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Artificial Intelligence: A Realistic and Virtual Delight on Indian Archaeology

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Abstract

The field of artificial intelligence is making renaissance in various disciplines and bringing out the realistic experience in the research fields. It's been done in various fields with accuracy and efficiency. Artificial intelligence is playing a vital role in the archaeological research in its various sub disciplines globally. The role of artificial intelligence in various sub disciplines of archaeology enhances the quality of research proving the accuracy and efficiency of the research to great extent. It plays an important role in cultural preservation process, which is very much necessary for a country like India which has a innumerable and invaluable archaeological assets and cultural properties. Those properties should be analyzed, segmented and documented with proper care and necessary records that should be facilitated by artificial intelligence. This article speaks about the need of importance of integrating artificial intelligence in the archaeological research in India.

Keywords: AL, ML, DL, Neural Network

Introduction

With remnants of human history dating back to the Stone Age, India has a variety of social systems, languages, scripts, architecture, and geographical settings. Based on archaeological field surveys, archaeologists find these material remnants, excavate in the field, examine them methodically, and make an effort to prove the history. AI technology has made it possible to take India's history on a road of resurrection and purposefully transport people back in time, which is a significant undertaking. Before executing actions, the human mind typically conceives if the action will be successful, whether it will move in the proper path, and whether what we have planned is going to materialize. The human brain is what motivates the mind to do action, makes plans for us to take action, and sends out commands to direct the mind to take action. It is asserted that this is the natural intelligence, which is identical to human intelligence. Artificial intelligence is the capacity to comprehend, think, and learn; it is also known as knowledge. Artificial intelligence is the reverse of natural and is defined as anything created by people that are not natural. When the words Natural and Intelligence are decoded, it leads to the terms Artificial Intelligence. Human intelligence, or natural intelligence, is well known. For us, the most important question is what that human intelligence entails. The intelligence of the human brain is the solution to that. 'Intelligence is a broad construct comprising multiple components, which can be estimated with a range of well-established tests'.[1] So we need to recognise that artificial intelligence is the additive part of the brain. We could have a question about this as well. Indeed, the functioning of the human brain is among the most intricate processes that could hypothetically exist. The topic of how to

make and use it artificially can come up. But there are a number of ways to simplify this function. A rule or formula for an operation, such as a job, can be developed in the context of artificial intelligence.

Before the start of study about artificial intelligence, readers ought to be conscious of the differentiation between computers and AI, as well as how each of them functions. The computers that we use have a lot of software installed. Similar to this, mobile phones use a variety of software. For computers and mobile phones to function, we must provide the proper commands to their electronic components and software. They are incapable of operating on their own. Both self-acting consciousness and independent thought are absent from them. Without the commands we give them, the computer's electronic parts cannot operate on their own. When we issue commands to Gmail and WhatsApp, for instance, they comply, take action, and provide us with the outcomes we are entitled to. Artificial intelligence is the expanded area of computer science that makes machines think and act like the human intelligence ie., the machines can take their own decision depending on the situation. The goal of artificial intelligence is to mimic the human brain and create the systems which may function intellectually and independently.

The year 1950 marked a new era in the computer science, as the introduction of artificial intelligence came into existence. This is the year when Alan Turing published an exclusively landmark article[2] which speculated about the possibility of creating the machines that would think and perform functions like the humans. On the basis of his paper, Turing has created his own research namely Turing test to determine whether a machine could think intelligently like humans, from which he could able to understand that the process of thinking is a complex process to explain. But all these years it is unfortunate to state that not a single machine was unable to pass the Turing test. A computer scientist named Christopher Strachey developed a checkers program later in 1951 using the Ferranti Mark I computer located at the University of Manchester in England. This software could play a full game of checkers by the summer of 1952.[3] John McCarthy known as father of ‘Artificial Intelligence’ initially introduced the term "artificial intelligence" at the Dartmouth conference in 1956.[4] The year 1956 was considered as the artificial intelligence research era, because it was during this point which MIT established a laboratory that is currently in operation still.

