CONTRIBUTION OF ARTIFICIAL INTELLIGENCE IN FOREST MANAGEMENT & REGULATION
A Critical Analysis

Rajiv K. Jha* & Shivoma Saxena**

[**Abstract:** *Nowadays Artificial intelligence or Machine Learning is becoming one of the most important factors contributing in every aspect of our lives. Even the U.N. also have this opinion that A.I. can be the key factor for attaining the targets under SDGs. Forest management is the most important task for saving humanity on the earth as it directly contributes in protecting and preserving our ecosystem. Since the forest covers a very large area, all time patrolling over such a wide area would be an impossible task. Here, A.I. can help a lot. There are many ongoing projects where A.I. is used for the forest management, specially to keep track on illegal activity, efficient data management about the endangered species, etc. In this paper, the author has examined use of A.I. in forest management*.]

INTRODUCTION

Forest is one of the most important resources for the existence of life on the earth. Our ecosystem depends on the forests. Our climatic system is also based on these forests. Not only wildlife andtribal, we are also directly or indirectly dependent on the forest for our existence. Forests are also referred to as the lungs of the Earth. It is estimated that one fifth of the oxygen comes only from Amazon forest. Even though forests are so much important for our existence but still we don't care much as our forest cover is decreasing significantly year by year. List of extinct animals, birds, insects & other organisms are also increasing. These are due to poor management of these forests, which results in deforestation, extinction of the plant varieties, and extinction of different species of organisms and the ultimate results of these are climate change & disturbance & imbalance in our ecosystem.[1]

Deforestation has an inconceivably & puts negative effects on planet earth. The forest area spreads over 33% of the land zone on our planet and gives us cleaner air and fresher water. A lot of the world's territory based natural life lives in timberlands. We ought to obviously not have to contend for why timberlands are significant yet it appears we need to. Somewhere in the range of last thirty years the world lost five lakh square miles of woods approximately. With the ongoing occasions of expanding woods fires in the Amazon ensuring our timberlands over the world has again filled in pertinence. So let us address the current issue of deforestation and afterward examine how man-made brainpower can add to arrangements that help with tackling this fiendish issue. An assortment of information collected by A.I. based tools is very crucial which foresters use to create the board plans and task what the timberland will resemble later on. The procedures produced two centuries prior to make such inventories relentless field inspecting to show up at populace insights have remained

generally unaltered right up A.I. based technology can obviously just be essential for an organized exertion, yet it must be properly considered in tending to this issue of forest management.[2]

Due to the above-mentioned reason protection & conservation of forests & wildlife became so important, as it will affect the existence of life on the earth. So, for protection, conservation & sustainable use of forests we have to manage our forest very efficiently. With regards to the forest management we have a wide range of legal frameworks both domestic as well as international because we don't see forests as anyone's property. Maybe exclusive rights of use vests in some State's hands but they don't have rights for destroying it. In these circumstances Forest Management became a very crucial & important task which must be performed very efficiently. Forest management is concerned with the regulation of the activities associated with forests with many aspects such as surveillance, administration, legal, economic & social etc.[3]

The use of A.I. technology is not very old. Forest management with A.I. based technologies is one of the new inductees in the use of the A.I. ways. The manual forest management is not going so well as if we will see the results. The forest cover is depleting, the number of forest fire cases is increasing, even we have strict forest laws with regards to illegal hunting but then even we have seen the increase in the illegal market of wild animals. So, for finding the efficient ways of the forest management we have to explore the A.I. based ways of Forest Management. Currently we have many A.I. based ways like Artificial Neural Network for Forest Management, Automated Forest Fire Prediction, Bird Eye View & A.I. Based Carbon cycle mapping for efficient forest management. But we have to give solutions to the problems which are attached with this. We have to map all the legal issues attached with the utilisation of these A.I. based ways for the forest management & regulations.[4]

NEED FOR A.I. BASED FOREST MANAGEMENT

People usually think about the betterment of the ecology but most of them once in a while consider forest management, yet it is already a proven fact that forest management is one of the most essential & fundamental functions to be done for the protection of our ecosystem as well as for our survival on this planet. The forest timber that are utilized to fabricate our homes, the paper cup that holds your morning espresso, and the cardboard box containing your most recent online conveyance all originated from a tree filling in the forested areas.[5]Estimating the capability of timberlands to give those things has truly been costly, slow, and low tech. The greatest ranger service organizations in the United States go through millions every year paying individuals to difficulty tally and measure trees.[6]

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[2] Josie Garthwaite, *Tracking the tinderbox: Stanford scientists map wildfire fuel moisture across western U.S.*, STANFORD (May 21, 2020) *available at –* https://news.stanford.edu/2020/05/21/mapping-dry-wildfire-fuels-ai-new-satellite-data/ (last visited on 15th Oct, 2020).

