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Theme: Applications Of Artificial Intelligence And Machine Learning In Various Fields

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AI based technologies have immense potential in recent years and have emerged as a highly effective approach in Bio sciences. AI's great achievement is that it recognizes patterns, interprets language, makes predictions from data and carries out actions in response to inputs by using many of the cognitive and perceptual abilities of live systems. An ideal AI can logically solve problems, learn from experience and react with external environment just like human intellect.

Artificial intelligence is classified into three types, Narrow AI, General AI and Super AI. Narrow AI can perform only one task at a time according to the given programs. General AI can efficiently perform numerous tasks simultaneously. It can learn, understand, reason and adapt across multiple domains. Super AI refers to hypothetical form of AI that exceeds human intelligence in every aspect such as problem solving, creativity and emotional understanding. Super AI in future will be capable of outperforming human intellectual and practical tasks.

Machine learning is a subset of artificial intelligence. It is a method that allows computers to learn patterns from data and make decisions or predictions automatically. For example, YouTube recommends videos you might like. Netflix suggests movies you would enjoy. The system observes what you have watched in the past, identifies patterns in your choices and predicts what you might like next.ML helps AI to become smarter over time.

AI has several branches such as computer vision, natural language processing and robotics.AI is no longer a research topic. It is already part of our daily life. It is working silently in the background to make things faster, smarter and more efficient. Therefore, let us dive deeper into the various applications of AI and ML in various fields.

Artificial Intelligence and Machine learning in Education

AI is transforming education in innumerable ways. It is helping in building strong and meaningful connections with students and can never replace teachers but on the contrary gives immense support to teaching. It analyses students learning patterns, strengths and weaknesses and provides a personalised learning experience to every student. It keeps the students engaged in learning through AI driven activities like games and simulations which make the learning process more exciting and fun filled.

Administrative tasks such as attendance scheduling, communication with parents, grading assignments and exams can be done quickly and consistently allowing teachers to dedicate more time to individual students needs and less to paper work. With the help of AI tools teachers can tailor their teaching strategies, identify learning gaps among students and ensure that no student is left behind. With reference to examinations there are several benefits such as automated grading, plagiarism detection and generation of personalised feedback. Digital text books are always up to date and online modules provide content which is relevant to the present situations.

Teachers can reach out to universal audience and enhance their teaching skills by integrating AI capabilities. Students can learn complex subjects at their leisure by using AI driven learning assistants such as Socratic by Google which helps to solve mathematical and scientific problems.

AI assisted support Chat bots such as IBM Watson Tutor works 24 hours a day to clarify students inquiries and provide solutions to difficult questions. Another AI assisted support chatbot namely Scribe Sense helps students to organise their handwritten notes and rewrite in digital content so that they can read easily at a later time. Students with speech and hearing impairment can be assisted by AI powered tools such as Google's live transcribe, Ava and Microsoft Immersive reader which convert speech to text and vice versa.

Nowadays due to ban on dissections teachers are unable to explain clearly the various systems in animal physiology. Virtual laboratories are providing a wonderful platform for students through laboratory simulations to enhance their practical knowledge Students are also able to perform experiments in scientific setups using Labster.

Instant translations help us understand other languages. Scientists can communicate with one another and share their scientific developments through AI powered linguistic training. Duolingo helps to personalise language learning experience and Dysolve can detect Dyslexia which is a learning disorder in children. Dyslexia is a neural disorder that mainly affects the ease with which a person reads, writes and spells.

Platforms like Dreambox and Smart space, Carnegie learning help students to understand and master concepts. Kahoot and Minecraft education edition helps to create interactive quizzes. Notta helps to convert spoken words into text for hearing impaired. Platforms like Knewton Alta helps teachers to track student performance across various metrices. Gradescope helps to grade assignments. Classcraft helps to track student behaviour and reward them for positive actions. Wolfram Alpha use AI to understand the interconnectedness of different fields of study. Earthspeakr helps students to have both theoretical knowledge and emotional understanding. Google expeditions use AI to create virtual field trips.

Virtual conferences can be organised by using Big marker. Remind helps to provide communication between parents and teachers. Dark trace helps to identify unusual network activity. Mainstay reminds students for deadlines and guide them for independent learning.

By integrating AI capabilities teachers can enhance their teaching methods provide better support to students and manage their time more effectively. Students on the other hand can understand complex concepts, improve their academic performance break away from the rigid traditional mode of learning and stay motivated and involved. Education is all round development of individual's physical, mental emotional, social and aesthetic domains. AI powered tools help in fulfilling these criteria and succeed in bringing about all round development in students.

AI and Machine Learning for advancements in Agriculture

AI in agriculture involves the use of advanced technologies such as robotics, machine learning and internet of things (IOT) to enhance various agricultural practices.

Agriculture which is integrated with Artificial Intelligence can do wonders in farming. AI driven tools can perform tasks faster and more accurately than traditional methods. Machine learning algorithms conduct analysis of vast amounts of data from reports such as weather forecasts, soil samples and crop health reports and help farmers to make decisions regarding sowing, fertilization and harvesting. AI also helps to achieve sustainability through optimal use of resources. AI helps to predict weather patterns, crop health and market trends and thus helps farmers to plan better. This is called predictive analysis. For detecting pests and diseases and for assessing soil conditions AI provides computer vision technology which enables machines to interpret and process visual information. Though image analysis farmers can monitor crop health.