Natural language processing (the study of how computers can interpret and process language similarly to how people do is known as natural language processing, or NLP. Computational linguistics, statistics, machine learning, and deep learning models are all required for NLP models to accomplish this. Leading examples of contemporary natural language processing (NLP) include language models that predict a sentence's final form based on its current parts using statistics and artificial intelligence (AI) - Being a large and multilingual country, India might benefit greatly from the application of natural language processing (NLP) algorithms to find patterns in old scripts and aid translate inscriptions and other written materials, even for languages with few recorded texts. Apart from this, NLP is also employed in text analysis of historical documents like excavation report, archaeological journals, geo-referencing and spatial analysis, etc), Neural Networks (neural network, a computer software that mimics the way the brain's natural neural network functions. Performing cognitive tasks like machine learning and problem solving is the aim of these artificial neural networks – as far as archaeology is concerned, conversely to more conventional approaches, neural network processing predominantly is used to analyze large image datasets, such as aerial photographs or 3D scans, in order to automatically identify and classify archaeological features like pottery shards, burial mounds, or settlement patterns. Essentially, it assists archaeologists "read" complex visual patterns in data that may be challenging for humans to recognize), Machine Learning (As described by Shalev-Shwartz Machine Learning is the process of converting

experience into expertise or knowledge. The input to a learning algorithm is training data, representing experience, and the output is some expertise, which usually takes the form of another computer program that can perform some task.[5] It's similar to an extremely intelligent assistant. It involves drawing lessons from past experiences and constructing statistics based on gathered information and experience. For instance, if a student is focusing on specific questions while studying for an exam, the questions that the students read do not need to be included in the exam itself. Despite the fact that the questions may vary, students can write an answer based on their experience studying similar questions and answers. In machine learning, we can't tell the computer to execute a specific task; instead, we can provide similar examples and instruct the computer to perform the task based on the examples provided. This is akin to machine learning, which also learns from prior experiences and exposes the data. Similarly, an archaeologist can enter information about the archaeological artifacts and instruct the computer to perform tasks based on the examples provided. For example, the details of stone tools or the shape of a coin), Deep Learning (With minimal assistance from the programmer, it can focus on the appropriate features on its own, which aids in overcoming feature extraction. The DL essentially imitates how our brains work, which is by learning from experience. The model will be learnt, and it will know which variable or feature is crucial for result prediction. – In archaeology can greatly increases the efficiency of site identification and mapping when compared to traditional methods. In other words, it helps archaeologists "see" hidden features in complex terrain by analyzing vast amounts of data much faster than manual analysis. It is most commonly employed in analyzing large datasets from remote sensing like LiDAR, facilitating the computerized identification and categorizing of archaeological sites and features, such as ancient structures, burial mounds, or even subtle terrain patterns), knowledge-based expert systems, and more are all included in artificial intelligence. AI is being used in image processing and computer vision. Though artificial intelligence has been utilized in some way for over 50 years, its demand has grown recently, and we are in a situation to delve into what the reason is. This is stipulated that artificial intelligence may be readily manipulated in the modern era and the computer technology required to exploit it is quite sophisticated. Artificial intelligence has been regarded as a computer-adapted micro-technology innovation which holds the ability to ultimately bring about an extremely significant technical revival in today's world and a new dimension of the future. This paper triggers an exploratory attempt to examine how sophisticated artificial intelligence may be employed to unearth previously undiscovered archeological artifacts, reconstruct historical events, track the traces of ancient myths, and trace the hierarchical evolution of historical social institutions.

Before looking at the use of artificial intelligence in archaeology, it is important to have a basic grasp of data science, data analysis, and machine learning from an academic perspective. Data science is the collection, organisation, and extraction of pertinent information from a variety of data types from various sources. The researcher uses this knowledge to assist them make the right choices for their task. Here, an archaeologist must gather many kinds of information about various cultural eras, such as stone tools, inscriptions, coins, tombstones, palm leaves, and diverse metal instruments that the ancient people utilized. The archaeologist can discover priceless insights and the history of ancient humanity, especially India with the aid of these hidden riches and important facts.

Analyzing data simply means creating narratives from the information gathered from different sources. Being a data analyst, he could comprehend the information that would be elucidated from the data. The data analyst should present the information gathered as a narrative so that others may comprehend and visualize the data, since commoners can't comprehend the data. Thus, based on the information gathered,

the data analyst would envision the current scenario and comprehend the information that has occurred in the past. Similar to a data analyst, an archaeologist gathers archaeological data from multiple sources and provides sufficient material evidence to support the data and its historical context. This makes it more feasible for ordinary individuals to comprehend the past and to picture the ancient history that transpired in the past.

