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Review Article

The Impact of Artificial Intelligence on the Modern Battlefield

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ABSTRACT

The rapid development of modern technology has made a significant impact on the various aspects of human lives. One important piece of technology that has recently come to the foray is Artificial Intelligence. Artificial Intelligence has already made an impact in the commercial and civilian fields. However, the technology's characteristics make it suitable for military application as well. This study is an attempt to understand the evolution of Artificial Intelligence and its applications in the civilian domain. At the same time, the study will also attempt to actively look into the military application of the technology as well. The study concludes that through the integration of Artificial Intelligence with the military affairs there will be a more synergistic and coordinated approach to the battles of the future. Also, the study has also concluded that Artificial Intelligence can lead towards the automation of various weapons platforms.

Keywords: Artificial intelligence; Unmanned aerial vehicles; Military application; Revolutionary technology

INTRODUCTION

The current era has seen a rapid development of modern technologies. Through the development of such technologies, humankind is furthering the development of the human race. In this regard, one of the key technologies under development is Artificial Intelligence. Even though Artificial Intelligence has adopted a multitude of meaning and explanation, a simpler way to explain Artificial Intelligence (AI) would be to make machines to be able to demonstrate cognitive behavior. Due to the vast potential of AI, the term has now become a common occurrence in modern scholarly debates. In particular, there has been focus on understanding the true potential of AI in various civilian spheres.

While there is no denying the fact that AI has had a major impact on the civilian spheres, there is also a need to understand the incorporation of AI in military affairs. As is with all technology, there is not only a civilian application, but also a military application. In the case of AI, there is a need to undertake a focused and in-depth study of the military applications of AI. The reason for this is the fact, that AI is being hailed as revolutionary technology that has the potential to change the way in which human civilization evolves.

In the case of military technology, it has also demonstrated trends of express improvement. There have already been marked improvements in Unmanned Aerial Vehicles (UAV), surveillance technologies, precision guided munitions, stealth technologies, are a testament to this fact. Therefore, there is a need to look into the future development curve of AI alongside modern military technology.

Therefore, this article will not only attempt to understand the evolution and development of AI but also attempt to understand the basic idea and understanding of the functioning of AI in the modern civilian spheres. However, the main focus of the article will be in understanding the potential impact AI has on modern battlefields. By undertaking an extensive study of the future role of AI on the modern battlefield, the aim is to predict the role that AI will adopt in future warfare.

LITERATURE REVIEW

Origin and Evolution of Artificial Intelligence

Even though the development of Artificial Intelligence (AI) has seen a rapid development in the past decade, the origins of AI can be traced back. One of the key developments in this regard has been the development of Artificial Neural Network (ANN) by Walter Pitts and Warren McCulloch [1]. Through the development of ANNs, there was a deeper understanding of the functioning of the human brain and how humans assimilate cognitive capabilities. The works of McCulloch and Pitts were important in terms of forming a baseline for the cognitive capabilities of the human mind. However, at this point, it must be said that the ANN model presented by Pitts and McCulloch were rudimentary at best, therefore it failed to provide a complete understanding of the functioning of the human brain. Nonetheless, it still serves as an important development for the future progression of AI.

In 1950, Alan Turing presented another perspective towards the

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development of machine intelligence and cognitive behavior. Turing authored a paper in which he deliberated the possibility of having cognitive machines. "Computing Machinery and Intelligence", written by Turing, saw Turing argue for the case that there is a possibility for future machines to think and act in manner which makes them resemble human intelligence and cognizance [2]. To demonstrate this, Turing proposed the "Imitation Game". According to Turing, the Imitation Game can be played by three players. Among the three players, one would play as the interviewer whose main objective would be to guess the sex of the other two players. Conversely, the other two players would actively try to deceive the investigator from guessing the sex of the players. The investigator can only ask questions to the players and not resort to any other means. Also, one of the main conditions of the Turing Game is that none of the players can be in the same room; they can only ask and answer questions through the use of computer terminals. To further his argument about Machine Intelligence, Turing proposed that one of the players should be replaced by a machine. Through the process of asking questions, the investigator would then guess that whether or not one of the players is a machine. According to Turing, if a machine successfully deceives the investigator by imitating human thought, then it can be considered as a machine capable of human intelligence.