[3] Deforestation and Forest Degradation, WWF, *available at –* https://www.worldwildlife.org/threats/deforestation-and-forest-degradation (last visited on 15th Oct, 2020).

[4] A. Imada,*A Literature Review: Forest Management with Neural Network and Artificial Intelligence*inNEURAL NETWORKS AND ARTIFICIAL INTELLIGENCE(V.Golovko& A. Imada, eds., 2014).

[5] T. Bruckner, et.al.,*Energy Systems* in IPCC, WORKING GROUP III CONTRIBUTION TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2014).

[6] Cf. Arthur Rizner& Caleb Watney, *Artificial Intelligence Can Make Our Jail System More Efficient, Equitable and Just*, TEX. REV. L. & POL. 181 (2018) (contending that AI may improve pretrial decision-making, as compared to human judgments). Controversy over the use of such tools has led to at least one controlled study, currently in progress, of judges' use of pretrial sentencing tools. See *Pretrial Release*,

With regards to the forest management we have various dimensions related to it. But when it comes to the surveillance of the forest related activities, monitoring & managing natural or man-made hazards in forests & smuggling of the wild animals, the existing manual forest management ways are not sufficient as the results are not positive but A.I. based forest management ways have shown some of the positive signs. We have an extremely large area of forest cover so the existing ways are expensive & they are not efficient in the management of the above-mentioned problem. Due to the climatic change because of the human activities which are destroying our environment are now affecting our forests as the number of hazards natural or man-made is increasing, due to which the forests are depleting & also affecting the wild animals. We have strict regulation for the protection of forest & wildlife. But because of the corruption & insufficient number of forest guards we are still unable to restrict these illegal activities of smuggling & killing of the wild animals. [7]

Forest related activities

We have many industries which are dependent on the forests for their raw materials. Due to which the commercial value of the forest is very high and the industries which are involved in this want to do the over exploitation of forests. But the States for having the sustainable use of these forest resources have made various laws & regulation for restricting the activities for overusing of the forest resources. And appointed authorities for the proper regulation of prescribed laws for conservation of forest. Even after doing all these steps the commercial value of forest is very high so the amount of money involved is also very high. Therefore, corruption became a very common problem with this regard. These industries bribe the local authorities and do the over exploitation of the forest resources. As forests are spread over a large area, manual surveillance is extremely difficult and expensive too. Due to this we need an automated type of surveillance which will be free from biases and corruption. thus, the A.I. based techniques can provide for more efficient ways for forest management when it comes to regulate the forest related activities. [8]

Monitoring & managing forest hazards

Experts have the opinion that forest hazards are the natural process which is for the betterment of the life cycle of the plants & the organisms living in the forest. But the above view is partially true because now the frequency of these forest hazards has increased exponentially due to the influence of human activities which ultimately results in deforestation at a very large scale. For example, if we take example of forest fire, it is categorised under the natural process but nowadays because of human activities we have recorded increase in the average temperature & the highest temperature season by season. Due to this we have seen the exponential growth in the number of cases of forest fire & the area it covers is also increasing. This ultimately results in the decrease in the forest cover. This is also the same situation with regards to other hazards like forest flood & landslides etc. Due to the influence of human activities the frequency of these hazards has increased which ultimately affects the forest cover negatively. So, if we can predict these hazards at the right time then we can minimise the impact thereof. So, in this process the prediction of these forest hazards can be done efficiently by using the A.I. based technologies. For this

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ACCESS TO JUST. LAB, HARV. L. SCH., *available at* – https://perma.cc/5XE2-S388 (last visited on Apr. 24, 2019).