In the past, archaeologists have spent days and years undertaking fieldwork and excavations in forests, deserts, and mountain caves in an effort to reconstruct history. Only in rare cases, fortunately had researchers been able to locate previous data. Consider an algorithm that might automatically decode the script that the archaeologist had not previously examined or identify the subtle outlines of a megalithic grave from satellite photos. Here, artificial intelligence is crucial in speeding up the process of determining our identities, origins, the materials utilized, etc.

The Benefits of AI for Archaeology

The integration of AI in archaeology and the potential it offers in the profession are the primary focus of this article. Not grappling with the basic concepts of the subject might be disastrous, even though some people may view it as unrelated to their main interests. Why This Happens? AI is used by archaeologists in a variety of methods, which involves as building 3D representations of historical locations along with employing laser radar to search for old graves. Furthermore, new techniques have just undergone testing and are nearly prepared for practical application. The paper contributes to the exploration of a field of research in which the past and present coexist. Additionally, AI facilitates archaeologists' work and increases public access to relics and cultural resources. In the near future, scientists anticipate being able to provide archaeological values in a way that will satisfy the audience. Artificial intelligence (AI) is revolutionizing how we discover and understand the past with its capacity to analyze images, process enormous data sets, and make predictions.

Application of Artificial Intelligence

AI is employed by archaeologists in a variety of applications, including the evaluation of natural and textile materials, the identification and classification of archaeological properties, and the organizing of information that has been received. Furthermore, artificial intelligence greatly simplifies excavations. For instance, archaeologists frequently deal with issues like uncertainty about the precise location of their excavations. They are able to identify the general area, but not the precise location of a burial or artefact. The neural network enters the picture at this point. Neural networks do the work for archaeologists instead of their sifting through millions of documents alone. This technique uses a particular algorithm to sort information. Through picture analysis, this technology might potentially guide archaeologists in their excavation efforts and identify areas with comparable patterns as possible excavation targets.

Dendrochronology is a technique that uses tree ring analysis to date old timber. It aids archaeologists in comprehending the climate, habitats, and human activities of the past. Archeologists use tree-ring dating to understand past human chronological, behavioral, and environmental events and conditions. Tree-ring dating can be performed on woody plants that produce recognizable and unique tree rings during a single growth season.[6] By enabling faster data analysis, artificial intelligence (AI) is being used extensively in dendrochronology to automate the process of analyzing tree rings. This greatly improves the accuracy and efficiency of identifying patterns in tree growth, especially in tasks like automatic tree ring

detection, cross-dating, determining stress factors from ring width variations, and reconstructing past climate conditions by means of complex data analysis using machine learning algorithms. By automatically detecting and measuring individual rings from scanned tree ring photos, artificial intelligence (AI) systems may mitigate the need for manual measurements and increase consistency across big datasets. Because AI can recognize similar growth patterns across samples, it can help with crossdating, which is the act of matching ring patterns between multiple trees to produce an accurate chronology.[7]

Ancient rock art can be found strewn across cliffs, mountain caverns, and forest rocks. Finding them used to be a very difficult and complex undertaking. Researchers who studied rock art went to the locations in the late nineteenth century, took pictures, and then carried out research. To learn more about the antiquity of the rock paintings and the different substances that might have been present, many others collected samples of the colors in the paintings and sent them to labs for analysis. However, any of these can occasionally produce inaccurate outcomes. This is due to the fact that human research methods are prone to mistakes and mishaps. The need for technology and accuracy in the study of rock paintings emerges from this situation. The necessity of artificial intelligence is deemed crucial in this context. Artificial Intelligence (AI) and Machine Learning (ML) can greatly facilitate rock art research in many ways, such as through Object Recognition and Detection, Motif Extraction, Object Reconstruction, Image Knowledge Graphs, and Representations.[8] A longer-term fieldwork poses problems since the rock art is not only weathered but also is usually located in isolated locations that are only accessible by foot through dense shrubs and steeps. Archaeologists are hoping that this AI technology, which is akin to facial recognition software, could eventually assist them in identifying specific artists. Deeper knowledge and comprehension of historical images, tales, and customs will be gained from AI. Machine learning can determine how similar two photographs are to one other. For instance: This enables us to demonstrate using the computer software how distinctive the rock art in Tamilnadu's Kilvalai is and how it connects to the rock art in other regions, such as Nehanurpatti. This can be used to illustrate the ways in which Tamilnadu's ancient inhabitants share rock art styles and how each group has distinguished itself over time. By looking at which styles exist on top of which, the machine learning method to rock art research has the ability to arrange the styles in the same chronological sequence as archaeologists. This is an incredible achievement. ML demonstrates how rock art from different parts of India, especially Tamilnadu, is closely related to one another in terms of time and resemblance. Figures drawn closer together in time were more similar to one another than those drawn farther apart.