Through the works of Alan Turing there was a much more focused approach towards the future of AI development. This is due to the fact that Turing helped remove the obscure and sometimes misinterpreted standards of intelligence. The idea of intelligence is a subjective debate [3]. Neither can intelligence be comprised into categories and nor is it the same for all humans. In fact, intelligence is one feat of humanity that is considered to be highly debatable. As there are no linear or straightforward definitions of intelligence, the works of Alan Turing become even more notable. Instead of setting a fixed standard, Turing proposed that one of the methods of measurement of intelligence is through actions. A machine which is capable of replicating human thought and actions can be considered intelligent. This removed a vague and seemingly obscure standard of intelligence set forth by the philosophers of the previous eras.

Not only did Turing help establish an understandable and measurable metric for machine intelligence, he also brought a scientific approach towards the development of AI. To achieve this, Turing actively worked towards separating theological and moral limitations from scientific studies. Prior to Turing, research on machine intelligence was hampered by theological or moral limitations. By helping develop a scientific approach towards the development of machine intelligence, scientists and researchers were more confident in furthering the study on achieving cognitive behavior for machines [4].

In the late 1950's and early 1960's there were attempts at developing machines capable of carrying out complex tasks. Such machines were modeled towards replicating intelligence. An example of this is the "General Problem Solver", a system developed by J.C. Shaw, Allen Newell and Herbert A. Simon in [5]. The General Problem Solver was designed as a system that was able to function as a problem solver. To achieve this, the system used a means-end analysis approach. Through the use of such an approach, the system would rely on determining the problem in terms of states. To achieve this, the system relied on understanding the difference in states and to address the difference would apply the suitable operators in order to reach the desired state as specified by the user [6]. The method relied on by the General Problem Solver is characterized as weak methods [7]. This is due to the fact that this method limits the operational range of the system. While weak methods can solve problems in a closed system, they fail at handling open system problems, as encountered in real life conditions.

The development of machine intelligence saw a gradual decline in the 1970's. One of the reasons attributed to this decline is the financial and technological limitations of the period. As we have discussed, the application of weak methods to systems allowed for a rudimentary level problem solving skill which was impractical for widespread usage. Another reason attributed to the decline is the fact that there was an overestimation of machine intelligence progression. Earlier research on machine intelligence had predicted that machine intelligence would be at par with human-level intelligence by 1980 and by 2000, machine intelligence would exceed human based intelligence. The widespread optimistic claims on the progression of machine learning hampered the development of machine intelligence because of the discouraging impact that it had on the research community. As a result of this, there was no significant progress in the early part of the 1970s.

The development of the Mycin, Dendral and Prospector systems in the latter half of 1970 signaled the progression of machine intelligence. The three systems mentioned above are categorized as Expert Systems. Instead of relying on a generic approach of general problem solving, these systems attempted a more knowledge inherent solution. In essence, these systems were designed for much defined purposes. NASA developed the DENDRAL to understand the molecular structure of Martian soil. By implementing the use of logic-gates (IF-THEN operators), the system would successfully identify the molecular structure by comparing the pattern to the vast database of molecular structures. By utilizing logic operators and comparing it with an enhanced inbuilt database, DENDRAL could present accurate results.