[7] Zack Parisa and Max Nova, *This AI can see the Forest and the Trees*, IEEE SPECTRUM (Jul. 30, 2020) *available at* –https://spectrum.ieee.org/artificial-intelligence/machine-learning/this-ai-can-see-the-forest-and-the-trees (last visited on 16th Oct, 2020).

[8] S. Hummel & K.L. O'Hara, *Forest Management*, ENCYCLOPAEDIA OF ECOLOGY (2008) *available at* – https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/forest-management (last visited on 23rd May,2020).

prediction we have to process a very large amount of data through a specified algorithm. Currently we have two algorithms for the prediction of the forest fire but processing of the data at that large scale is a big issue with it as these A.I. based technologies in the initial stage. But still A.I. based technologies have the potential for doing the work with regards to the prediction of the forest hazards at the time. So that these hazards cannot result in the depletion of the forest cover.[9]

Smuggling of the wild animals

Wild animals are an integral part of the forest as billions & trillion of organisms are living in these forests. So, forest management also includes the management of these wild animals living in the forest area. In the past two-three decades we have done a lot for the prevention of the illegal hunting and selling of the wild animals in both the aspect of the making of legal framework and formation of specific authorities at different levels for the protection of these wild animals living in the forest. These above mentioned have made a great noticeable change in this regard but a large illegal market involved in selling & purchasing of the wild animals & products made by wild animals still exists. Market for the medicine which are made with these wild animals still exists, especially with regards to the medicine related with the fertility issues. Even after that much effort we are still failing in the protection of the wild life. So, in this regard also A.I. based technologies can help. As A.I. can analyse & process a huge amount of data captured by live camera, sensors & satellite images received every second. So, it can give alarms for any unusual or unidentified movements. This can also help in the smuggling of the timbers from the forest & have a huge potential for restricting the smuggling of the wild animals & timbers from forest.[10]

A.I. RELATED WAYS FOR FOREST MANAGEMENT

As we have already discussed the need for these artificial intelligence-based technology for the more efficient forest management & regulation as it eliminates the biasness & the ability of data processing is way higher if compared to the manual process. Now we will discuss some of the major A.I. based ways for the forest management will help in different aspects of the forest management.

Using artificial neural network for forest management

When we discuss Artificial Intelligence alone then even the Artificial Neural Network (ANN) is one of the most important factors over which the major research is going on. ANN is one of most important tools for the machine learning. Under this all the data presented before it is analysed & processed as a human brain but on extremely higher rate. So when we talk about forest management & regulation with advance technique than the major problem is that how that huge amount of data & information will be processed as the data associated with it is in huge amount. ANN perceived the data & evaluate or process it with the algorithms with is provided for this. The data associated with the forest management & regulation are of non-linear type of data & artificial neural network is the best possible way for the processing of such type of data.[11]

Automated forest fire prediction

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9   C. Bates, *Book Reviews : K. Sivaramakrishnan*: *Modern Forests: Statemaking and Environmental Change in Colonial Eastern India*, 21(1) SOUTH ASIA RES. 124 (2001).

10   *Id.*

11   *Supra* note 4.

Artificial Intelligence based technology & tools can play a significant role in taking over the control over the forest fire like hazards. We can prepare the product by giving it the data about the spots which are generally helpless against bursts into flames. So, it can identify the weak spots of a forest cover and send warnings to the forest management team with the goal that they can quickly go to those spots and put out the fire. Subsequently they will require less time and can spare more regular assets by extinguishing the fire without any problem. It could spare large number of dollars

Promptly as such location of flames appear to be to one potential use of A.I. based technologies in managing forest hazards & will be useful for managing the forest cover in such ways In the event that firemen can react or fitting measures can be taken to ration backwoods that would be valuable whenever executed with contemplations to the utilization of energy by the calculations utilized.**12**

With regards to the Forest hazard management, one major affecting hazard is 'Forest Fire'. The loss we suffered in some recent forest fires as in the Amazon Forest fire, Arizona Forest fire & Australia forest fire is extremely hard to measure. So, it is better to predict these kinds of forest fires at an accurate time from where we can prevent these kinds of forest fires & protect our forest resources. So, under this data related with climatic condition & other ecological data of any specific forest, along with this the satellite Images, signal from the sensors installed etc. when processed with the prescribed algorithms then we can have a more accurate prediction about the seriousness of that particular event. Some hazards are natural processes for the benefit of the forest ecology. So, we have to predict the loss against the benefit it will provide to the forest and must manage according to it.[13]