Additionally, archaeologists began using artificial intelligence to replace lost ancient artefact writings. Additionally, this new AI technology aids researchers in determining the origin and chronological period of the cultural item under study. As a result, the estimates are typically more accurate and assist researchers save time compared to a manual examination. For many decades, linguistic scholars and historians have faced the difficult task of deciphering old and undetectable languages. Understanding the meaning and concept of these languages was challenging because they frequently only left behind a few fragments or inscriptions. With the aid of artificial intelligence, scholars may now study ancient texts using sophisticated methods like machine learning and pattern recognition, which may lead to new discoveries and the resolution of long-standing issues and conundrums. Artificial intelligence plays a significant role in this scenario by recognising patterns that aid in script decoding. Artificial intelligence machine learning algorithms make significant progress in identifying patterns in large amounts of data.

Through the examination of existing inscriptions or texts, artificial intelligence is able to identify recurrent symbols, word structures, and grammatical patterns that inscriptional studies specialists have overlooked. Artificial intelligence's machine learning process aids in the creation of databases that compare ancient symbols and inscriptions with current languages and symbols. This allows AI to more quickly and effectively determine the meanings that are required and how they relate to one another. The subgroup of artificial intelligence known as neural networks has demonstrated more efficacy in translating texts from ancient languages. Languages that are currently in use might be used to train this neural network to comprehend and acquire their vocabulary, syntax, and grammatical structures. Based on patterns they have identified, neural networks generate the necessary predictions about the unintelligible scripts or text. The neural networks then provide translations or their hypothesis, which may give the essential clue regarding the meaning of unknown symbols and characters of ancient languages or texts.

Accuracy through the incorporation of linguistic databases and artificial intelligence

Large linguistic databases with knowledge about ancient languages, including dictionaries, grammar rules, and syntactic structures, can be combined with artificial intelligence. The translations produced by artificial intelligence can be verified and improved by researchers by comparing them with various resources. By uncovering hidden layers of historical knowledge, this process contributes to a more thorough comprehension of the language and gradually increases the accuracy of decoding. Since ancient times, people in India have spoken a wide variety of languages. Different scripts were used by ancient humans to write in various languages. In particular, the Tamizhi, Ashokan-Brahmi, Kharoshti, Prakrit, Vattezhuthu, and Grantham scripts have been employed in India. Prior to the emergence of these scripts, people expressed their ideas and behaviours through symbols or graffiti marks. It was difficult for archaeologists to analyse these symbols when archaeology and epigraphy research started in the early 19th century. The application of artificial intelligence in cryptanalysis allows for the systematic testing of potential decoding techniques. By feeding encoded text into artificial intelligence algorithms, archaeologists, along with computer analysts and researchers, can easily and quickly experiment with various coding systems and strategies. This will help uncover the hidden aspects of ancient texts more accurately and efficiently than with traditional manual inputting methods.