By developing a task specific system, DENDRAL had the ability to make a successful attempt at identifying the compound at hand. Hence, this characteristic of DENDRAL enabled it to present a commercial aspect as well. Therefore, DENDRAL was sold commercially as well, as knowledge specific system able to achieve specific tasks [8]. To demonstrate this, a survey in 1986 indicated that there were only 200 expert systems being utilized in different fields of science and medicine. The number grew to 2500 in 1993. The successes of systems such as DENDRAL were due to the fact that they were able to Engineer knowledge. The designers were able to convert the technical knowledge into computable data through the use of logic operators. This method of system design has been identified as "Knowledge Engineering".

However, the features which made Expert Systems an appealing prospect for also their downfall when it came to their widespread usage. Expert Systems were a reliable system when it came to handling specific tasks in a specific field. Outside of that field, the system cannot be deemed accurate or functional. The flexibility of such systems was also one of the problems. In order to make minor modification to an Expert System, an immense amount of manpower and time was required. These characteristics limited the use of Expert Systems to a specific field.

As expert systems had demonstrated, machine intelligence was possible but it was hampered due to the fact that it was not able to

enhance its own database and neither did it have any method or mode of learning new information. Due to these reasons, there has been an enhanced focus on understanding and developing ANNs. Recently, there has been an active in the scientific community to develop complex ANNs which are able to enhance their existing bodies of knowledge on their own. The simultaneous progression and development of neuroscience has also complemented the development of ANNs.

The progression of the modern AI has its roots in the development of modern ANNs. Whereas the previous eras of machine intelligence were focused on developing a system capable of solving specific problems utilizing built-in programming, modern vision for AI is to have complex ANNs that are able to learn, adapt and change their database and programming without the need of human involvement [9]. To achieve this, there is a need to have a deep enough understanding to develop complex ANNs. That is why the development of neuroscience has complemented machine learning. Therefore, the ultimate blueprint for future AIs is to have a self-aware system that is able to self-train. One of the methods of training is to have the machine or system learn to perform tasks by the repetition of performing the tasks.

Also, ANNs are very flexible due to the idea that they are designed with the ability to enhance their database and knowledge through their own learning. Self-learning and self-training is one of the most prominent and appealing aspects of the modern ANN. To achieve this, Back-Propagation Algorithms are deployed in ANNs. These algorithms allow the ANN to expand and learn new data based on the output of the current structure of its coding. Therefore, it can then modify its protocols to better perform the task. This cycle of learning is done by the machine on its own without the need of human input. Repetition of tasks and the ability to understand the results, allow the ANN to become much more flexible and diverse in the performance of tasks. Due to this reasons, ANNs are now handling increasingly complex problems in almost all spheres of life.

In order to further enhance the versatility and adaptation of ANNs, Fuzzy Logic is used. The term "Fuzzy Logic" was coined by in 1965 by Professor Lotfi Zadeh. In essence, Fuzzy Logic entertains the notion that a multi-valued logical calculus should be employed rather than a traditional Aristotle's logical calculus. through the utilization of Fuzzy Logic in ANN design, it reduces the logical or computational limitation of the previous era systems. Through the utilization of logical operators, Fuzzy Logic can allow the system to learn through the usage of "words". As a result of this, Fuzzy Logic has the ability to mimic intelligence because it deals with the "grey areas" of human computation [10-13]. As the human mind is unable to classify every piece of information into a true or false state, ANNs make the use of Fuzzy Logic to provide a bridge between the true and false states as found in Aristotle's logical calculus which is used widely among other computing system. The result of this is that modern intelligent machines can adapt and learn according to the different situations and as a result evolve their architecture to better handle the developing situation.

Another aspect of technology that aids modern ANNs is the implementation of multi-layered Perceptron's. A perceptron is an algorithm which is designed to implement the training process of an ANN into implementing binary classification [14,15]. One of the emerging characteristics of ANNs is "Deep Learning". The practice of Deep Learning is to train ANNs into extracting information from a given data set. This is accomplished by using different layers with the purpose of extracting specific information. Each progressive stage is utilized to perform extraction of specific information set 6from the data presented. The extracted information is then presented to the next layer, which further refines the research by extracting its own particular set of information [16]. In simpler terms, the output generated from the previous layer is presented as the new data set for the subsequent layer. By refining the information, the system is then in a position to assign a category to the data set. Therefore, this is the execution of an ANN equipped with multi-layered Perceptron's.