Bird eye view

This is one of the most popular A.I. based way for the forest management. Under this with A.I. based technologies will process the data, images or anything captured from satellite, camera or sensor. High definition satellite images are helpful in tracking each and every tree present in the forest. Recently drones were also used in mapping the activities in the forest. But when it comes to mapping the condition & activities in the forest of each & every second then the amount of the collected data will be huge. So, it is beyond the capability of humans to process the data. So, in that case ANN or other methodology based on A.I. technologies can be used for processing this huge amount of data for mapping of the forest condition & activities more efficiently.[14]

A.I. based carbon cycle mapping

Currently for the carbon cycle mapping A.I. based technologies are used by the researcher for using it for better forest management. The traditional approach was related with the empirical processing & parameterization or recognition of input or output data. But under A.I. based carbon cycle mapping ANN can be used with splines, neural networks, and kernel methods to predict CO_2 and energy flux. This carbon cycle mapping can be used for many purposes as it

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[12]   Chris Stewart, Hey Watson: Local Judge First to Use IBM's Artificial Intelligence on Juvenile Cases, MY DAYTON DAILY NEWS (Aug. 3, 2017) *available at* – https://perma.cc/9TAN-4FM3.

[13]   *Supra* note 2.

[14]   Tristram Walsh & Christian Schröder de Witt, *Artificial Intelligence & Climate Change: Supplementary Impact Report*, *available at* – https://www.oxfordfoundry.ox.ac.uk/sites/default/files/learning-guide/2019-11/Artificial%20Intelligence%20%26%20Climate%20Change_%20Supplementary%20Impact%20Report.pdf (last visited on 29th April, 2020).

can be used for the hazard prediction or mapping of the lifecycle in the forest. So overall this also helps in the better forest management with lots of unexplored area within its scope.[15]

Automated precision

Precision of agriculture can really help in managing the forest as it has the potential to decrease deforestation & can increase the afforestation. One of the major portions of deforestation happens due to the food supply chain. If the agriculture in every form will be done with the help of the A.I. based technologies, it will benefit us in multidimensional & the potential is limitless. Under this we can do it more sustainably as the water resources will be saved & the pesticide will also be used in less quantity. Exactness in farming could prompt not so much pesticides but rather more effective utilization of water with a mix of mechanical technology, equipment and sharp utilization of calculations. AI devices for strategy producers and agronomists could moreover assist with empowering atmosphere positive activity.

Automation in forestry & afforestation

We have a limit with regards to 1.5 trillion trees on the planet. This can possibly offset a time of carbon outflows. In this sense mechanization can be helpful. Two new businesses Bio Carbon Engineering and Drone seed are referenced in such manner. AI can be utilized to find fitting planting locales, screen plant wellbeing, survey weeds, and dissect patterns. While some deforestation is the consequence of extending farming or metropolitan turns of events, its vast majority originates from the logging business. Clear-cutting has an especially ruinous impact and stays a far-reaching practice over the world. Following deforestation can advise strategy creators. Rainforest Connection has introduced old advanced mobile phones fuelled by sun powered boards in the backwoods. At that point, a ML calculation can recognize cutting apparatus sounds inside a sweep of a kilometre and report them to a close by wireless receiving wire. A.I. based technologies can likewise be applied to coordination and transport, in spite of the fact that this can have a negative impact and must be joined with acceptable arrangements.[16]

LEGAL IMPACT OF A.I. BASED WAYS FOR FOREST MANAGEMENT

All over the world the legal fraternity with help of the experts of Artificial Intelligence is trying to regulate Artificial Intelligence & A.I. based technologies. Besides that, we are still unable to find even a proper definition for artificial intelligence. So, we can understand the difficulties in the regulation of artificial intelligence. Regulation is very necessary as everything has two aspects, both positive & negative. For now, Artificial Intelligence is in its infant state but still it can damage human existence to a very high extent. So even with forest management whatever A.I. based technologies are being used and can have both positive & negative impacts. But we cannot ignore the usefulness of these A.I. based ways for the forest management & regulation. So, in my opinion we must have to regulate these as the benefits are also exponentially high with this regard.[17]

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[15] *Id*.

