A to I of Artificial Intelligence

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Abstract - *This article demonstrates about what is Artificial Intelligence (AI)? How it is distributed? How it has grown in different fields and what does our future look like with increased use of AI? How Artificial Intelligence (AI) like new technologies support to fight and look ahead against the new diseases? We aim to review the role of AI as a decisive technology to analyze, prepare us for prevention and fight with COVID-19 (Coronavirus) and other pandemics.*

KeyWords: Artificial Intelligence, Machine Learning, Deep Learning, Cyber security, Applications.

1. What is Artificial Intelligence?

The short answer to what is Artificial Intelligence? is that it depends on who you ask. A layman with a fleeting understanding of technology would link it to robots. They'd say Artificial Intelligence is a terminator like figure that can act and think on its own. An AI researcher would say that it's a set of algorithms that can produce results without having to be explicitly instructed to do so. And they would all be right. [1]

So to summarize, Artificial Intelligence is:

- An intelligent entity created by humans.

- Capable of performing tasks intelligently without being explicitly instructed.

- Capable of thinking and acting rationally and humanely.

1.2. AI as a Superset

Artificial Intelligence (AI) is a superset with Machine Learning (ML) being the subset of AI and Deep Learning (DL) being subset of ML. To better understand all of them, Let us dive in each technology [2].

AI the replication of Human Intelligence in computers was first adopted in a Dartmouth Conference organized by John McCarthy. AI was promoted globally as the science that could transform the world. In the day, the primary goal of AI was to assist computers to carry out tasks that were exclusively humanly possible, precisely, the tasks that needed brains to act. This was a beginning of an era that made corporations and governments turned heads towards AI. Over the course, giants like Amazon and Google powered up with AI by leveraging data to understand customer behavior and patterns [3].

AI is classified by its ability to imitate human behaviors, the hardware they use to do so, their applications in the real world and the theory of mind [4]. Using these features for comparison, all systems of AI actual and hypothetical fall into one of three types:

- ANI: Artificial Narrow Intelligence
- AGI: Artificial General Intelligence
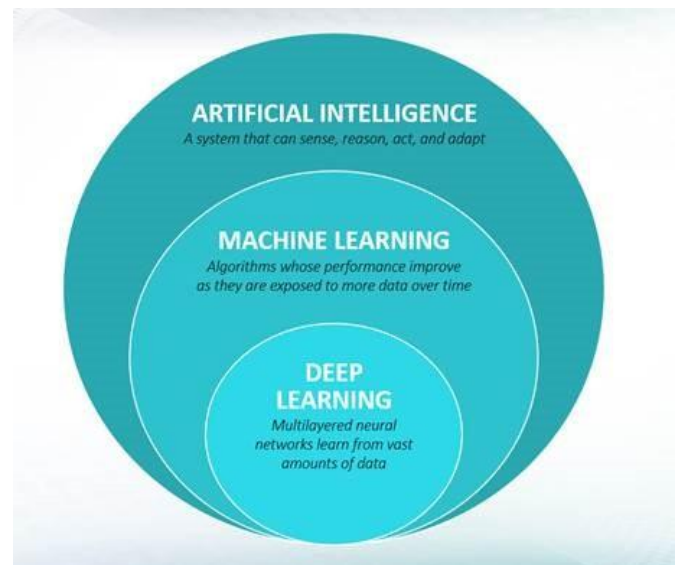- ASI: Artificial Super Intelligence

Fig -1: Artificial Intelligence and its subsets [5]

2. Machine Learning

Machine learning the subset of artificial intelligence (AI) defines one of the core tenets of Artificial Intelligence – the ability to learn from experience, rather than just instructions.

Machine Learning algorithms automatically learn and improve by learning from their output. They do not need explicit instructions to produce the desired output. They learn by observing their accessible data sets and compare it with examples of the final output. They examine the final output for any recognizable patterns and would try to reverse-engineer the facets to produce an output.

ML algorithms can be broadly classified into three categories:
- Supervised Learning
- Unsupervised Learning

- Semi-supervised learning
- Reinforcement Learning

3. Deep Learning

Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks. Deep Learning concepts are used to teach machines what comes naturally to us humans. Using Deep Learning, a computer model can be taught to run classification acts taking image, text, or sound as an input.