To further enhance the potential of ANNs, modern techniques such as Feed forward Neural Networks and Back propagation Algorithms are used. Both of the techniques mentioned, utilize the functioning of multi-layer Perceptron's in order to allow data to move among the layers. By combining such techniques and methods, the modern ANNs can demonstrate Deep Learning potential. The practice of Deep Learning, allows machines to gather and learn information on their own. In order to achieve this, ANNs are presented data sets in order to train them to classify information. The larger the data set, the more operating capacity of the ANNs. In fact, the training aspect of ANNs is very crucial as it allows them to learn the task at hand and how to execute them. ANNs that are trained on a larger and diverse database will have more potential to analyze information and characteristics as compared to an ANN that has been trained on a limited dataset. These characteristics have made the modern ANNs much more capable of analyzing and pick up patterns in random datasets, hence making them ideal candidates for Data Mining [17]. As compared to their human counter parts. This will be elaborated in the section below.

Role of AI in the civilian spheres

The utilization of ANNs in the civilian spheres is now becoming a common and widespread occurrence. As discussed earlier, due to the effectiveness of the Artificial Intelligence (AI) systems at recognizing patterns in random data sets, they are now seeing usage in social media and websites. One of the tasks assigned to the Artificial Neural Nets (ANN) is the role of data mining. Websites are utilizing ANNs to identify user patterns and then tailor content to their liking and appeal. To achieve this, ANNs monitor the usage pattern of a user and then identify the likes and dislikes of the user. As a result of this, the advertisements and contents can be tailored to suit the likes of the user. Through this, websites are able to attract more traffic due to the suitability of its content for particular users. Previously, such tasks would be handled by human operators which would lead to a lot of computational data and slow results. The incorporation of ANNs in the digital media has enabled websites and social media platforms to generate widespread following.

Not only are ANNs being used to handle data mining but they are also being used to monitor the content that is uploaded on social media websites. Mark Zuckerberg announced in 2018 to monitor and control the upload of violent content on Facebook. In particular, he mentioned the intentions to stop the propagation of murders and suicides on Facebook. In order to do so, he has hinted at the creation of an ANN to identify and remove violent or graphic content from Facebook. [18]. previously, this work was left to the human programmers and developers. They would rely on manual complaints from other users in order to assess the content and

then take appropriate action. However, under the supervision of an ANN, this content would automatically be detected as the ANN sweeps the website for inappropriate content and correlates them with its parameters. Such an approach reduces the workload on the human development team and at the same time results in quick action where necessary. Previously, it would require a very large manpower to adequately monitor the content uploaded on a website.

In terms of maintaining network security, ANNs are now in a position to demonstrate its potential at defending and securing communications. To illustrate this, Google announced that it had managed to develop an AI algorithm that was able to develop its own cryptographic algorithms in order to secure communications [19]. It was explained that in an experiment, two AIs were tasked with the objective of establishing communications with each other. The third AI was given the task of hacking into their communications. The result of the experiment saw that the two AIs were able to successfully encrypt their messages whereas the third AI was unsuccessful in hacking the encryption. The experiment may be considered as an important progression for future AI. As AI has now demonstrated its potential in securing and encrypting communications, there may be a possibility that in the future, AI will be tasked with handling cyber security. This is due to the fact, that AI does not have a fixed programming; rather it has an evolutionary mechanism that is able to modify and adjust its coding as necessary. This is also demonstrated by another project underway at Google. Google is now in the process of developing an AI that will be able to develop its own language and architecture. In essence, this entails a completely fluid algorithmic structure which can adapt, adjust and change with the change in the demands. Therefore, if cyber security is assigned to such AI, they will be able to adjust according to the level of threat that is presented before them. This can therefore lead to a further reduction of human staff required to uphold network security.