[16] Steven Borowiec and Tracey Lien, *AlphaGo beats human Go champ in milestone for artificial intelligence*, Los Angeles Times (Mar. 12, 2016)*available at* – https://www.latimes.com/world/asia/la-fg-korea-alphago-20160312-story.html (last visited on 29th April, 2020).

[17] *See generally*, Kiel Brennan-Marquez & Stephen E. Henderson, *Artificial Intelligence and Role-Reversible Judgment,* 109 J. Crim. L. & Criminology 137 (2019) – *mounting defense of human judgment that focuses on the normative integrity of decision-making and advocating role-reversibility as a requirement for introduction of robo-judges*; Eugene Volokh, *Chief Justice Robots*, 67 Duke L.J. 1135 (2019) – *Arguing that robot judges should generally be used for adjudicatory functions when they write relevant opinions as persuasively as competent human judges*; Ian Kerr & Carissa Mathen, *Chief Justice John Roberts Is a*

With regards to the advantages & the impact of A.I. based ways of forest management over us has been discussed in the above chapter. Even these A.I. based ways can help in restricting & regulating the illegal activities & can help in maintaining the impact of laws over the management of the forest. One of the dimensions of forest management is related to the legal aspect of forest management. So, the potential of A.I. based technologies are extremely high as we can eliminate all kinds of the illegal activities happening in the whether it is related to illegal hunting or illegal clearing of the timbers. It can also prevent illegal activities related to other sectors like mining which can affect the forest & can cause deforestation & killing of the wildlife which are dependent on the forests. [18]

Management of the forest cover isn't just a mechanical exercise and innovation cannot explain everything. We as of now comprehend that woodlands are being lost and this reality must be tended to. As such planning woodland holds appears to be just an aspect of the arrangement. Political will and comprehension of the serious results by a bigger populace is fundamental. On the off chance that change doesn't originate from one spot or one individual and rises up out of a group of activity then we can expect that each activity you do towards improving conditions for our woods will matter. As such technologists or innovation aficionados can obviously have an impact, and for what reason ought not mechanical advances advantage humankind? You may quietly consider what better approach to utilize man-made consciousness than to guarantee cleaner air and guarantee expanded common carbon catch by dealing with our forest cover & wildlife.[19]

With regards to the disadvantage of the A.I. based technologies being used for the forest management are as following: Most of the countries who have the major forest resources are developing nations & the developed nations have ownership over all this advanced A.I. based technologies. Further these developed nations are not ready to share the knowledge about all these A.I. based technologies & the developing nations are also not agreed for giving the access to monitoring & mapping of their forest resources. It can hamper the privacy of any nation but the most important concern is with regards to the national security of any State. The sovereignty of a developing nation will be in question. Apart from this another major concern is with regards to the responsibility if any miss conducts or miss happening takes place. None of the parties are ready to take the responsibility. So, with these situations the use of these A.I. based ways of forest management for every forest is possible only when proper regulation will be framed & the responsibilities will be decided in any case of miss happening or miss conduct & assurance will be given to the developing nation that their sovereignty & national security will not be in danger.[20]

Robot, Presentation at WeRobot (2014), *available at* – https://perma.cc/3EBP-3FHC - *Offering a philosophically-grounded thought experiment that situates jurisprudence against the capabilities of expert systems, AI, and decision making by mechanized judges*; Cass R. Sunstein, *Of Artificial Intelligence and Legal Reasoning*, U. CHICAGO PUB. L. & LEGAL THEORY, Working Paper No. 18, 2001.

[18] Cf. Gregory N. Mandel, *Legal Evolution in Response to Technological Change*, in THE OXFORD HANDBOOK OF LAW, REGULATION, AND TECHNOLOGY 225 (Brownsword et al. eds., 2017); Urs Gasser, *Recoding Privacy Law: Reflections on the Future Relationship Among Law, Technology, and Privacy*, 130 HARV. L. REV. F. 61 (2017), at 64.