AI-Reconstructing the Text

Artificial intelligence can be used to recreate lost scripts in addition to assisting in the identification and reading of unintelligible words. AI can mimic the evolution of letters and give thorough explanations for words and phrases that don't exist by examining other scripts that are linked to unreadable scripts and learning about how they changed over time. The languages that produced certain scripts based on cultural, historical, and linguistic factors will be seen and understood more broadly as a result. Artificial intelligence has the potential to expedite the process of deciphering and translating scripts, as well as computerising and automating the laborious and time-consuming tasks performed by linguistic academics in the past. Through its computerised methods, artificial intelligence can swiftly and precisely scan vast portions of the scripts, providing basic translations and insights on the scripts, in addition to relying on the experts. In the beginning, this allows the researchers to focus on improving the artificial intelligence work and investigate the ramifications of novel findings that improve the productivity and efficiency of the decoding process. AI plays a crucial role in preserving old languages and scripts in

addition to decoding them. By employing artificial intelligence in the process of digitising ancient scripts for analysis, we can ensure that the languages and scripts of the past will be preserved, thereby preserving historical and cultural assets that could be passed down to future generations. The application of artificial intelligence to the preservation of ancient scripts is regarded as a valuable digital asset that contributes to the preservation of ancient humanity's linguistic heritage in the event that ancient languages and scripts become extinct in the current digital world.

Analyzing Skeletal Remains

The biological makeup of ancient humans may be inferred from their bones and other remnants, which can also provide insight into their surroundings, environmental factors, food practices, and physical issues they faced. In the past, getting historical information from such bone remains to establish their validity was not only a very tough and complex work, but it also took a very long time and was done with some difficulty by their scholars. Such a difficult operation has now been computerized thanks to artificial intelligence technology, which has also improved the quality of the data and is technically very helpful for acquiring historical data. Facial recognition and biometric analysis are two of AI's most interesting uses in the investigation of human remains. Researchers are able to rebuild face characteristics from bone remains by employing algorithms that have been trained on large datasets. In addition to helping with identification, this procedure offers information on a person's background and current health. Utilizing such technology has important ethical ramifications as it raises concerns regarding consent and misuse possibilities. Software named Skeleton ID supports skeleton-based identification through physical anthropology techniques like craniofacial superimposition, facial comparison, biological profiling, dental comparison and comparative radiography. It aids archaeologists enhance the neutrality, traceability, in addition to comprehensibility of their findings while being applicable to a wide range of ancient skeletal structure identifications. The use of artificial intelligence (AI) to the identification and analysis of human skeletal remains is becoming increasingly significant in the modern day as its significance grows. The prospect of unauthorised and fraudulent depiction of the remains also exists, which poses a serious risk to the field of research. In order to guarantee that the study activity respects the dignity of the ancient people being researched, researchers must exercise greater caution and handle these issues and concerns with clarity and care. It is crucial to preserve public confidence and uphold research ethics by being transparent about the data gathering process and its appropriate and required usage at key locations. Artificial intelligence has a multifaceted function in examining ancient skeletal remains, providing previously unheard-of possibilities for learning more about and discovering ancient humans. Advancements in this technology aid in the integration of archaeology and study, which might grow in the future to yield more fresh perspectives on our ancient Indian human past.

Reconstructing Artifacts through AI

Archaeological relics buried in the ground are recovered through the process of excavation. However, there's a good chance that different archaeological artefacts might be impacted and damaged throughout that procedure. Therefore, it is difficult to create historical data that is correct. Furthermore, repositioning the damaged material's pieces using adhesive is the most difficult and time-consuming procedure. This is where artificial intelligence technology comes in most handy when it comes to moving shattered things from a three-dimensional perspective. Accurate reconstruction, appropriate

measurement of the number of shattered components, and property analysis are all made feasible by three-dimensional computer technology. In addition to cutting down on time, this technology allows for precise measurements of the items' characteristics, a better comprehension of the things, and a better comprehension of the histories and messages that ancient civilisations left behind. The unique strength of GANs lies in their ability to autonomously generate lifelike images that closely emulate real-world objects, drawing from comprehensive training datasets.[9]