In terms of the military, AI also has vast applications. These applications can lead towards the development of a more comprehensive organization and structure of the armed forces that can respond in a timely and complete manner. The following literature will attempt to highlight the said impacts.

AI and the modern battlefield

The above stated section has helped us understand the potential of Artificial Intelligence (AI) and its utilization in the civilian spheres. The following discourse will help shed light on the possible utilization of AI in the military spheres and its implications for modern battles

As we have discussed, AI has demonstrated significant operational potential when it comes to Data Mining. This aspect of AI can be utilized in the military affairs for data fusion. The idea of data fusion is one of the main tenets of Revolution in Military Affairs (RMA). Under the current military force structure, the role of data fusion is handled by human operators. With the constant development of new air, ground, naval and space based data sensors the amount of data to be compiled is also increasing. This can lead to slower intelligence cycles and at the same time would require an increasing amount of manpower to correlate, compute and compile the given data into useful information.

The advancement in AI technology and the introduction of smarter and self-aware Artificial Neural Networks (ANN) can help with the data fusion aspect of modern battles. One of the features that favor the use of AI over humans is the learning curve of the AI. The advantage of AI is that it is able to compute at greater speed and process large amounts of data in relatively quick time. By incorporating battlefield sensors with AI, the relevant information required can be presented to commanders in quick time. The AI system can also help generate a 3D map of the battlefield situation which is updated in real time as new data is collated and compiled by the AI.

Modern warfare has seen an increase of Counter-Terrorism (COT) and Counterinsurgency (COIN) operations. An important aspect of these operations is effective surveillance. Modern surveillance platforms are being designed to further enhance surveillance on targets and provide intelligence. AI is also playing a role in the development of such platforms. In this regard, the Autonomous Real-Time Ground Ubiquitous Surveillance Imaging System (ARGUS) is an opportune example. According to the, Defense Advanced Research Projects Agency (DARPA), the operational range of ARGUS is 25 km^2. ARGUS has also been retrofitted to Reaper drones in order to provide operational intelligence on targets in battles. [20]. A 1.8 Gigapixel video surveillance platform is incorporated into ARGUS. There have been claims that ARGUS is able to identify individually each pedestrian and car. According to DARPA, ARGUS claims to recognize persons of interest from over 20,000 feet. However, this also means that the video data ranges in excess of 6,000 Terabytes per day [21]. Therefore, in order to handle such a large amount of data AI has been incorporated in order to categorize the data and highlight person or places of interests. Through the use of AI based autonomous surveillance systems such as ARGUS, COT and COIN operations can now be carried out with greater intelligence on targets.

Similarly, there has been the development of other autonomous surveillance systems that utilize biometric and facial recognition to recognize perpetrators of illegal activities. There has been the introduction of a surveillance system that is able to identify suspects even if they are using silicon masks to hide their identities. [22]. As a result of this, there can be a more comprehensive surveillance which will aid law enforcement authorities in maintaining peace. However, the amount of data generated by such systems is vast. Without the introduction of task specific ANNs, this data may not be utilized into actionable information.

The utilization of AI to develop fully autonomous combat platforms has been one of the most often highlighted aspects. AI can help unmanned vehicles to become autonomous and carry out commands according to their tactics and strategies. In essence, AI may allow unmanned platforms to perform the Observe-Orient-Decide-Act (OODA) loop on its own. One of the most probable platforms for the integration of AI to unmanned platforms may be to aerial vehicles. Unmanned Aerial Vehicles (UAV) has been in common usage by modern militaries to carry out limited strikes. By utilizing AI, UAVs may be trained to handle reconnaissance and surveillance missions on its own. There has been research to understand the potential of the application of AI to UAVs.