[19] Bert-Jaap Koops, *Criteria for Normative Technology: The Acceptability of 'Code as Law' in Light of Democratic and Constitutional Values*, in REGULATING TECHNOLOGIES: LEGAL FUTURES, REGULATORY FRAMES AND TECHNOLOGICAL FIXES 172 (Roger Brownsword & Karen Yeung eds., 2008); Ronald Leenes et al., *Regulatory Challenges of Robotics: Some Guidelines for Addressing Legal and Ethical Issues*, 9 L. INNOVATION & TECH. 1 (2017), at 25.

[20] Handbook of Artificial Intelligence (Avron Barr & Edward A. Feigenbaum, eds. 1979) *available at* – https://stacks.stanford.edu/file/druid:qn160ck3308/qn160ck3308.pdf (last visited on 16th Oct, 2020).

MAJOR INITIATIVE

With the increase in the dimension of utilization of A.I. based technologies, the interaction of the Artificial Intelligence based technologies have done wonders for the betterment. So now on the conceptual level it always provided scope for exceptional potential. Why have we said "On the conceptual level" because we know that the integration of A.I. based technologies & Forest management is not so new even on the conceptual level. This all happened because of the improvement in the approach of doing development towards tools & technologies based on artificial intelligence & the approach of doing the overall development of our society & environment. Due to this changed approach towards environment and ecology we may try to indulge A.I. based technology & tool into one of the most difficult, complicated & one of the most essential tasks for our survival on this planet. [21]

Microsoft project

One of the major & most discussed under this is Microsoft's "A.I. for Earth Project". Under this project they are trying to work over four major areas that are climate, agriculture, biodiversity & water for achieving sustainability with the help of A.I. based innovation & technologies for the better & sustainable future. The reasons for choosing these in primary phase are as the changing atmosphere compromises human wellbeing, framework, and characteristic frameworks. A.I. based innovation can give individuals more precise atmosphere expectations to help diminish the possible effects. After two or three decades we will have to increase food production on less arable land and with less ecological effect on feeding the world's expanding populace. A.I. based technology can assist individuals with observing the soundness of ranches progressively. Species are going to be wiped out at a disturbing rate. Artificial intelligence-based ways can assist individuals with quickening the revelation, observing, and assurance of biodiversity over our planet. In the following twenty years, interest for new water is anticipated to significantly dominate gracefully. A.I. based innovation can assist individuals with displaying Earth's water gracefully to assist us with rationing and ensure new water.[22]

Under this project Geo-physics empowered A.I. based assist everybody with understanding atmosphere related danger at the hyper local level. This method utilizes A.I. based innovations to conjecture atmosphere related dangers. It recorded rapidly spreading fire information, mathematical recreations and satellite symbolism under project to demonstrate fire hazard for any area. Anybody can get to fire related figure data by means of APIs and graphical apparatuses. Gathering information related with farming areas in the cloud and making it accessible to ranchers to empower exactness agribusiness. Under this project it utilizes sensors to gather soil, culturing, and yield information for explicit plots of farmland. The information is put away in Microsoft Azure and made accessible to ranchers through easy to understand APIs to assist them with bringing down expenses, improve yields, and limit the ecological expense of horticulture.

Utilizing satellites and A.I. based innovation & technologies to safeguard biodiversity, ensure vocations, and forestall servitude in the fish business. The ocean segment of the project works with government specialists to forestall illicit, unreported, and unregulated fishing by investigating vessel developments continuously. Artificial intelligence calculations distinguish dubious conduct, which it imparts to offices to coordinate watch vessels all the

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[21] Artificial Intelligence and Life in 2030, Report of the 2015 Study Panel (Sep. 2016), *available at* – https://ai100.stanford.edu/sites/g/files/sbiybj9861/f/ai_100_report_0831fnl.pdf (last visited on 15th Oct, 2020).

[22] AI for Earth, Microsoft, https://www.microsoft.com/en-us/ai/ai-for-earth (last visited on 17th Oct, 2020).

more successfully. This project is changing how we measure and screen our forest cover. It's fundamental for preservationists, governments, and landowners to stock woodlands for environmental, social, and monetary wellbeing. By using AI, cloud programming, and AI these gatherings can cooperate to contemplate the impacts of environmental change and improve territories. Under this high-definition satellite imagery, and US Forest Service stock and investigation field information to prepare A.I. based models to map the forest cover.[23]

A.I. based innovation & technologies and resident researchers cooperate to battle elimination. Computer based intelligence for Earth is utilizing AI innovation and progressed cloud programming to recognize creature species that are very nearly terminated. It utilizes A.I. algorithms-based vision and profound learning calculations to control. Under this they are using innovation to check and distinguish between creatures and species.