Artificial intelligence technologies may be used to bring back a variety of historical photos in three dimensions. numerous of the images taken to preserve old archaeological sites and locations of historical significance are in risk of disappearing in a nation like India, which has numerous places of historical significance. This is because of environmental and natural variability as well as poor preservation. We may purposefully bring our previous history to the future society in a comparable form by conserving it all using artificial intelligence technology, according to a number of researches. Such research is always being carried out elsewhere. It is crucial to preserve the photographs of temples that are in a state of decay, especially in a country like India where there are temples from many historical periods. This will allow people to learn about the temple's history, the architectural details of temples constructed during the reign of different kings, the evolution of sculpture, and the dissemination of culture. The largest obstacle in comprehending the whole history of the temples in the photos will be their fading, cracks, and distortions. Here, the established picture enhancing algorithms of artificial technology highlight how the photograph and its data should be interpreted. Advanced artificial intelligence and three-dimensional photography allow us to see details and clear creative compositions in photographs that are not normally visible to the naked eye. Subsequently then, a variety of artificial intelligence computer algorithms interpret and analyse the 2D photos from a three-dimensional perspective. Artificial intelligence technology performs this analysis by using machine learning technology to examine the bumps and sculptures in other images that resemble the one under study. Then, the technology absorbs these details and provides us with the intrinsic details and measurements of the images in those images. In addition to providing visitors with a novel experience, the three-dimensional representations of the different temples that face destruction will enable researchers to delve deeper into the subtleties of architecture from a variety of perspectives if this project is a collaborative effort between programmers working on artificial technology and archaeologists.

AI and Underwater Archaeology

One of the most significant and least explored facets of archaeological research is underwater archaeology. In addition to being one of the most significant domains of archaeology, underwater excavation is also the most crucial area of study that reveals and reconstructs history. Since it is frequently impossible to identify historical remnants that may be buried underwater due to their potential underwater depth and the variety of habitats in which they may be found, accessing such historical traces is extremely difficult. Here, artificial intelligence has experienced a rebirth, paving the way for new underwater exploration techniques and giving everyone the chance to learn about the historical riches hidden beneath the surface of the planet. India has 7,516 kms long coastline, 1197 Islands, 1,55,889 sq. kms of terrestrial waters and 20,13,410 sq. kms economic zone.[10] This vast area of the country is rich in underwater cultural heritage. This water sources has innumerable number of cultural resources being immersed without showing their historical importance. The underwater heritage of India, in the form of submerged cities and sunken ships spans a period of around 4000 years or more.[11] Since the

establishment of the underwater archaeology department within the Indian archaeological survey, multiple explorations and excavations have been carried out in various coastal areas with potential cultural resources, such as Dwarka, Somnath, Goa, Poompuhar (Kaveripoompattinam), Mamallapuram, Calicut, Rameshwaram coast, etc. Furthermore, an array of educational institutions especially Tamil University in Thanjavur, Tamilnadu, have carried out traditional investigation and discovered shipbuilding activity and iron and stone anchor portions along the state's coast. In order to locate the coastal submerged remains, the Andhra University Marine Archaeology Centre in Visakhapatnam has also carried out exploratory work along the Visakhapatnam coast. In this case, artificial intelligence plays vital role in expanding and exploring the cultural wealth of India which is submerged under deep waters. Through AI-driven tools such as sonar mapping, predictive modelling, and machine learning algorithms, researchers are now able to explore and analyze vast areas of the ocean floor with unparalleled precision, and unearth long-lost artifacts that were once thought to be beyond reach.[12] Sonar (Sound Navigation and Ranging) employs sound waves to determine the ocean floor and generates an immense amount of data that can be difficult for humans to understand. Sonar has applications for mapping and exploring the ocean because sound waves travel farther in the water than radar and light waves. However, artificial intelligence (AI) systems are able to search through this data and find changes and abnormalities that can point to the existence of an archaeological site. By using artificial intelligence predictive modelling, researchers are able to pinpoint and examine how a shipwreck deteriorates over time, giving them a clear understanding of where to focus their excavation efforts and potentially find tangible evidence for their studies. Machine learning is regarded as an intelligent assistant that, in addition to mapping the shipwrecks using the previously mentioned techniques, helps identify particular features within the wrecks by drawing on knowledge from prior experience to construct statistics based on the information gathered. Machine learning algorithms that are already taught to recognise patterns in the shapes of ships, cargo, navigation aids, etc., pave way for underwater archaeologists to identify the key elements of shipwrecks before the divers ever enter the water. These machine learning algorithms aid in expediting the excavation process and studying ship remains, enabling underwater archaeologists to uncover priceless historical artefacts and gather essential historical data with remarkable efficiency and capability. Despite the implementation of AI in underwater archaeology currently lies in its infancy, there is a great deal of scope for innovation. The use of AI in this sector will advance as it develops more, enabling archaeologists to delve deeper and reach beyond reaches of the ocean. The efficiency, accessibility, and precision of underwater archaeology will all increase with improved algorithms, more processing power, and improved integration with other technologies.