Deep Learning is becoming popular as the models are capable of achieving state of the art accuracy. Large labeled data sets are used to train these models along with the neural network architectures. [6]

Simply put, Deep Learning is using brain simulations hoping to make learning algorithms efficient and simpler to use. There are three fundamental network architectures used in DL as listed below:

- Convolutional Neural Networks
- Recurrent Neural Networks
- Recursive Neural Networks

4. AI in Cyber Security

When it comes to Cyber Security, the science of artificial intelligence, machine learning and Deep learning is the most common approach and term used to describe its application in cybersecurity. With the advancement in the field of artificial intelligence and growth in the number of applications of machine learning, new methodologies are being developed to make the cybersecurity space more automated and risk-free. With the application of these elements, the cybersecurity personnel can easily organize and manage log data. Cybersecurity involves a lot of data points that can make use of artificial intelligence, as AI is all about data clustering, classification, processing, filtering, and management.

AI, though a very strong concept, cannot set-up and run on its own. It needs to have specific data chunks based on which the decisions must be made. Machine Learning analyses data from the past and then comes out with the optimum solutions for both the present and the future. Therefore, the past data will have to be made available to make the combination of machine learning, artificial intelligence, and cybersecurity work [[7],[8]].

The Algorithms must be fed in so that the data from the past can be organized effectively. The system then has to provide instructions on various elements and patterns based on which it will scan threats and other malware. The algorithms have to be designed in such a way that the machine can easily differentiate between a normal situation and a situation where the security of the party involved is compromised.

With the help of this pre-defined pattern, the machine learning system recognizes the party trying to break into the system and disrupt the essence of it.

Fig -2: AI in Cyber Security [9]

With multiple applications, machine learning and artificial intelligence are a great investment for a company whose focus is on strengthening cybersecurity and minimising the loss of sensitive information. With these tools, cybersecurity is becoming stronger with every passing day.

5. AI in COVID-19 pandemic

AI is used everywhere in different domains by large organizations to give insights into user behavior and make an end user's life simpler. From music recommendations, map directions, mobile banking to fraud prevention, AI and other similar technologies have taken over.

In this worldwide health crisis, the medical industry is also looking for new technologies to monitor and control the spread of COVID-19 (Coronavirus) pandemic. AI is one of such technology which can easily track the spread of this virus, identifies the high-risk patients, and is useful in controlling this infection in real-time.

AI can help us to fight this virus by population screening, medical help, notification, and suggestions about the infection control [[10], [11], [12]]. This technology has the potential to improve the planning, treatment and reported outcomes of the COVID-19 patient, being an evidence-based medical tool. Fig -3 shows the general procedure of AI and non-AI based applications that help general physicians to identify the COVID-19 symptoms.

The below flow diagram informs and compares the flow of minimal non-AI treatment versus AI-based treatment. The below flow diagram explains the involvement of AI in the significant steps of treatment of high accuracy and reduces complexity and time taken. The physician is not only focused on the treatment of the patient, but also the control of disease with the AI application. Major symptoms and test analysis are done with the help of AI with the highest of accuracy. It also shows it reduces the total number of steps taken in the whole process, making more procurable in nature.
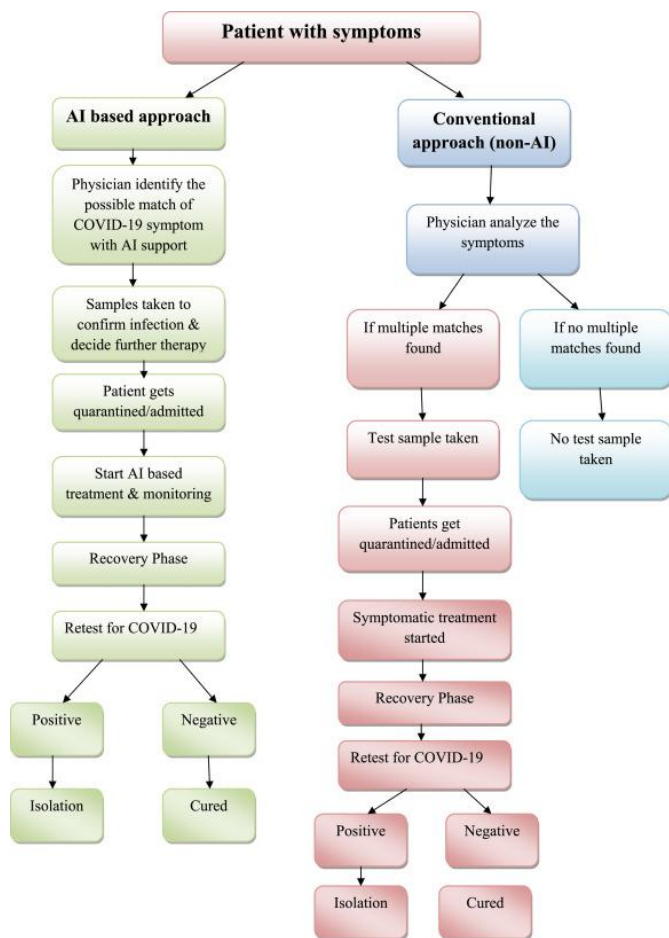
Fig -3: General procedure of AI and non-AI based applications that help general physicians to identify the COVID-19 symptoms.