The research was based on an experiment involving AI based UAVs. The UAVs were responsible for delivering information to home base. The experiment created random and unfavorable circumstances for the relay of information such as equipment malfunctions and a deliberate fault in the means to relay information back

to home base. Even with all of the proposed problems, the UAVs were able to modify their strategies and achieve the objectives. It has to be reiterated that the mission strategy, execution and control was handled by the AIs only, without any human input [23].

By progressively demonstrating an enhanced intelligence quotient, autonomous platforms may see their role shift from purely reconnaissance missions to combat operations. The reason for this rationale can be explained due to the emotional and physical limitations of human beings. Human beings as a species are prone to be fatigued by work strain or emotions. This sometimes creates error in their judgments and may not always lead to a logical decision. Also, with the introduction of new sensors and surveillance platforms, the amount of computable data is constantly increasing. Therefore, it will require a progressively increasing amount of manpower to compute that data. Considering this, a case can be made for the introduction of AI in combat operations.

There has been development in the realm of autonomous combat aerial vehicles as well. One of the examples has been the X-47B Pegasus program. The X-47B is the first of its kind as it is an Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS) aircraft. It is under development by Northrop Grumman and it performed its debut aircraft carrier landing on 11 July, 2013 [24].

Through the development of the Pegasus program, the US aims to develop a modern era of aircraft that are autonomous. This fact can also be demonstrated by understanding that the X-47B has already taken on missions autonomously. The aircraft has carried out Air-to-Air refueling missions, flown alongside manned aircraft and performed night time operations. All of these operations were performed autonomously by the aircraft [25]. Similarly, it may be a possibility in the coming years to see combat operations handed to autonomous aircrafts as well. In this regard, the Pegasus program can serve as a launching pad for future autonomous aircrafts.

Conversely, if the aim is to hand over combat operations to autonomous vehicles, then it becomes crucial to ensure that the training of the AI is at an optimal level. To achieve this, the AI needs to be given a large and diverse data set to train on; this figure may even reach into the billions of gigabytes. Such measures are important so that the autonomous vehicles do not commit errors and mistakes because doing so can result in unnecessary casualties and damage.

Another method of further enhancing the training of autonomous vehicles can be by introducing training missions or missions of lesser intensity. These missions can ensure operational readiness of the autonomous vehicles. These training missions can be basic in nature and may be considered with surveillance and reconnaissance. Through the progression of such missions and by demonstrating the operational capabilities, autonomous vehicles may be given combat missions.

Future autonomous vehicles may also have the capability to self-train. Such autonomous vehicles may have the capability to salvage data from sources such as other AI machines or through the internet. By siphoning of data from other sources, these AI machines would not require formal training programs. Instead, they can continue further where the last machine left off.

We have already discussed in great detail that AI has demonstrated great potential when it comes to displaying intelligence and learning. Therefore, there is a possibility in the future that the tactical commands of squads might be handed over to AI. This may be due to the fact that AI has the ability to quickly gather intelligence and then present measures and countermeasures to the probable hurdles. Therefore, AI may be involved in the tactical planning of missions and then the mission execution.

Finally, it must also be highlighted that through the use of AI, the Network-Centric Warfare (NCW) phase of RMA can be furthered. NCW doctrine states that superior information position should be converted into battlefield advantage through the utilization of computer networking. NCW also argues that through the utilization of such a doctrine, "geographically dispersed forces" can perform in a more cohesive and coordinated manner [26].

Key postulates of the NCW doctrine are the timely dispersal of relative information and providing a timely update of the status of the battlefield and the various components. AI can help develop an infrastructure where timely information is mined and conveyed to the appropriate elements. In short, AI can help develop synchronization among the various branches of the forces. Due to this, there can be a comprehensive and enhanced operational potential of the forces.