Locating New Sites via AI

Historical values are being transformed by artificial intelligence, which is also producing new and creative histories of historical locations. India is a booming country with emerging industries spanning all sectors. On account of significant developments in technology and industry, ancient sites are either destroyed or altered for development purposes. This uncovers the historic past beneath the surface without having the opportunity to document the historical details. In order to accurately find the archaeological sites, artificial intelligence is used in conjunction with cutting-edge technology like lidar and drones. High-resolution images and artificial intelligence-analyzed data sets are provided by this reputable, high-profile technology in order to find the traits and abnormalities that show signs of human

activity. Technologies like as lidar, which has its own specialised algorithms for studying and recognising minor irregularities, can uncover hidden treasures that have previously been buried beneath the Earth's surface but never been discovered. The existence of human activity over the ages would be revealed to researchers by differences in plant patterns or soil compositions that may be seen with infrared or multispectral cameras. When GIS and AI are combined, the pictures are divided into layers, including topographical maps, climatic data, historical documents, etc. Layering makes it easier to find regions that are similar to the geographical and environmental characteristics of previously recognised historical sites. When LIDAR and artificial intelligence are combined, they can reveal historical riches that have been concealed in deep forest regions that have been destroyed over time. The Ultraytics YOLO11 is one of several computer vision models that may be used to interpret pictures captured by various cameras, like as multispectral and infrared cameras, in order to identify buried places. YOLO11 is a real-time modelling tool for object orientation and picture segmentation from Ultraytics. This program, which uses machine learning and neural networks to teach computers to comprehend visual data like photos or movies, is the most advanced version of deep learning and computer vision software. This might help you make better selections.) that provides unparalleled speed and precision. With the use of this program, it can identify changes in the landscape that are hidden under the surface and provide a variety of information on the buildings, streets, walls, and other structures.

Augmented Reality

The process of overlaying the digital information in the physical environment is the Augmented Reality i.e., placing a 3D object in a place where we like to place it to make prior arrangements. Also it can be explained as bring the 3D object, images or text into the real world. In archaeology AR offers lots of opportunities for real time visualizing and interacting with virtual artifacts. This gives the public and archaeologists realistic and intriguing experiences of ancient sites. Augmented reality (AR) allows investigators to digitally "travel around" historical towns, explore the interior of buried tombs, and realise locations as they existed in the past by superimposing three-dimensional reconstructions of old buildings onto present environments. This fascinating feature of augmented reality in archaeological study aids in a better comprehension of the geographical distribution and relationships between different sites, as well as the numerous historic habitats that formerly predominated. Additionally, augmented reality will make the past more interesting, approachable, and productive for the vast majority of people by allowing the general population to see archaeological sites and artefacts. India is home to several historical relics and World Heritage Sites. Visiting India's years old historical sites is invaluable for tourists travelling from all over the world. This artificial intelligence technology will allow them to see the existing archaeological sites from a three-dimensional viewpoint. Additionally, they will feel as though they can travel back in time by viewing the old archaeological remains in the modern world. Opportunities for travellers to see India's historical past from many perspectives and dimensions and to grow tourism at its heart abound.

Virtual Reality in Archaeology

It is a completely computer generated stimulated environment where user can interact in the real world. It’s also an exciting technology that transports users into immersive digital environments, completely separate from the real world. For example it’s been used in the training session for the pilots in a room as each and every time the trainers cannot be taken for flying. It gives the trainers the real world

experience as if they fly in the skies. VR technology is increasingly changing the archaeology field in the way how the sites been explored and how the visitors communicate with it. High resolution 3D models are being used in VR to make the archaeological features more visible in the ways that have not been possible before. Various archaeological sites in India could be visualized and shared in a totally exiting new ways. It gives impression that the visitor walk through the site or monuments and he or she can feel it. The visitors can interact as if they are in the field even if they are far away from the sites. Archaeologists can recreate ancient cities, artifacts and environment in a digital space. Lidar and Photogrammetry technologies are being used to scan the sites which capture the physical dimensions of the ruins of the cities which are later reconstructed in 3 dimension. VR headsets are used to explore the sites and monuments enabling the visitors to interact with historical sites.