Agriculture can be transformed using AI in areas of soil management, water management, precise mapping of the need of fertilizers, pesticides herbicides and insecticides, to predict the amount of yield and overall management of crops. Drones and robots are being used to harvest crops at a much faster rate than traditional methods. AI helps in forecasting weather fluctuations and arrival of monsoons. AI based biosensors help in early detection of diseases in crop plants even in the absence of symptoms and thus reduce product loss. Drone technologies such as Efficient Net V2 can detect classify plant diseases very accurately, precisely and thus helps to monitor plant health. AI can be used to manipulate genes and design effective synthetic promoters to improve the agronomic traits in plants. Recurrent Neural Network (RNN) and Temporal Convolutional Network (TCN) algorithm can be utilized to estimate greenhouse crop yields very accurately. AI and machine vision based smart sprayer sprays pesticide specifically on weed targets thus reducing overuse of weedicide and contamination of the environment. Thus, AI helps to improve environmental sustainability

AI in Medical Science:

In medical science AI is used in disease diagnosis, Predictive Epidemiology, manufacture of precision- based medicines and studying host pathogen interactions. AI based biomarkers help doctors to predict and analyze patient responses to the treatment and survival of the patient and distinguish between benign and malignant tumors. With the help of AI personalized medicine is developing at a fast pace in which drugs are tailored basing on the body's needs and adaptability. Researchers are using AI in DNA, RNA, and protein studies and helping in creation of appropriate treatment plan for a patient depending on the patient's medical history, personal data and genetic make-up. AI based system of personalized medicine helps in reducing treatment costs, minimizes side effects, saves time and improves patient care.AI simplifies gene editing, radiography and helps in building electronic health records with evidences and helps to forecast major adverse effects of prolonged medications

Artificial Intelligence was found to be useful in early diagnosis and treatment of Myopia. Deep learning algorithms can detect metastatic breast cancer from biopsies very accurately and also diagnose heart malfunctioning through cardio vascular imaging. Algorithms combined with medical expertise can do wonders in medical field.AI can also be used to forecast genetic disorders and thus prevent occurrence of inherited diseases.

AI and Industrial Biotechnology:

AI based computer models, robotics and machine learning are being used to develop best optimum growth conditions for the strains and thus increase the productivity. For ex: Response Surface Methodologies (RSM) which is an AI based approach helped in high level production of amylases from Rhizopus microporous. Integrated ANN Taguchi method model was used to predict biomass feedstock properties, bio energy supply chains and thus attain maximum bio fuel yield up to 98.95%. The availability of Omics data has helped in using machine learning for host strain selection, metabolic pathway reconstruction, fermentation and optimization of metabolic flux.

AI based technologies generally use high resolution lenses, infrared cameras, competent programs and highly expensive sensors. More over to operate drones, farmers need authorization according to its operative and regulative provisions of the law of land. To design protocols thorough knowledge of the effects of algorithms as well as data sets are essential to meet bio industry challenges. Efficient data integration is essential for proper functioning of AI and ML based models.

Despite a few drawbacks AI in medicine will save millions of lives and reduce medical costs. AI in agriculture leads to precision farming and will in future help to reduce world's rising population's demand for food. The efficient production of bio-enzymes using AI will reduce production costs and revolutionize biotech industry

Artificial intelligence in Aquaculture:

Remote sensing is becoming an important tool in aquaculture and is being used extensively to monitor water quality and temperature, detect pollution, track fish population and detect changes in sea level. Remote sensing also helps to reduce the risk of disease outbreaks by providing accurate view of conditions on the farm.

1) Various remote sensing techniques such as acoustic surveys, sonar and LiDar are used to monitor fish behavior, assess fish health and estimate fish biomass. Use of satellite images aids in mapping aquaculture farms.

2) Remote sensing and mapping help to detect harmful algal blooms (HABs) , changes in physical and chemical parameters, size and intensity of HABs and chlorophyll concentration by using sensors that can measure the reflectance of light from water surface. Bathymetry mapping helps to know the depth of water in aquatic systems with the help of Sonar technology.

3) Sensors can also detect the abundance of fish in a water body, monitor water temperature fluctuations, fish migration patterns and fish distribution patterns. Coastal erosion is a threat to aquaculture farms in coastal areas. This can be detected by remote sensing and helps fish farmers to avoid habitat degradation and protect aquaculture infrastructure. By tracking fish migration patterns fish farmers can decide when and where to deploy fishing gear and also understand the behaviour of different fish species. Hence Aquaculture practitioners should incorporate remote sensing technology into their management practices to obtain better productivity and profitability.

CONCLUSION

Artificial intelligence and machine learning have transformed the way we interact with technology, offering solutions that are faster, more efficient, and increasingly autonomous. Their ability to learn from data, recognize patterns, and make intelligent decisions has opened up new frontiers in innovation and problem solving. However, alongside these advancements come challenges such as data privacy, algorithmic bias, and ethical considerations that must be carefully addressed. As AI and ML technologies continue to evolve, the focus must remain on creating transparent, fair, and human centred systems that augment human capabilities rather than replace them. Ultimately, the future of AI and ML lies in responsible development, harnessing their immense potential to drive progress and ensure sustainable inclusive growth across all sectors.

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