Researchers are utilizing ongoing information planning to empower exactness protection. In a progressing exertion to secure complex eco-frameworks, we joined forces with Chesapeake Conservancy to construct a unique framework for creating one-meter goal land spread information anyplace in the United States. Our serious planning uses AI and key informational collections to upset exactness protection. A.I. based ways have helped them in the battle against poaching by using A.I., A.I. arranging, and conducting demonstrations. Under this they gather data from past poaching exercises, at that point utilizing A.I. based ways and social demonstrating to create forecasts about poaching areas and ideal watch courses. The result is more successful watches and better utilization of assets in the battle against poaching.[24]

Data science institute project

Under this project work conducted by A.I. experts & other experts at this institute reveal much more insight into why exact, definite and cutting-edge data is significant. They have been contemplating the effect of extraordinary climate on forest cover and their regrowth designs, with an eye towards the effect this has on carbon sequestration capacities: more limited, more youthful and less thick backwoods are less successful than more seasoned, denser territories. Under their survey the harm to the forest cover by Hurricane Maria they find many important data. It will in the long run utilize the gathered information, with the far off detecting pictures and estimations, to think of a definite gauge of the misfortune from the tempest. Without current standard information and a forward inclining perspective on what the timberland stock might be later on, organizers may underestimate or nations may over esteem sequestration capacities.[25]

Plan & research designs like these are basically imperative to building a major piece of information on a worldwide scale. We accept the world needs a lot more associations accomplishing more work this way, which is the reason we are so amped up for how rapidly the arrangement of AI for Earth grantees has developed. This work has given us a bird's-eye perspective on how ground-breaking the blend of human resourcefulness and AI is, and exactly how seriously it is expected to make the sort of brisk, powerful and worldwide advancement this planet needs. Fortunately, the innovation as of now exists to gather and investigate the information pouring in from sensors, satellites, drones, resident researchers, camera traps and numerous different sources. With the cloud and AI, we can handle this

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[23] *Id.*

[24] *Id.*

[25] Alex Moltzau, *Artificial Intelligence and Forest Management*, ODSC JOURNAL (Sep. 4, 2019) *available at* – https://medium.com/odscjournal/artificial-intelligence-and-forest-management-50f480b56325 (last visited on 17th Oct, 2020).

precisely and cost-successfully, to do things that were beforehand as troublesome and costly as to be outlandish. [26]

The advancement was observed ashore spread planning is an illustrative model. In the United States, the best accessible informational collections ashore spread, at a goal of thirty meters, were last refreshed almost seven years back. A.I. based innovation can be a distinct advantage since taking activities are simpler and more successful and less powerless against politicization in the event that we realize what's going on Earth, when and where. The speed of development is one of only a handful barely any things staying up with environmental change. Saddling the intensity of AI to screen the effects of our momentum land use rehearses and to show situations implies that, maybe unexpectedly, we can have the correct data readily available to all the more successfully and reasonably deal with our properties, watersheds and biological systems.

CONCLUSION

Forest management is one the most important tasks when it comes to the survival of the humans on the earth as whole of the ecosystem, Climate & our oxygen cycle etc. are based on the forests. Even we have the regulations with regards to forest management but for the sustainable, scientific & efficient management of the forest we depend on A.I. based ways like Artificial Neural Network for Forest Management, Automated Forest Fire Prediction, Bird Eye View & A.I. Based Carbon cycle mapping. But with every advantage there comes a disadvantage. So in this case of forest management by using A.I. based technologies the question of privacy & national security is there with the developing nation who have a major share of the forest resources. So, for having more efficient ways for forest management these issues must be addressed or else a major portion of forest resources in the hands of the developing nation won't have the more efficient ways for the forest management & regulation. With regard to research initiatives of Microsoft & DSI these initiatives related with management of forest with the help of A.I. based technologies are looking promising but are in the very initial stage. Hence, we can say that A.I. based ways of forest management can be the most significant & promising for having sustainable development & forest management in the most efficient way.

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[26]   *Id.*