Enhancing AI hardware

Future advancements in artificial intelligence hardware technology will support the progress of cultural preservation in a variety of ways. Archaeologists will be able to work with larger data sets more accurately and quickly due to the software and hardware that initially improve the resolution of the 3D models created by AI technology once processor speed is increased and storage capacity seems increased. Furthermore, on-site archaeological site analysis is likely to be accomplished by tiny, portable machinery manufacturers and would grow with the use of AI-assisted analytical technologies. Furthermore, the upcoming archaeological research might experience a Renaissance thanks to the new, sophisticated censors and artificial intelligence-integrated scanning equipment for archaeological materials.

In archaeological investigation, interdisciplinary methods

Archaeology is not a single subject, as is previously known; its research module incorporates elements of science, computer science, mathematics, statistics, and other fields. In order to bridge the gap between technology and the humanities and effectively preserve ancient monuments, sites, and materials, future advancements in artificial intelligence and its potential integration with other disciplines will be necessary. Working together, the artificial intelligence specialists, archaeologists, historians, and cultural preservation specialists will expedite the research process and resolve the numerous issues encountered in archaeological study and the conservation process.

Discussion

Even though archaeology is an old science, integrating artificial intelligence to address some of its most enduring problems is still a relatively young area of study. Although study and testing on many of its applications are still in their early phases, the findings are encouraging. AI is used relatively little in archaeological research in India; this has to be improved with an interdisciplinary approach and the inclusion of professionals. The potential of artificial intelligence (AI) to help solve new puzzles left by ancient civilizations is rapidly becoming apparent to researchers. Archaeologists are empowered to make discoveries and reconsider our preconceived notions when they get fresh information about possible archaeological sites or details we overlooked. These technologies will become even more accurate with the collection of data, opening up new historical windows for possible archaeological research. Thus far, it is evident that many of the artificial intelligence technologies discussed above is applied in archaeological study globally and how we could perhaps reconstruct history by unearthing buried,

forgotten, and obscured archaeological material. Multiple finds of archaeological evidence are constantly being discovered during field research and excavations, particularly in a nation having so rich heritage as India. Various kinds ancient stone tools, metal items, inscriptions, coins, sculptures, architecture, etc. have been taken out of the archaeological study and put on display in museums, especially since the Stone Age. The biological makeup of ancient humans may be inferred from their bones and other remnants, which can also provide insight into their surroundings, environmental factors, food practices, and physical issues they faced. In the past, getting historical information from such bone remains to establish their validity was not only a very tough and complex work, but it also took a very long time and was done with some difficulty by their scholars. Such a difficult operation has now been computerised thanks to artificial intelligence technology, which has also improved the quality of the data and is technically very helpful for acquiring historical data. We are capable of understanding the ancient language structure of different Indian languages, the formation and hierarchical development of writing, the social structure, and the cultural assemblages that existed at the time by using artificial intelligence technology to study the damaged portions of the inscriptions and comprehend their entire history. We have to admit that the underwater excavations that have been done so far in various places of India, using various methodologies, are taking a long time and have certain technical issues. Artificial intelligence technology would undoubtedly aid in deep-sea exploration to uncover our nation's cultural splendour in such a scenario by forecasting the most accurate history without wasting time or allowing for technological issues. Conducting field surveys to identify different sites is another challenge for archaeologists. Finding archaeological sites and deciding where to excavate at the sites that have been found can be challenging due to their lengthy turnaround periods and the traditional methods of information gathering and analysis. In order to circumvent this, artificial intelligence created a much easier environment to perform a variety of tasks, including taking three-dimensional photos with different cameras using unmanned aircraft, comparing the results, choosing the best sites for excavation, and identifying the objects that are available at the chosen location without altering their nature. There is no question that if this artificial intelligence technology is applied more thoroughly and accurately, our history will be proclaimed on a global scale and the antiquity of India will be more accurately confirmed. This is specifically true in Tamil Nadu, where the culture, civilization, and antiquity of the Tamil language can be explored. India is a country that places a high value on excavations.

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