RESULTS AND DISCUSSION

Artificial Intelligence (AI) has immense potential to help the human civilization progress further. AI may have great prospects for the progression of our species but it also leaves some dilemmas. Firstly, the interaction between AI and human workers will create organizational friction. This can be demonstrated by understanding the mechanization of factories. Workers and employees have resisted the mechanization of factories because it costs them their job. Such mindset may also apply in the military circles as well. It is also interesting to note that Carl Frey and Michael Osborne have predicted that 45% of the US jobs are at the risk of being automated due to the progression of AI [27].

Another dilemma posed with the full automation of weapons platforms is that should AI be provided the provision to enact an action which results in a human casualty? Or would such a power always rest with humans? As there is a great deal of complexity and sensitivity involved in this subject, the future may not see such power being handed over to AI. However, as AI technology is evolving at a consistent pace, and if it proves its reliability, it is a possibility that AI may be given the authority to take a human life.

Also, while it is true that there will be organizational friction and resistance to the application of AI, it needs to be understood that such resistance may reduce with the passage of time. As technology proliferates in a society, opposition to its usage tends to reduce. Also, as Constructivism also states that ideas, values and norms are social constructs which change over the passage of time. Therefore it can be argued that resistance to the application of AI will reduce over the passage of time.

There is also an argument that the utilization of AI may make governments powerful and intrusive. Such claims came forward after the confessions of Edward Snowden, who has claimed that the US Government relies on the use of AI to monitor its citizens. He further confessed the development of the PRISM program which enables the US Government to collect data from nine major internet websites [28].

On the other hand, the increasing cases of domestic terrorism in

the regions of Europe and North Africa lead to a change in the outlook regarding AI surveillance. Then Prime Minister of UK, Theresa May, has already opined the need to regulate the internet, "We need to work with allied democratic governments to reach international agreements to regulate cyberspace to prevent the spread of extremist and terrorism planning," [29]. She said. Similarly, France has also advocated the case for internet regulation on multiple international forums [30]. Therefore, in this regard, there seems to be the development of a narrative of the need to regulate the internet in order to counter terrorism. AI surveillance may provide the tool to achieve that goal. Whether or not that becomes an acceptable practice is a question that only time will tell. This is due to the fact that the notion of security or the idea of threats is socially constructed by the political elites. This notion has been argued by Constructivists as well. Therefore, it may not come as a surprise that AI surveillance becomes a norm in the future.

CONCLUSION

The possibility of having a weapons system dominant with battle space awareness and able to modify or integrate battle strategies autonomously has become a very distinct possibility. Through the utilization of AI, the data fusion aspects of battles will become streamlined and efficient. Similarly, it will allow for the integration and coordination among different sensors in battle to be more coordinated and integrated. Due to these reasons, the intelligence cycles of the modern battlefield may be reduced significantly leading to quicker mobilization of offensive or defensive assets.

In terms of potential in battle, AI can be used to plan for contingencies and have the proactive nature to be able to modify and change strategy in order to adapt to the changing dynamics. Due to this, there might be shifting and changing in the conventional organization of militaries. For instance, in the case of aircraft carrier groups, autonomous systems such as Unmanned Carrier Launched Airborne Surveillance and Strike (UCLASS) aircrafts along with miniaturized drones may be used to gather intelligence of targets and relay the information back to the headquarters. Similarly, it might also be a possibility that autonomous weapons platforms may be tasked with the responsibility of defending the carrier against airborne and naval threats.

There can be a possibility of introducing autonomous systems alongside other conventional weapon platforms such as tanks, armored personnel carriers, aircrafts etc. The autonomous systems can be miniature and autonomous and may be tasked with the responsibility of defending the aircraft or tank squadrons or maybe tasked with the acquisition of actionable intelligence. Either way, these systems maybe designed as completely autonomous without the requirement of having any human involvement at any level. Such systems and platforms carry out their tasks and inform the squadron leaders of any anomaly or update them on the status of the objectives.