6. CONCLUSIONS

Artificial Intelligence is the all-encompassing concept that initially erupted. It was then followed by ML that thrived later, and lastly DL that is now promising to escalate the advances of AI to another level.

AI is an upcoming and useful tool to analyze, prepare us for prevention and fight with viruses such as COVID-19 and other pandemics. Its significance is not only in field of health industry but in different other field as well.

AI is going to transform our world. It will change how we work, think and live. It has been touted as our Final Invention, a creation that would invent ground-breaking tools and services that would exponentially change how we lead our lives, by hopefully removing strife, inequality and human suffering. That's all in the far future though we are still a long way from those kinds of outcomes.

The key to setting yourself up for the future is conjunction with AI.

REFERENCES

[1] https://www.mygreatlearning.com/blog/what-is-artificial-intelligence/

[2] https://medium.com/mlait/what-is-al-ml-and-dl-c5c24093a005

[3] https://www.comakeit.com/blog/difference-artificial-intelligence-ml-dl/#:~:text=In%20simplest%20terms%20possible%2C%20AI,mental%20power%20through%20Artificial%20Intelligence

[4] https://towardsdatascience.com/understanding-the-difference-between-ai-ml-and-dl-cceb63252a6c

[5] https://blog.radware.com/security/2019/11/the-state-of-ai-in-cybersecurity-today/

[6] https://www.mygreatlearning.com/blog/what-is-artificial-intelligence/?highlight

[7] https://www.varonis.com/blog/ai-vs-ml-in-cybersecurity/

[8] https://www.mygreatlearning.com/blog/how-will-ai-and-machine-learning-affect-cyber-security/

[9] https://jewishlifenews.com/uncategorized/latest-now-artificial-intelligence-ai-in-cybersecurity-market-estimated-to-experience-a-hike-in-growth-global-industry-size-growth-segments-revenue-and-manufacturers/

[10] A. Haleem, M. Javaid, Vaishya Effects of COVID 19 pandemic in daily life Curr Med Res Pract (2020), 10.1016/j.cmrp.2020.03.011

 Google Scholar

[11] H.X. Bai, B. Hsieh, Z. Xiong, K. Halsey, J.W. Choi, T.M. Tran, I. Pan, L.B. Shi, D.C. Wang, J. Mei, X.L. Jiang **Performance of radiologists in differentiating COVID-19 from viral pneumonia on chest CT** Radiology (2020), 10.1148/radiol.2020200823

Google Scholar

[12] Hu Z, Ge Q, Jin L, Xiong M. Artificial intelligence forecasting of COVID-19 in China. arXiv preprint arXiv:2002.07112. 2020 Feb 17.

Google Scholar

[13] J. Stebbing, A. Phelan, I. Griffin, C. Tucker, O. Oechsle, D. S mith, P. Richardson

COVID-19: combining antiviral and anti-inflammatory treatments

Google Scholar

[14] Expert system team (2019) Expert system, What is machine learning? A definition.

 https://www.expertsystem.com/machine-learning-definition/