach us how to recognize a car by measuring the shape of its nose or the contours of its body. by ourself learned to recognize a car by being shown multiple examples and being corrected when we made the wrong guess. In other forms, when we have our birth, the human brains provided us with a model that described how we would be able to see the world. When we grew up, that model would take in our sensory inputs and make a guess about what we were experiencing. When that guess was confirmed by our parents, our model would be reinforced. If our parents said we were wrong, we would modify our model to incorporate this new information. In our lifetime, this model becomes more and more accurate as we assimilate more and more examples. Obviously all of this happens subconsciously, without us even realizing it, but we can use this to our advantage nonetheless (10-12).

CONCLUSION

Future studies and research in this area will be interesting enough to check the possible application of these streams and get benefited and make the world more digital and user friendly.

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