Therefore, one might assume that AI may play a crucial role in the modern battlefield, from the inception of battle strategies to the on ground execution, AI maybe expected to see an enhancement in their purview in combat roles. Also, it must be reiterated that AI is capable of self-evolution and improvement. Therefore, one can assume that AI will be able to adjust and adapt according to the needs of the time without the need of human input.

REFERENCES

1. Michael N. Artificial Intelligence: A Guide to Intelligent Systems Essex: Pearson Education, 2007;5.1-407.
2. Turing AM. Computing Machinery and Intelligence. 1950;59(236):433-460.
3. Miksch S, Hunter J, Keravnou K, Negnevitsky P. Artificial Intelligence. 2007;39(2):97-98.
4. Turing A. Computing Machinery and Intelligence. 2004; 447.474.
5. Simon H A, Shaw JC, Newell A. Report on a General Problem-Solving Program. Rand J Econ. 1959;256:64.
6. Harry H. Artificial Intelligence: Mirrors for the Mind New York: Chelsea House, USA. 2007;33(3):400-422.
7. Negnevitsky M. Artificial intelligence applications to security control in power systems. 1999; 25.
8. Henderson M. Artificial Intelligence. 64. 1993;64(2):363-364.
9. Negnevitsky M. Artificial Intelligence. 1992;55(3):385-386.
10. Henderson M. Artificial Intelligence. 1996;86(2):407-408.
11. Multi-Leveled Calculus is one which states that at any given time there can be more than one true value.
12. Aristotle's logical calculus views only two possibilities at any given time, false or true.
13. Michael N. The Fuzzy Logic involves degrees of truth. This means that between true or false there can be a number of logical values. For more information, Artificial Intelligence a Guide to Intelligent Systems. 2007;89.
14. Negnevitsky M. Artificial Intelligence. 2005;165:267-268.
15. A binary classification comprises of classifying elements into two groups on the basis of a classification.
16. Deng L, Yu D. Deep Learning: Methods and Applications. Fou Tre Sig Pro. 2014;3(4):212-217.
17. Zdravko M, Daniel T. Data Mining is concerned with uncovering patterns in large data sets. Wiley 58:1-213.
18. Allen G. Mark Zuckerberg wants to stop suicides being broadcast on Facebook Live - here's his plan to stop it, The Daily Mirror. 2017.
19. Anthony S. Google AI invents its own cryptographic algorithm; no one knows how it works, Ars Technica. 2016.
20. Trimble S. Sierra Nevada fields ARGUS-IS upgrade to Gorgon Stare pod, Flight Global. 2014.
21. Anthony S. DARPA shows off 1.8-giga-pixel surveillance drone, can spot a terrorist from 20,000 feet, Extremetech. 2013.
22. Ishan M, Tariyal S, Vatsa M, Singh R, Majumdar A. Detecting Silicone Mask-Based Presentation Attack via Deep Dictionary Learning. IEEE Trans. Inf. Forensics Secur. 2017;12(7): 1713-1723.
23. Balduccini M, Nguyen DN, Regli WC. Coordinating UAVs in Dynamic Environments by Network-Aware Mission Planning, IEEE Military Commun Confer. 2014;985-988.
24. News Desk. US unmanned drone jet makes first carrier landing, BBC News. 2013.
25. Rockett A. Historic day: Carrier-based drone flies with manned aircraft, Daily Press. 2014.
26. Alberts DS, Garstka J, Stein FP. Network Centric Warfare: The Face of Battle in the 21st Century Washington, DC: National Defence University Press. 1999;88-92.

27. Frey CB, Osborne MA. The future of employment: How susceptible are jobs to computerisation?'', Technological Forecasting and Social Change 2017;262-280.

28. Gellman B, Poitras L. US British intelligence mining data from nine U.S. Internet companies in broad secret program, The Washington Post. 2013.

29. Stone J. Theresa May says the internet must now be regulated following London Bridge terror attack. The Independent. 2017.

30. News Desk. France wants to put Internet regulation on the G8 agenda, DW News. 2011.